

Schedule

Element Materials Technology Singapore Pte Ltd
West Point Bizhub
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Certificate No. : LA-2018-0689-G

Issue No. : 3

Date : 15 March 2021

FIELD OF TESTING: Mechanical Testing

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MATERIALS / PRODUCTS TESTED	TESTS / PROPERTIES	STANDARD METHODS / TECHNIQUES / EQUIPMENT
<p>A Metals, Metal Products & Welds</p>	<p><u>Mechanical Tests</u></p> <p>1. Tension Test on Structural Steel Plate, Sheet Tubular Machine Capacity up to 1000 kN</p>	<ul style="list-style-type: none"> • ASTM A370-20 • ASTM B557-15 • ASTM B557M-15 • ASTM E8/E8M-16ae1 • *ASTM A20/A20M-20 • *ASTM A36/A36M-19 • *ASTM A516/A516M-17 • *ASTM A615/A615M-20 • *ASTM A962/A962M-19 • API 5L: 2018 46th Ed Errata 1: 2018 • API 2H: 2006 9th Ed Reapproved 2012 • *API 2W: 2019 6th Ed • API 1104: 2013 21st Ed Errata 5: 2018 • AWS D1.1/D1.1M: 2020 • AWS D1.2/D1.2M: 2014 Errata 2014 • ASME IX-2019 • AS 1391: 2020 • BS EN 10025-1: 2004 • BS EN 10025-6: 2019 • BS EN ISO 6892-1: 2019 • BS EN ISO 4136: 2012 • *BS EN 10225-1: 2019 • *BS EN 10225-2: 2019 • *BS EN 10225-3: 2019 • *BS EN 10225-4: 2019 • *BS 111: 2019 • *BS EN ISO 15614-1: 2017 + A1:2019 • *DNV rules for classification of ships-Jul 2019 • *DNV Offshore Standards B101-Jul 2020 "Metallic Materials" • *DNV Offshore Standards F101-May 2017 Appendix B, B300 • ISO 4136: 2012 • ISO 5178: 2019 • ISO 6892-1: 2019 • *ISO 2566-1: 1984

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	2. Tension Test at Elevated Temperature (150°C)	<ul style="list-style-type: none">• ASTM E21-20
	3. Tension and Proof Load Test on Fastener	<ul style="list-style-type: none">• ASTM F606/F606M-19• *ASTM A194/A194M-20a• *ASTM A193/A193M-20• *ASTM A962/A962M-19• ISO 898-1: 2013• ISO 898-2: 2012
	4. Through-Thickness Tensile Test	<ul style="list-style-type: none">• ISO 7778: 2014• *ASTM A770/A770M-03(2018)• *API 2W: 2019 6th Ed• *API 2H: 2006 9th Ed Reapproved 2012• *BS EN 10164: 2018• *BS EN ISO 11960: 2014• API 5CT: 2018 10th Ed Errata 3: 2020
	5. All Weld Tensile Test	<ul style="list-style-type: none">• AWS D1.1/D1.1M: 2020• AWS D1.2/D1.2M: 2014 Errata 2014• *BS EN ISO 15614-1: 2017 + A1:2019• *DNV Offshore Standards F101-May 2017
	6. Charpy V-notch Impact Test Temperature From Ambient Temperature Down to -196°C	<ul style="list-style-type: none">• ASTM A370-20• ASTM E23-18• AWS D1.1/D1.1M: 2020• API 5L: 2018 46th 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: 2014• ISO 148-1: 2016• *ASTM A962/A962M-19• *DNV Offshore Standards F101-May 2017 Appendix B, B400
	7. Flattening Test	<ul style="list-style-type: none">• ASTM A370-20• *ASTM A106/106M-19a• *ASTM A530/A530M-18• *ASTM A1016/A1016M-18a
	8. Flaring / Flanging Test	<ul style="list-style-type: none">• ASTM A370-20• *ASTM A1016/A1016M-18a

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	<p>9. 3-Point Bend Test</p> <p>10. Fracture Test</p> <p>11. Fracture Toughness: Single Edge Notch Bend (SENB)</p> <p>12. Fracture Toughness: Single Edge Notch Tension (SENT)</p> <p>13. Nick-Break Test</p> <p>14. Fatigue Testing of Reinforcing Bar</p> <p>15. Shear Strength</p>	<ul style="list-style-type: none"> • ASTM A370-20 • *ASTM A615/A615M-20 • *ASTM A962/A962M-19 • ASTM E855-08(2013) • ASTM E190-14 • ASTM E290-14 • AWS D1.1/D1.1M: 2020 • ASME IX-2019 • ISO 5173: 2009 + A1: 2011 • BS EN ISO 5173: 2010 + A1: 2011 • BS EN ISO 7438: 2020 • *BS EN ISO 15614-1: 2017 + A1:2019 • *BS EN ISO 11960: 2014 • AWS D1.2/D1.2M: 2014 Errata 2014 • API 5CT: 2018 10th Ed Errata 3: 2020 • *DNV Offshore Standards F101-May-2017 Appendix B500 • API 1104: 2013 21st Ed Errata 5: 2018 • AWS D1.1/D1.1M: 2020 • AWS D1.2/D1.2M: 2014 Errata 2014 • ASME IX-2019 • BS EN ISO 9017:2018 • BS 7448-1: 1991 • BS 7448-2: 1997 • BS EN ISO 15653: 2018 • API 2Z: 2005 4th Ed Reapproved 2015 • API 1104: 2013 21st Ed Errata 5:2018 • *DNV Offshore Standards F101-May 2017 Appendix B, B800 • ISO 12135: 2016 • ASTM E1820-20b • DNV RP-F108-2017 • API 1104:2013 21st Ed Errata 5:2018 • BS 4449: 2005 + A3: 2016 • ASTM A264-12(2019) • ASTM A265-12(2019)

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	<u>Metallography</u>	
	16. Vickers Hardness Test	<ul style="list-style-type: none">• ASTM A370-20• *ASTM A962/A962M-19• ASTM E92-17 • BS EN ISO 6507-1: 2018• *DNV Offshore Standards F101-May 2017 Appendix B, B1003• *DNV Offshore Standards F101-May 2017 Appendix B, B1011
	17. Rockwell Hardness Test	<ul style="list-style-type: none">• BS EN ISO 6508-1: 2016• ASTM E18-20• ASTM A370-20• *DNV Offshore Standards F101-May 2017 Appendix B, B1011• *ASTM A962/A962M-19
	18. Brinell Hardness Test	<ul style="list-style-type: none">• BS EN ISO 6506-1: 2014• ASTM E10-18• ASTM A370-20• *DNV Offshore Standards F101-May 2017 Appendix B, B1011• *ASTM A962/A962M-19
	19. Microindentation Hardness Test	<ul style="list-style-type: none">• ASTM E384-17
	20. Macroetching of Metals & Alloys	<ul style="list-style-type: none">• ASTM E340-15• ASME IX-2019• AWS D1.1/D1.1M: 2020• *DNV Offshore Standards F101-May 2017 Appendix B, B1001• ASTM E381: 2020• ASTM A604/A604M-07(2017)
	21. Macroscopic Examination	<ul style="list-style-type: none">• ASME IX-2019• AWS D1.1/D1.1M: 2020• *DNV Offshore Standards F101-May 2017 Appendix B, B1001• BS EN ISO 17639: 2013• ISO 5817: 2014

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	22. Microetching of Metals & Alloys	<ul style="list-style-type: none">• ASTM E407-07(2015)e1• *DNV Offshore Standards F101-May 2017 Appendix B, B1002
	23. Microscopic Examination	<ul style="list-style-type: none">• ASTM E562-19e1• ASTM E45-18a• BS EN 1321: 1997• BS EN ISO 17639: 2013• *DNV Offshore Standards F101-May 2017 Appendix B, B1002
	24. Sample Preparation	<ul style="list-style-type: none">• ASTM E3-11(2017)
	25. Determination of Average Grain Size	<ul style="list-style-type: none">• ASTM E112-13
	<u>Corrosion Tests</u>	
	26. Corrosion Testing	<ul style="list-style-type: none">• ASTM G48-11(2015), Practice A• ASTM G48-11(2015), Practice C• ASTM G48-11(2015), Practice E• ASTM A923:2014 Method C
	27. Pitting Corrosion	<ul style="list-style-type: none">• *DNV Offshore Standards F101-May 2017 Appendix B, C200
	28. Intergranular Corrosion	<ul style="list-style-type: none">• ASTM A262-15, Practice A• ASTM A262-15, Practice B• ASTM A262-15, Practice C• ASTM A262-15, Practice E• ASTM A262-15, Practice F
	29. Hydrogen Induced Cracking (HIC)	<ul style="list-style-type: none">• NACE TM0284-2016• *DNV Offshore Standards F101-May 2017 Appendix B, C300
	30. Sulfide Stress Cracking (SSC)	<ul style="list-style-type: none">• NACE TM0177-2016• NACE TM0316-2016• ASTM G39-99(2016)• EFC No. 16• *DNV Offshore Standards F101-May 2017 Appendix B, C400

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	31. Detecting Susceptibility to Intergranular Corrosion (Ferric Sulfate – Sulfuric Acid Test)	• ASTM G28-02(2015) Method A
	<u>Coatings</u>	
	32. Cathodic Disbondment	• AFNOR NF A49-711 (1992), Annex K • AFNOR NF EN 10329 (A49-716), Annex E • NACE SP0394-2013, Appendix F • CSA Z245.20- 14 Section 12.8 Update No. 3, May 2016 • ISO 21809-1: 2018, Annex H • ISO 21809-3: 2016, Annex G • ASTM G8-96(2019) • ASTM G42-11(2019)e1
	33. Hot-Water Soak	• NACE SP0394-2013, Appendix J • ISO 21809-3: 2016, Annex I
	34. Nondestructive Measurement of Film Thickness of Pipeline Coatings on Steel	• ASTM D7091-13 • ISO 21809-1: 2018, Annex A • ISO 21809-3: 2016, Annex B
	35. Penetration Resistance of Pipeline Coatings (Blunt Rod)	• ISO 21809-3: 2016, Annex E (excluding pressure of 0.10 N/mm ²)
	36. Holiday Detection	• ASTM G62-14 • ISO 21809-1: 2018, Annex B • ISO 21809-3: 2016, Annex C
	37. Pull-off Test for Adhesion	• ISO 4624: 2016 • BS EN ISO 4624: 2016
	38. Adhesion or Cohesion Strength of Thermal Spray Coatings	• CSA Z245.20-14 Section 12.14 Update No. 3, May 2016
	39. Peel Strength Test	• ISO 21809-1: 2018, Annex C • ISO 21809-3: 2016, Annex H
	40. Impact Test	• ISO 21809-3:2016, Annex D

* Product Specification

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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 except tests 20 to 25 and 32 to 40.
4.	Ms Khin Ohnmar Aung	- For accredited tests 32 to 40 only (i.e. coating tests).
5.	Mr Muhammad Bilal	- For all accredited tests
6.	Dr Basab Bhattacharya	- For all accredited tests.

Note :

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025. A laboratory's fulfilment of the requirements of ISO/IEC 17025 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 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001.