



A QUAKER HOUGHTON COMPANY

Certificate of Conformance SIFCO Process Solution

The solution identified below has been tested under controlled conditions and found to meet SIFCO Applied Surface Concepts specifications and Quality Assurance standards. This product does not contain, nor has it been contaminated with metallic mercury or mercury compounds. SIFCO ASC, LLC is a mercury free facility. This product is free from all foreign materials that could result in foreign object damage to the equipment or process.

Capability of Meeting Specifications

SIFCO Process electroplates, when properly selected and applied, will meet the requirements of: AMS2451/9, MIL-STD-2197A (SH), and BAC5664A. This solution meets the Hydrogen Embrittlement requirement for AMS2451/9C, LGPS1107, BAC5664A, MIL-STD-865E and ASTM F 519-18.

Product Code	4018 / 5970
Product Description	Zinc-Nickel LHE®
Batch Number	2108035
Test Requirement	Actual Value
Specimen Types	1a.1 Notch Bars per ASTM F 519 Lot # 53G 1a.2 Notch Bars per ASTM F 519 Lot # 99E Notch Bars per BAC5144 Lot 068327N
pH	8.91 @ 20°C
Specific Gravity	1.268 @ 20°C
Metal Content	Zn 83.71 g/L Ni 15.76 g/L
Hydrogen Embrittlement	Conforms
200 Hour Fracture Test	PASS per AMS2451/9C, LGPS1107, BAC5664A, MIL-STD-865E Report Numbers: 21-70858, 21-71065, 21-71066
96 Hour Corrosion Test	PASS per BAC5664A and LGPS1107 Report Number: 2109-13-0567
Solution Appearance	Blue-Green
Solution Manufacturing Date	August 13, 2021
H/E Certification Pass Date	September 18, 2021
Date of Expiration	AMS2451/9 and MIL-STD-865E: August 13, 2025 LGPS 1107 & BAC 5664A: Retest Before: September 18, 2022

Quality Systems Engineer

09/23/2021

Date

"Specialists in Embrittlement Testing"

Date: August 30 2021
To: **SIFCO OH**
5708 Schaaf Road
INDEPENDENCE, OH 44131
Test Report: 21-70858
Reference P.O.: PO00007850
S/N 888 - 890
Test: **NOTCH TENSILE HYDROGEN EMBRITTLEMENT**
Sample Identification: SAMPLES A, B, C:
Job / SN: SOLUTION CODE 4018 BATCH 2108035
Process: BRUSH ZINC NICKEL
PO Specification: AMS 2451/9C, ASTM F519
Test Method Scope: ASTM F519-18
Receive Date: Aug 19, 2021
Test Start Date: Aug 19, 2021
Test End Date: Aug 28, 2021
Sample Lot: 99E **Mfg.:** GREEN
Notched Ultimate Tensile Load: 15100 **Units:** LBS
Test Load: 11325 **Units:** LBS
Results: Conforms

The above identified notched tensile samples were subjected to a 200-hour sustained load test at a load of 75% of the Notch Ultimate Tensile Load (NUTL). Results above are applicable to submitted purchase order specifications. Additionally, results apply to the samples as received. Variances as applicable are noted at bottom right of report:

Report Revision: 1
Revision Description: 1 - Original

APPROVED
SMB 9/3/2021



Testing performed under direct supervision of approved signatories per QM-001 ISO 17025 Quality Manual PARA 7.8.

Jeremy Riley **Joshua Cox** **Clint Williams**
Ops Mgr **Quality Mgr** **Engr Tech**

Decision Rule: Per previously communicated and agreed, data has been supplied/reported as observed without accounting for measurement uncertainty.

Report invalid unless color seal present. Page 1 of 1

"Specialists in Embrittlement Testing"

Date: September 20 2021
To: **SIFCO OH**
5708 Schaaf Road
INDEPENDENCE, OH 44131
Test Report: 21-71065
Reference P.O.: PO00007906
S/N 1,2,3,4
Test: **NOTCH TENSILE HYDROGEN EMBRITTLEMENT**
Sample Identification: SAMPLES A, B, C, D:
Job / SN: SOLUTION CODE 4018 BATCH 2108035
Process: BRUSH ZINC NICKEL PLATE
PO Specification: LGPS 1107², MIL-STD-865E,ASTM F519 1A1
Test Method Scope: ASTM F519-18
Receive Date: Sep 10, 2021
Test Start Date: Sep 10, 2021
Test End Date: Sep 18, 2021
Sample Lot: 53G **Mfg.:** GREEN
Notched Ultimate Tensile Load: 9280 **Units:** LBS
Test Load: 6960 **Units:** LBS
Results: Conforms

The above identified notched tensile samples were subjected to a 200-hour sustained load test at a load of 75% of the Notch Ultimate Tensile Load (NUTL). Results above are applicable to submitted purchase order specifications. Additionally, results apply to the samples as received. Variances as applicable are noted at bottom right of report:

Report Revision: **Revision Description:**
1
2 - 9/21/21
1 - Original
2 - Customer added specification to PO

APPROVED
SMB 9/28/2021



Testing performed under direct supervision of approved signatories per QM-001 ISO 17025 Quality Manual PARA 7.8.

Jeremy Riley **Joshua Cox** **Clint Williams**
Ops Mgr **Quality Mgr** **Engr Tech**

Decision Rule: Per previously communicated and agreed, data has been supplied/reported as observed without accounting for measurement uncertainty.

Report invalid unless color seal present. Page 1 of 1

"Specialists in Embrittlement Testing"

Date: September 20 2021
To: SIFCO OH
5708 Schaaf Road
INDEPENDENCE, OH 44131
Test Report: 21-71066
Reference P.O.: PO00007904
S/N 0889N, 0890N
Test: NOTCH TENSILE HYDROGEN EMBRITTLEMENT
Sample Identification: SAMPLES A, B:
Job / SN: SOLUTION CODE 4018 BATCH 2108035
Process: BRUSH ZINC NICKEL PLATE
PO Specification: BAC 5664A, BAC 5144, ASTM F519
Test Method Scope: ASTM F519-18
Receive Date: Sep 10, 2021
Test Start Date: Sep 10, 2021
Test End Date: Sep 18, 2021
Sample Lot: N **Mfg.:** ONAMAC
Notched Ultimate Tensile Load: 16126 **Units:** LBS
Test Load: 12095 **Units:** LBS
Results: Conforms

The above identified notched tensile samples were subjected to a 200-hour sustained load test at a load of 75% of the Notch Ultimate Tensile Load (NUTL). Results above are applicable to submitted purchase order specifications. Additionally, results apply to the samples as received. Variances as applicable are noted at bottom right of report:

Report Revision: 1 **Revision Description:** One sample was metallographically cross-sectioned longitudinally across the notch and evaluated at 80-100X magnification for complete plating coverage of the notch. Conforms. Photo attached
1 - Original Samples Loaded on individual frames.



Testing performed under direct supervision of approved signatories per QM-001 ISO 17025 Quality Manual PARA 7.8.

Jeremy Riley **Joshua Cox** **Clint Williams**
Ops Mgr **Quality Mgr** **Engr Tech**

Decision Rule: Per previously communicated and agreed, data has been supplied/reported as observed without accounting for measurement uncertainty.

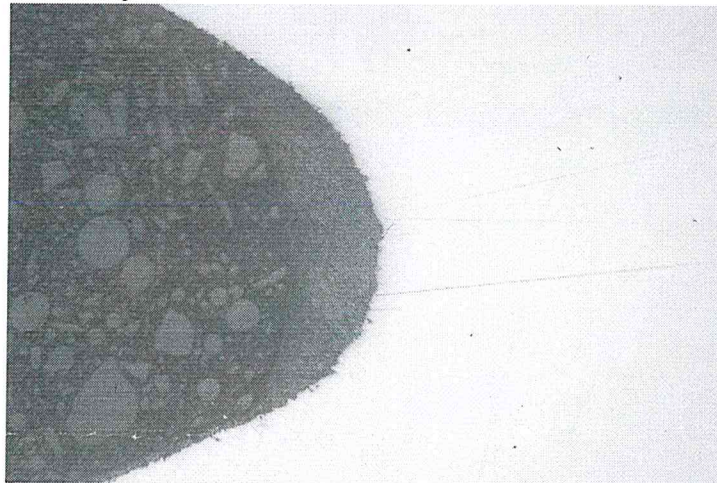
Report invalid unless color seal present. Page 1 of 1

APPROVED

SMB 9/28/2021

"Specialists in Embrittlement Testing"

Date: September 20 2021
To: **SIFCO OH**
5708 Schaaf Road
INDEPENDENCE, OH 44131
Test Report: 21-71066
Reference P.O.: PO00007904
Test: **PHOTOMICROGRAPH**
Sample Identification: SAMPLE A:
Job / SN: SOLUTION CODE 4018 BATCH 2108035
Process: BRUSH CADMIUM PLATE 1A2
PO Specification: BAC 5854M, BAC 5144
Test Method Scope: ASTM E3-11(2017)
Receive Date: Sep 10, 2021



S/N 0889N



Revision Description:
1 - Original

Testing performed under direct supervision of approved signatories per QM-001 ISO 17025 Quality Manual PARA 7.8.

Jeremy Riley **Joshua Cox** **Clint Williams**
Ops Mgr **Quality Mgr** **Engr Tech**

Decision Rule: Per previously communicated and agreed, data has been supplied/reported as observed without accounting for measurement uncertainty.

Report invalid unless color seal present. Page 1 of 1



A DIVISION OF J.T. ADAMS CO., INC.

4520 WILLOW PARKWAY
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PHONE (216) 641-3290
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www.tensile.com

CERTIFIED TEST REPORT

Sifco ASC
5708 E Schaaf Rd
Independence OH 44131

Job No.: 2109-13-0567
Date: 9-22-2021
Cust. PO#: PO00007908

Description: 2 samples Panel 1 & 2 Reference# 4018-2108035
Solution Code: 4018 Batch# 2108035

Material: Steel with Zinc Nickel and 3007 Conversion Coating

Spec: LGPS 1107
BAC 5664A

TEST RESULTS

96 Hour Salt Spray (ASTM B117-19)

Cust. Req.: No white or red corrosion of significant surfaces after 96 hours ±1.

Test panels showed no corrosion products.

Note: Panels exposed at 6° from vertical.

(See attached photo)

APPROVED

8MB 9/23/2021

The above **conforms** to requirements listed.

Authorized Agent

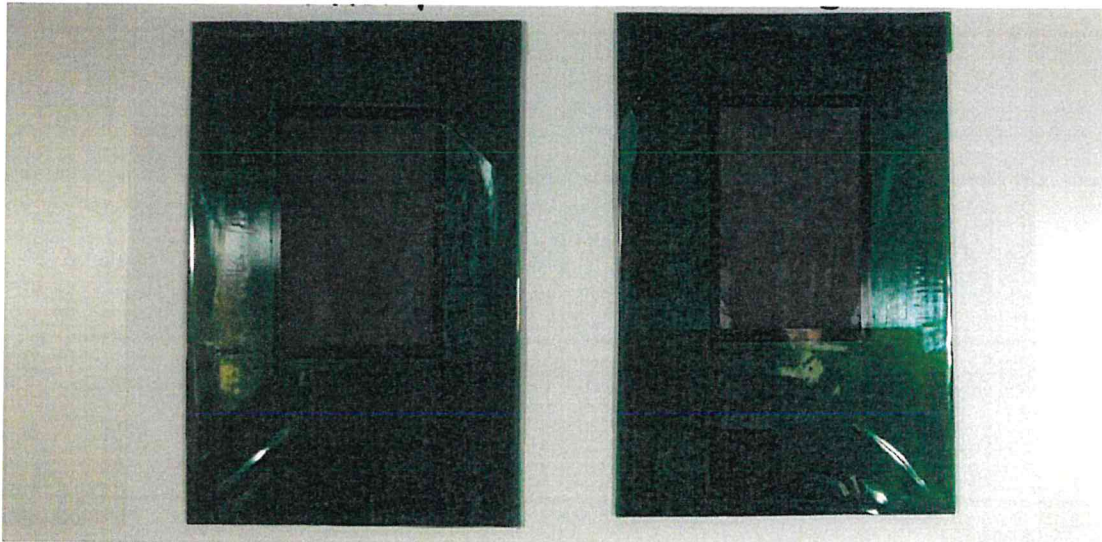


CERTIFIED TEST REPORT

Job No.: 2019-13-0567

Sifco ASC

Salt Spray 96 Hours



Panel 1

Panel 2

Figure No.: 1