STRESS ENGINEERING SERVICES INC.

13800 Westfair East Drive
Houston, Texas 77041-1101
Phone: 281-955-2900
Texas Registered Engineering Firm F-195

Certificate of Test

Client:	CapRite	**Date:**	22 January 2025
	13100 Wortham Center Dr. #333	**SES Document No.:**	2024_2674-CT-03_Rev1
	Houston, Texas 77065	**Project Manager:**	Taylor Yeary, PE
Client Contact:	David Brown	**Date of Testing:**	January 6-8, 2025
PO Number:	1007		

Project/Test Description: CapRite contracted SES to perform impact testing of thread protector caps per API 5CT Annex F.6-7. The thread protectors were tested in the "Standard" configuration with the "Bowed Finger(s)" pipe internal retention and stability mechanical apparatus installed into the thread protector.

Test Sample Identification: CapRite, 5-1/2" 17/20lb Quickie Protector – Standard with Bowed Finger(s) Pipe Internal Retention and Stability Mechanical Apparatus

Samples: 1, 3A, 4, 6, 8, 10

Test Temperatures, Impact Energies, and Orientations are listed in Attachment 1 for each sample.

Test Equipment: Vertical Drop Impact Frame

- Axial Impact
  Drop Weight: 402 lb
  Impact Surface: 1.5" Dia. Rod
- 45° Impact
  Drop Weight: 391 lb
  Impact Surface: Flat plate

Drop Height: Displacement transducer (SN: 44060948)

Drop Weight: 1K Load cell (SN: 108964A)

Procedure: The testing procedure included vertical axial impact drops and 45 degree angular impact drops at 3 temperature levels for a total of 6 drop configurations, detailed in Attachment 1. Testing was performed per API 5CT Annex F.6-7.

Standard protectors were temperature conditioned as an assembly with the casing pin. The drop sled weight and drop heights were measured with a calibrated load cell and displacement transducer. Calibration Sheets can be found in Attachment 3.

Before and after each drop, observations of any damage to casing pin or thread protector were noted and photographed.

Certificate of Test

Results: Standard Thread Protectors

Test of all standard thread protectors with the "Bowed Finger(s)" installed resulted in no observable damage to casing pin in their respective impact drops in both axial and angled orientations at all temperatures. The condition of each thread protector after each test is summarized in Attachment 1.

Observations for each test are documented in Attachment 1.

Test set-up photos are included in Attachment 2.

Detailed photos of thread protector samples after testing can be found in Attachment 4.

Prepared by:

Cole Gatz
Project Engineer

Taylor Yeary, PE
Associate

Reviewed by:

Scott Wharton, PE
Principal

List of Attachments:

Attachment 1: Testing Log

Attachment 2: Test Set-up Photos

Attachment 3: Calibration Certificates

Attachment 4: Post-test photos

Attachment 1: Testing Log

STRESS ENGINEERING SERVICES INC.

SES PN: 2024_2674
Project Manager: T. Yeary
Testing Performed by: C. Gatz
Test Date: January 6-7, 2025

CapRite Thread Protector Impact Testing - API 5CT Class A

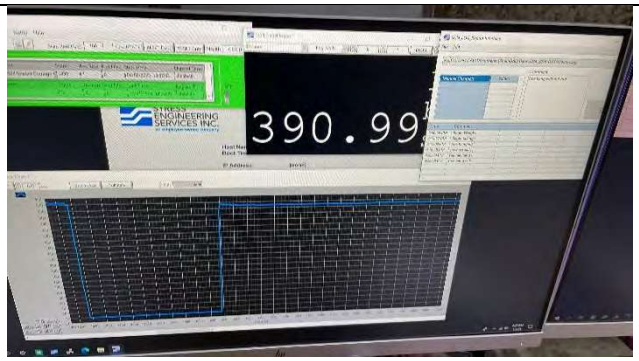
CapRite, 5-1/2" 17/20lb Quickie Protector – Standard

Sample No.	Test Orientation	Impact Head	Specified Test Temperature (±10 °F)	Measured Drop Weight (lbs)	Req'd Min Impact Energy (ft-lbs)	Sample Temperature (Measured) (°F)	Drop Height (Measured) (in)	Impact Energy (Measured) (ft-lbs)	Pct. Over Req'd Energy	Thread Protector Test Results	Casing Pin Test Results
1	Axial	1.5" Diam. Round Bar	70	402	757	63	24.19	810	7	Exterior deformation at rod impact. Slight indendtation on interior side wall at pin nose.	No Observable Damage
8	Axial	1.5" Diam. Round Bar	-50	402	424	-54	13.6	456	7	Exterior deformation at rod impact. Crack through material at impact location. Slight indendtation on interior side wall at pin nose.	No Observable Damage
6*	Axial	1.5" Diam. Round Bar	150	402	282	155	12.05	404	43	Exterior deformation at rod impact. Slight indendtation on interior side wall at pin nose.	No Observable Damage
3A	Angular	Flat Plate	70	391	378	63	12.54	409	8	Visible surface cracking and indentation at impact location. Slight indendtation on interior side wall at pin nose.	No Observable Damage
10*	Angular	Flat Plate	-50	391	211	-58	12.09	394	87	Visible surface cracking and indentation at impact location. Slight indendtation on interior side wall at pin nose. "Secondary Containment" cap disconnected (See Post Test Photo)	No Observable Damage
4*	Angular	Flat Plate	150	391	141	155	12.16	396	181	Exterior deformation and signs of surface cracking at impact location. No Throughwall Cracks. Interior indentation at pin nose into side wall and cap end.	No Observable Damage

*Note: Test No. 6, 10, and 4 impact energy will be higher than the minimum required impact energy due to the required minimum drop height and minimum drop weight of test frame. Drop test frame is assumed to be frictionless.

Attachment 2: Test Set-up Photos

Axial	Angular (45°)
	
	

Axial	Angular (45°)
	
1.5 inch dia. rod impactor per API 5CT F.6.3	Flat plate impactor per API 5CT F.7.3
	
Calibrated drop sled weight in Axial configuration	Calibrated drop sled weight in Angular configuration

Standard Thread Protector With “Bowed Finger(s)”

Attachment 3: Calibration Certificates

Stress Engineering Services, Inc.
13800 Westfair East Dr.
Houston, Texas 77041

Cal Date: 22 May 2024
Due Date: 22 May 2025
Report No: 45434-964AT
SES PN: 9170305

Calibration Report

Owner: Mohr Engineering Division
13602 Westland East Blvd.
Houston, Texas 77041

Ambient Temp: 75.5 F

Machine: Tovey Engineering - Interface 1,000 Lb Load Cell System
Tovey Engineering Cell Model: FR10-1K-B253 Serial: 108964A
Interface Indicator Model: 9840 Serial: 75300
Shunt Cal: 865.7 Lbs

TENSION LOADING - POSITIVE OUTPUT (POSITIVE SHUNT)
"AS FOUND, AS LEFT" – NOT ADJUSTED

Run 1: Load, in Lbs:		Machine Error		Run 2: Load, in Lbs:		Machine Error		Repeatability:	
True:	Indicated:	Lbs:	%:	True:	Indicated:	Lbs:	%:	Lbs:	%:
100.8	100.0	-0.8	-0.79%	100.7	100.0	-0.7	-0.66%	0.1	0.14%
200.7	200.0	-0.7	-0.36%	199.7	200.0	0.3	0.18%	1.1	0.54%
298.1	300.0	1.9	0.63%	300.4	300.0	-0.4	-0.14%	-2.3	-0.77%
400.5	400.0	-0.5	-0.12%	400.4	400.0	-0.4	-0.11%	0.1	0.01%
500.9	500.0	-0.9	-0.17%	500.3	500.0	-0.3	-0.06%	0.6	0.11%
599.7	600.0	0.3	0.06%	600.2	600.0	-0.2	-0.03%	-0.5	-0.08%
700.3	700.0	-0.3	-0.04%	700.2	700.0	-0.2	-0.03%	0.1	0.01%
800.0	800.0	0.0	0.00%	800.5	800.0	-0.5	-0.06%	-0.5	-0.06%
900.2	900.0	-0.2	-0.03%	899.4	900.0	0.6	0.07%	0.9	0.10%
1,000.5	1,000.0	-0.5	-0.05%	999.9	1,000.0	0.1	0.01%	0.6	0.06%

Tolerance per ASTM E-4: 1% (of Reading)
System Resolution: 0.1 Lb
Machine Loading Range: 100.0 to 1,000.0 Lbs
Maximum Error Observed: 0.79 % @ 100.0 Lbs Indicated
No-Load Output: -0.003 mV/V Shunt Output: 0.880 mV/V

True loads were recorded at values of indicated load according to ASTM Standard E4-21
Observed zero return was within the tolerance in section 10.5

This calibration was performed using equipment verified by Morehouse Instrument Company, Inc. and is traceable to SI through a National Metrology Institute (NMI) such as the United States National Institute of Standards & Technology (NIST) in accordance with ASTM Standard E74-18. Instruments were compensated for the effect of temperature on zero and span by the manufacturer(s).

Device:	Serial:	Class "A" Range, in Lbs:	Verified:
Morehouse Cell	P-8281	100.00 – 5,000.0	28 Jun 2023

Performed By: Joshua Hamel

Reviewed By: Roy Nash

Certificate of Verification

This is to certify that the:

Tovey Engineering - Interface 1,000 Lb Load Cell System
Tovey Engineering Cell Model: FR10-1K-B253 Serial: 108964-A
Interface Indicator Model: 9840 Serial: 75300
Shunt Cal: 865.7 Lbs

TENSION LOADING - POSITIVE OUTPUT (POSITIVE SHUNT)
"AS FOUND, AS LEFT" – NOT ADJUSTED

Located At:

Mohr Engineering Division
13602 Westland East Blvd.
Houston, Texas 77041

Was calibrated on 22 May 2024 according to ASTM Standard E4-21 Annex A1 (verification of a force measuring system out of the test machine). The system was determined to indicate load within the specified 1.0 percent tolerance on the ranges listed below. This Certificate accompanies a Calibration Report which details the specific errors. The maximum error observed was 0.79 percent

Machine Range, lb:	Loading Range, lb:
1,000	100.0 – 1,000.0

Ambient temperature recorded during this calibration: 75.5 F

This calibration was performed using equipment verified by Morehouse Instrument Company, Inc. and is traceable to SI through a National Metrology Institute (NMI) such as the United States National Institute of Standards & Technology (NIST) in accordance with ASTM Standard E74-18.

Device:	Serial:	Class "A" Range, in Lbs:	Verified:
Morehouse Cell	P-8281	100.00 – 5,000.0	28 Jun 2023

Stress Engineering Services, Inc.
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Houston, Texas 77041

22 May 2024
Report No: 45434-964AT
SES PN: 9170305

Performed By: Joshua Hamel

Reviewed By: Roy Nash

STRESS ENGINEERING SERVICES INC.
an employee-owned company

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HOUSTON • WALLER • CINCINNATI • CALGARY*
*STRESS ENGINEERING SERVICES CANADA

CALIBRATION CERTIFICATE

Owner: Stress Engineering Services / Building 3
13800 Westfair East Drive
Houston, TX 77041

Doc# 44060948-20241023

Equipment:

Transducer Make:	UNIMEASURE	Transducer Model:	PA-40-70302
Transducer SN:	44060948	Transducer Full Range:	40000 mils

Calibration Equipment

Manufacturer	Model	Tracking Number	Calibration Due
Kentucky Gauge	MPP-LD142	171000613	1-May-25
Agilent	34401a	MY47015464	9-Sep-25

Calibration Data ("As Left")

Excitation Voltage: 10.008 V Ambient Temperature: 74.6 °F
Humidity 51.4 % RH

Actual (mils)	Reading (1) (V)	Converted (1) (mils)	Error (1) (%)	Reading (2) (V)	Converted (2) (mils)	Error (2) (%)	Repeatability (%)
-20000.0	-4.860	-19988.4	0.03	-4.857	-19976.1	0.06	0.03
-16000.0	-3.888	-15996.8	0.01	-3.885	-15984.5	0.04	0.03
-12000.0	-2.916	-12005.1	-0.01	-2.914	-11996.9	0.01	0.02
-8000.0	-1.943	-8009.3	-0.02	-1.941	-8001.1	0.00	0.02
-4000.0	-0.972	-4021.7	-0.05	-0.969	-4009.4	-0.02	0.03
0.0	0.000	-30.1	-0.08	0.002	-21.8	-0.05	0.02
4000.0	0.969	3949.3	-0.13	0.972	3961.6	-0.10	0.03
8000.0	1.967	8047.8	0.12	1.969	8056.0	0.14	0.02
12000.0	2.932	12010.7	0.03	2.933	12014.8	0.04	0.01
16000.0	3.904	16002.4	0.01	3.905	16006.5	0.02	0.01
20000.0	4.876	19994.0	-0.01	4.877	19998.2	0.00	0.01

All readings within tolerance (±0.25% FS and ±0.1% FS Repeatability)

Conversion = (Reading - Offset)*gain

Shunt Value (Δmils)	Shunt Voltage Reading (ΔV)	Calculated Offset (V)	Calculated Gain (mils/V)
6847	1.667	0.007	4106.666

The measurement standards used during calibration are traceable to NIST
Calibrations were performed per SES Document: L3-CAL-PR-013

Technician: Alejandro Galvan Date: 10/23/2024

Signed: Recall: 10/23/2025