

Schedule

Element Materials Technology Singapore Pte Ltd
West Point Bizhub
106 Tuas South Avenue 2
Singapore 637158

Certificate No. : LA-2018-0689-G
Issue No. : 9
Date : 8 September 2025
Expiry of Certificate : 09 September 2029
Page : 1 of 7

FIELD OF TESTING : Mechanical Testing

MATERIALS / PRODUCTS TESTED	TESTS / PROPERTIES	STANDARD METHODS / TECHNIQUES / EQUIPMENT
A Metals, Metal Products & Welds	<p><u>Mechanical Tests</u></p> <p>1. Tension Test on Structural Steel Plate, Sheet Tubular Machine Capacity up to 1000 kN</p>	<p>ASTM A370-24a ASTM B557-15 (2023) ASTM B557M-15 (2023) ASTM E8/E8M-24 *ASTM A20/A20M-20 *ASTM A36/A36M-19 *ASTM A516/A516M-25 *ASTM A615/A615M-24 *ASTM A962/A962M-25 API 5L: 2018 46th Ed Errata 1: 2018 API 2H:2006(R2020), 9th Ed *API 2W: 2019 6th Ed API 1104:2021 22nd Ed +Errata 1:2023 AWS D1.1/D1.1M:2020 AWS D1.2/D1.2M:2014 Errata 2020 AWS D1.6/D1.6M:2017 + Amd1 ASME BPVC IX-2023 AS 1391:2020 BS EN 10025-1:2004 BS EN 10025-6:2019+A1:2022 BS EN ISO 6892-1:2019 BS EN ISO 4136:2022 *BS EN 10225-1:2019 *BS EN 10225-2:2019 *BS EN 10225-3:2019+A1:2023 *BS EN 10225-4:2019 *BS 111:2019 *BS EN ISO 15614-1:2017+A1:2019 *DNVGL Rules for Classification of Ships July 2023 *DNV-OS-B101 July 2023 DNV-ST-F101 August 2021 Appendix B, B300 ISO 4136:2022 ISO 5178:2019 ISO 6892-1:2019 *ISO 2566-1:2021 *ABS Rules Part 2 2023 *CAAS SAR Chapter 6.5 Appendix 1 [15 Dec 2011 issue 2]</p>

Schedule



Certificate No. : LA-2018-0689-G Issue No. : 9

Date : 8 September 2025 Page : 2 of 7

MATERIALS / PRODUCTS TESTED	TESTS / PROPERTIES	STANDARD METHODS / TECHNIQUES / EQUIPMENT
A Metals, Metal Products & Welds		*CAP 553 BCAR Section A AS 2205.2.1:2003 *AS/NZS 2885.2:2020
	2. Tension Test at Elevated Temperature (150°C)	ASTM E21-20
	3. Tension and Proof Load Test on Fastener	ASTM F606/F606M-24 *ASTM A194/A194M-24 *ASTM A193/A193M-24 ^a *ASTM A962/A962M-25 ISO 898-1:2013 ISO 898-2:2022
	4. Through-Thickness Tensile Test	ISO 7778:2014 *ASTM A770/A770M-03(2025) *API 2W:2019 6 th Ed *API 2H:2006(R2020), 9 th Ed *BS EN 10164:2018
	5. All Weld Tensile Test	AWS D1.1/D1.1M:2020 AWS D1.2/D1.2M:2014 Errata 2020 *BS EN ISO 15614-1:2017+A1:2019 *DNV-ST-F101 August 2021
	6. Charpy V-notch Impact Test Temperature From Ambient Temperature Down to -196°C	ASTM A370-24 ^a ASTM E23-23a AWS D1.1/D1.1M:2020 API 5L: 2018 46 th Ed Errata 1:2018 BS EN 10025-1:2004 BS EN 10025-2:2019 BS EN ISO 148-1:2016 *BS EN ISO 15614-1:2017+A1:2019 *BS EN ISO 11960:2021 ISO 148-1:2016 *ASTM A962/A962M-25 *DNV-ST-F101 August 2021 Appendix B, B400 AS 2205.7.1:2003 *AS/NZS 2885.2:2020
	7. Flattening Test	ASTM A370-24 ^a *ASTM A106/106M-19a *ASTM A530/A530M-18 *ASTM A1016/A1016M-24 ^a
	8. Flaring / Flanging Test	ASTM A370-24 ^a *ASTM A1016/A1016M-24a

Schedule



Certificate No. : LA-2018-0689-G Issue No. : 9

Date : 8 September 2025 Page : 3 of 7

MATERIALS / PRODUCTS TESTED	TESTS / PROPERTIES	STANDARD METHODS / TECHNIQUES / EQUIPMENT
A Metals, Metal Products & Welds	9. 3-Point Bend Test	ASTM A370-24a *ASTM A615/A615M-24 *ASTM A962/A962M-25 ASTM E855/E855M-21 ASTM E190-21 ASTM E290-22 AWS D1.1/D1.1M:2020 ASME BPVC IX-2023 ISO 5173:2023 BS EN ISO 5173:2023 BS EN ISO 7438:2020 *BS EN ISO 15614-1:2017+A1:2019 *BS EN ISO 11960:2021 AWS D1.6/D1.6M:2017 +Amd1 AWS D1.2/D1.2M:2014 Errata 2020 API 5CT 11 th Edition (2023) + Addendum 1 (2021) API SPEC 5CT 11 th Ed + Errata 1 & 2 (2024) *DNV-ST-F101 August 2021 Appendix B, B500 API 1104:2021 22 nd Ed +Errata 1:2023 *ABS Rules Part 2 2023 *CAAS SAR Chapter 6.5 Appendix 1 [15 Dec 2011 issue 2] *CAP 553 BCAR Section A *AWS D17.1/D17.1M:2024 AS/NZS 2205.3.1:2024 *AS/NZS 2885.2:2020
	10. Fracture Test	AWS D1.1/D1.1M:2020 AWS D1.2/D1.2M:2014 Errata 2020 AWS D1.6/D1.6M:2017 ASME BPVC IX-2023 BS EN ISO 9017:2018 *ABS Rules Part 2 2023 *AWS D17.1/D17.1M:2024
	11. Fracture Toughness: Single Edge Notch Bend (SENB)	BS 7448-1:1991 BS 7448-2:1997 BS EN ISO 15653:2018 API RP 2Z: 2005 4 th Ed Reapproved 2020 API 1104:2021 22 nd Ed +Errata 1:2023 *DNVGL-ST-F101 2017 Appendix B, B800 ISO 12135:2021 ASTM E1820-25a *AS/NZS 2885.2:2020
	12. Fracture Toughness: Single Edge Notch Tension (SENT)	DNVGL RP-F108-2019

Schedule



Certificate No. : LA-2018-0689-G Issue No. : 9

Date : 8 September 2025 Page : 4 of 7

MATERIALS / PRODUCTS TESTED	TESTS / PROPERTIES	STANDARD METHODS / TECHNIQUES / EQUIPMENT
A Metals, Metal Products & Welds	13. Nick-Break Test	API 1104:2021 22 nd Ed +Errata 1:2023
	14. Fatigue Testing of Reinforcing Bar	BS 4449:2005+A3:2016
	15. Shear Strength	ASTM A264-12(2019) ASTM A265-12(2019)
	<u>Metallography</u> 16. Vickers Hardness Test	ASTM A370-24a *ASTM A962/A962M-25 ASTM E92-23 BS EN ISO 6507-1:2023 *DNV-ST-F101 2021 AS 2205.6.1:2003 *AS/NZS 2885.2:2020
	17. Rockwell Hardness Test	BS EN ISO 6508-1:2024 ASTM E18-24 ASTM A370-24a *DNV-ST-F101 2021 *ASTM A962/A962M-25
	18. Brinell Hardness Test	BS EN ISO 6506-1:2014 ASTM E10-23 ASTM A370-24 ^a DNV-ST-F101 2021 *ASTM A962/A962M-25
	19. Microindentation Hardness Test	ASTM E384-22
	20. Macroetching of Metals & Alloys	ASTM A340-15 ASME BPVC IX-2023 AWS D1.1/D1.1M:2020 *DNV-ST-F101 2021 ASTM E381-22 ASTM A604/A604M-07(2022)
	21. Macroscopic Examination	ASME BPVC IX-2023 AWS D1.1/D1.1M:2020 AWS D1.2/D1.2M:2014 Errata 2020 AWS D1.6/D1.6M:2017 *DNV-ST-F101 2021 BS EN ISO 17639:2022 ISO 5817:2023 AS/NZS 2205.5.1:2019 *AS/NZS 2885.2:2020

Schedule



Certificate No. : LA-2018-0689-G Issue No. : 9

Date : 8 September 2025 Page : 5 of 7

MATERIALS / PRODUCTS TESTED	TESTS / PROPERTIES	STANDARD METHODS / TECHNIQUES / EQUIPMENT
A Metals, Metal Products & Welds	22. Microetching of Metals & Alloys	ASTM E407-23 *DNV-ST-F101 2021
	23. Microscopic Examination	ASTM E562-19e1 ASTM E45-18 ^a (2023) BS EN 1321:1997 BS EN ISO 17639:2022 *DNV-ST-F101 2021 *CAAS SAR Chapter 6.5 Appendix 1 [15 Dec 2011 issue2] *CAP 553 BCAR Section A
	24. Sample Preparation	ASTM E3-11(2017)
	25. Determination of Average Grain Size	ASTM E112-24
	26. Microstructure and Graphite in Iron Castings	ASTM A247-24
	27. Visual examination of Welded Structure/ Plates/ Pipes	*CAAS SAR Chapter 6.5 Appendix 1 [effective date 15 Dec. 2011 (issue 2)] *CAP 553 BCAR Section A *AWS D17.1/D17.1M:2024
	<u>Corrosion Tests</u> 28. Corrosion Testing	ASTM G48-11(2020)e1, Practice A ASTM G48-11(2020)e1, Practice C ASTM G48-11(2020)e1, Practice E ASTM A923-23 Method C
	29. Pitting Corrosion	*DNV-ST-F101 2021
	30. Intergranular Corrosion	ASTM A262-15(2021), Practice A ASTM A262-15(2021), Practice B ASTM A262-15(2021), Practice C ASTM A262-15(2021), Practice E ASTM A262-15(2021), Practice F
	31. Hydrogen Induced Cracking (HIC)	NACE TM0284-2016 *DNV-ST-F101 2021
	32. Sulphide Stress Cracking (SSC)	NACE TM0177-2024 NACE TM0316-2023 ASTM G39-99(2021) EFC No 16 3 rd Edition *DNV-ST-F101 2021

Schedule



Certificate No. : LA-2018-0689-G Issue No. : 9

Date : 8 September 2025 Page : 6 of 7

MATERIALS / PRODUCTS TESTED	TESTS / PROPERTIES	STANDARD METHODS / TECHNIQUES / EQUIPMENT
A Metals, Metal Products & Welds	33. Detecting Susceptibility to Intergranular Corrosion (Ferric Sulphate – Sulphuric Acid Test)	ASTM G28-24 Method A
	34. <u>Coatings</u> Cathodic Disbondment	AFNOR NF A49-711 (1992), Annex K AFNOR NF EN 10329 (A49-716) Annex E (2006) NACE SP0394-2023, Appendix F CSA Z245.20-14 Section 12.8 Update No. 3, May 2016 ISO 21809-1:2018, Annex H ISO 21809-3:2016 Amd.1:2020, Annex G ASTM G8-24 ASTM G42-11(2019)e1
	35. Hot-Water Soak	NACE SP0394-2023, Appendix J ISO 21809-3:2016 Amd.1:2020, Annex I ISO 21809-1:2018 Annex L ISO 21809-2:2014 Annex A.16
	36. Non-destructive Measurement of Film Thickness of Pipeline Coatings on Steel	ASTM D7091-22 ISO 21809-1:2018, Annex A ISO 21809-3:2016 Amd.1:2020, Annex B
	37. Penetration Resistance of Pipeline Coatings (Blunt Rod)	ISO 21809-3:2016 Amd.1:2020, Annex E (excluding pressure of 0.10 N/mm ²)
	38. Holiday Detection	ASTM G62-23 ISO 21809-1:2018, Annex B ISO 21809-3:2016 Amd.1:2020, Annex C
	39. Pull-off Test for Adhesion	ISO 4624:2023 BS EN ISO 4624:2023 ASTM D4541-22
	40. Adhesion or Cohesion Strength of Thermal Spray Coatings	CSA Z245.20-14 Section 12.14 Update No. 3, May 2016
	41. Peel Strength Test	ISO 21809-1:2018, Annex C ISO 21809-3:2016 Amd.1:2020, Annex H
	42. Impact Test	ISO 21809-3:2016 Amd.1:2020, Annex D NACE SP0394-2023 Appendix I

Schedule



Certificate No. : LA-2018-0689-G Issue No. : 9

Date : 8 September 2025 Page : 7 of 7

MATERIALS / PRODUCTS TESTED	TESTS / PROPERTIES	STANDARD METHODS / TECHNIQUES / EQUIPMENT
A Metals, Metal Products & Welds	43. Measurement of Metal and Oxide Coating Thickness by Microscopic Examination	ASTM B487-24
	44. Porosity of the coating	ISO 21809-2:2014 Annex A.12
	45. Cross-Section & Interface Porosity	NACE SP0394-2023 Appendix G
	46. Flexibility	NACE SP0394-2023 Appendix H
	47. Post-Weld Heat Treatment (PWHT)	EL-A-OP-MEC-SIN-MD218

* Product Specification

Approved Signatories

S/N	Name	Scope
1.	Mr Aldrin C. Quijada	- For all accredited tests
2.	Mr Rory L. Dapitan	- For all accredited tests
3.	Mr Ramesh Sellapan	- For all accredited tests
4.	Ms Khin Ohnmar Aung	- For accredited tests 16 to 27 and 34 to 46 only
5.	Dr Basab Bhattacharya	- For all accredited tests
6.	Mr Kingsley Leong	- Item 1, 3 to 10, 13, 16 to 22, 24 to 25.
7.	Mr Lim Bing Cong	- For accredited tests item 16 to 27 and item 43

Note :

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025:2017. A laboratory's fulfilment of the requirements of ISO/IEC 17025:2017 means the laboratory meets both the technical competence requirements and **management system requirements** that are necessary for it to consistently deliver technically valid test results. The **management system requirements** in ISO/IEC 17025:2017 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001.