Form NSC/TISI 2

(Garuda)

Certificate No. 19T106/0883

Certificate of Laboratory Accreditation

by Virtue of National Standardization Act B.E. 2551 (2008)

Secretary-General, Thai Industrial Standards Institute

Issues this Certificate to

Professional Testing Company Limited

Laboratory address :

55/6-7 Moo 4, Huai Kapi, Mueang Chonburi, Chonburi

This laboratory is accredited for testing in accordance with
the Thai Industrial Standard TIS 17025-2561 (2018) (ISO/IEC 17025:2017)
General requirements for the competence of testing and calibration laboratories

Accreditation No. TESTING 0250

The scope of accreditation is as annexed hereto.

Valid from 13th August B.E. 2562 (2019)
Valid until 12th August B.E. 2565 (2022)

Issue date 22nd August B.E. 2562 (2019)

(Signature)
(Mr.Verakit Rantakittanawat)
Deputy Secretary - General
For Secretary - General
Thai Industrial Standards Institute

Translation approved

(Mrs. Sutavadee Techajunta)
Director
Office of the National Standardization Council
Date 29th August 2019

Ministry of Industry, Thai Industrial Standards Institute

Translation Note: In the event of doubt or misunderstanding, the original in Thai shall be the authoritative.

Scope of Accreditation for Testing

Certificate No. 19T106/0883

Laboratory name Professional Testing Company Limited

Address 55/6-7 Moo 4, Huai Kapi, Mueang Chonburi, Chonburi

Accreditation No. TESTING 0250

Laboratory Status ☑ Permanent ☐ Site ☐ Temporary ☐ Mobile

Field of Testing	Specific Test	Test Method
Civil field		
1. Iron and steel	– Tensile strength – Yield stress – Elongation	– TIS 244 Part 4-2525 (1982) – TIS 2172 Part 1-2556 (2013)
	– Tensile strength	– AS 1391:2007 – AS 1391:2007 (Reconfirmed 2017) – ASME SA-370-15, SECTION II, PART A – ASME SA-370-17, SECTION II, PART A – ASTM A 370-15 – ASTM A 370-16 – ASTM A 370-17 – ASTM A 370-18 – ASTM E8/E8M-15a – ASTM E8/E8M-16a – BS EN 10002-1:2001 – BS EN ISO 6892-1:2009 – BS EN ISO 6892-1:2016 – DNV-OS-B101:2012 – DNVGL-OS-B101:2015 – DNVGL- OS-B101:2017 – DNVGL- OS-B101:2018 – DNV-OS-F101:2012 – DNV-OS-F101:2013 – DNVGL-ST-F101:2017 (Amended 2017) – JIS Z 2241:2011

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Field of Testing	Specific Test	Test Method
Civil field		
1. Iron and steel (cont.)	– Yield strength	– ASME SA-370-15, SECTION II, PART A – ASME SA-370-17, SECTION II, PART A – ASTM A 370-15 – ASTM A 370-16 – ASTM A 370-17 – ASTM A 370-18 – ASTM E8/E8M-15a – ASTM E8/E8M-16a – DNV-OS-B101:2012 – DNVGL-OS-B101:2015 – DNVGL-OS-B101:2017 – DNVGL-OS-B101:2018 – DNV-OS-F101:2012 – DNV-OS-F101:2013 – DNVGL-ST-F101:2017 (Amended 2017) – JIS Z 2241:2011
	– Upper yield strength	– AS 1391:2007 – AS 1391:2007 (Reconfirmed 2017) – BS EN ISO 6892-1:2009 – BS EN ISO 6892-1:2016 – BS EN 10002-1:2001 – JIS Z 2241:2011
	– Lower yield strength	– AS 1391:2007 – AS 1391:2007 (Reconfirmed 2017) – BS EN ISO 6892-1:2009 – BS EN ISO 6892-1:2016 – BS EN 10002-1:2001 – JIS Z 2241:2011

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Field of Testing	Specific Test	Test Method
Civil field 1. Iron and steel (cont.)	- Elongation after fracture	- AS 1391:2007 - AS 1391:2007 (Reconfirmed 2017) - ASME SA-370-15, SECTION II, PART A - ASME SA-370-17, SECTION II, PART A - ASTM A 370-15 - ASTM A 370-16 - ASTM A 370-17 - ASTM A 370-18 - ASTM E8/E8M-15a - ASTM E8/E8M-16a - DNV-OS-B101:2012 - DNVGL-OS-B101:2015 - DNVGL-OS-B101:2018 - DNV-OS-F101:2012 - DNV-OS-F101:2013 - DNVGL-ST-F101:2017 (Amended 2017) - BS EN ISO 6892-1:2009 - BS EN ISO 6892-1:2016 - BS EN 10002-1:2001 - JIS Z 2241:2011
	- Through-thickness tension test (Z-direction tension test)	- API Specification 2H Ninth Edition, July 2006 Effective Date : Febuary 1, 2007 Reaffirmed, January 2012

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Field of Testing	Specific Test	Test Method
Civil field		
1. Iron and steel (cont.)	– Through-thickness tension test (Z-direction tension test) (cont.)	– API Specification 2W Fifth Edition, December 2006 Effective Date: June 1,2007 Reaffirmed, January 2012 – ASTM A770/A770M-03 (Reapproved 2012) – ASTM A770/A770M-03 (2018)
	– Bend test	
	• Bending device with two supports and a former	– TIS 244 Part 11 to 13 - 2525 (1982) – BS EN ISO 7438:2005 – BS EN ISO 7438:2016
	• Guided-bend test jig	– TIS 244 Part 11 to 13 - 2525 (1982) – ASME SA-370-15, SECTION II, PART A – ASME SA-370-17, SECTION II, PART A – ASTM A 370-15 – ASTM A 370-16 – ASTM A 370-17 – ASTM A 370-18 – ASTM E 290-09 – ASTM E 290-14
	• Press bending method	– TIS 244 Part 11 to 13 - 2525 (1982) – JIS Z 2248:2006 – JIS Z 2248:2014

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Field of Testing	Specific Test	Test Method
Civil field 1. Iron and steel (cont.)	– Impact test • Charpy V notch Temperature -196 °C to 30 °C Energy 1 J to 324 J	– AS 1544.2:2003 – AS 1544.2:2003 (R2017) – ASME SA-370-15, SECTION II, PART A – ASME SA-370-17, SECTION II, PART A – ASTM A 370-15 – ASTM A 370-16 – ASTM A 370-17 – ASTM A 370-18 – ASTM E 23-12c – ASTM E 23-16b – ASTM E 23-18 – BS EN 10045-1:1990 – BS EN ISO 148-1:2010 – BS EN ISO 148-1:2016 – BS EN ISO 148-1:2018 – JIS Z 2242:2005 – JIS Z 2242:2018
	– Vickers hardness test • HV5 • HV10	– AS 1817.1:2003 – AS 1817.1:2003 (Reconfirmed 2017) – ASTM E 92-16 – ASTM E 92-17 – ASTM E 384-11$^{\varepsilon 1}$ – ASTM E 384-17 – BS EN ISO 6507-1:2005 – BS EN ISO 6507-1:2018
	– Brinell hardness test • HBW 5/750 • HBW 10/3000	– ASTM E 10-17 – ASTM E 10-18

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Field of Testing	Specific Test	Test Method
Civil field		
1. Iron and steel (cont.)	– Rockwell hardness test • HRBS • HRC • HRBW	– ASTM E 18-17$^{\varepsilon 1}$ – ASTM E 18-19
	– Microetching metals and alloys	– ASTM E 407-07 (Reapproved 2015)$^{\varepsilon 1}$
	– Qualitative analysis of structure by optical microscope • Microstructure analysis	– ASM Handbook Volume 9 Metallography and Microstucture:2004
	– Determining volume fraction by systematic manual point count	– ASTM E 562-2011
	– Determining average grain size	– ASTM E 112-13 by Planimetric procedure – AS 1733-1976 by Planimetric method and comparison method (exclude at x75) – AS 1733-1976 (R2018) by Planimetric method and comparison method (exclude at x75)
	– Field metallographic replicas	– ASTM E 1351-01 (Reapproved 2012)
	– Intergranular corrosion test	– ASTM A262-15 Practice E – ASTM A262-17 Practice E – BS EN ISO 3651-2:1998 Method A
	– Pitting corrosion test (Ferric chloride corrosion test)	– ASTM A 923-14 method C – ASTM G 48-11 (Reapproved 2015) method A

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Field of Testing	Specific Test	Test Method
Civil field 1. Iron and steel (cont.)	– Chemical composition • Aluminium 0.014% to 0.093% by weight • Carbon 0.02% to 1.10% by weight • Chromium 0.037% to 2.09% by weight • Cobalt 0.006% to 0.20% by weight • Copper 0.082% to 0.50% by weight • Manganese 0.31% to 1.19% by weight • Molybdenum 0.007% to 0.788% by weight • Nickel 0.064% to 4.13% by weight • Niobium 0.003% to 0.12% by weight • Nitrogen 0.009 6% to 0.055% by weight	– ASTM E 415-17

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Field of Testing	Specific Test	Test Method
Civil field		
1. Iron and steel (cont.)	– Chemical composition (cont.) • Phosphorous 0.006% to 0.085% by weight • Silicon 0.023% to 1.54% by weight • Sulfur 0.01% to 0.047 6% by weight • Tin 0.005% to 0.047% by weight • Titanium 0.002% to 0.2% by weight • Vanadium 0.008% to 0.3% by weight	– ASTM E 415-17
2. Weld test coupon of metal	– Tensile strength	– ASTM A 370-15 – ASTM A 370-16 – ASTM A 370-17 – ASTM A 370-18 – ASTM E8/E8M-15a – ASTM E8/E8M-16a – ANSI/AASHTO/AWS D1.5:2002 – AASHTO/AWS D1.5:2015

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Field of Testing	Specific Test	Test Method
Civil field 2. Weld test coupon of metal (cont.)	– Tensile strength (cont.)	– API Standard 1104 Twenty-first Edition, September 2013 Errata 3, July 2014 Addendum 1, July 2014 – API Standard 1104 Twenty-first Edition, September 2013 Errata 3, July 2014 Addendum 2, May 2016 – AS 2205.2.1-2003 – AS 2205.2.1-2003 (R2018) – AS 2205.2.2-2003 – AS 2205.2.2-2003 (R2018) – ASME BPVC Section IX, 2015 – ASME BPVC Section IX, 2017 – ASME BPVC Section IX, 2019 – AWS B4.0:2007 – AWS B4.0:2016 – AWS D1.1/D1.1M:2010 – AWS D1.1/D1.1M:2015 – AWS D1.6/D1.6M:2007 – AWS D1.6/D1.6M:2017 – BS EN 895:1995 – BS EN ISO 4136:2011 – BS EN ISO 4136:2012 – BS EN ISO 15614-1:2004+A2 : 2012 – BS EN ISO 15614-1:2017 – CSA W47.1-09 (reaffirmed 2014) – DNV-OS-C401:2013 – DNVGL-OS-C401:2015 – DNVGL-OS-C401:2017 – DNV-OS-F101:2012 – DNV-OS-F101:2013 – DNVGL-ST-F101:2017 (Amended 2017)

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Field of Testing	Specific Test	Test Method
Civil field 2. Weld test coupon of metal (cont.)	– Bend test • Guided-bend test jig	– API Standard 1104 Twenty-first Edition, September 2013 Errata 3, July 2014 Addendum 1, July 2014 – API Standard 1104 Twenty-first Edition, September 2013 Errata 3, July 2014 Addendum 2, May 2016 – ASME BPVC Section IX, 2015 – ASME BPVC Section IX, 2017 – ASME BPVC Section IX, 2019 – ASTM A 370-15 – ASTM A 370-16 – ASTM A 370-17 – ASTM A 370-18 – ASTM E 190-14 – CSA W47.1-09 (reaffirmed 2014)
	• Guided-bend test with a former	– BS EN ISO 5173:2010 – BS EN ISO 5173:2010+A1 : 2011 – DNV-OS-F101:2012 – DNV-OS-F101:2013 – DNV-OS-C401:2013 – DNVGL-OS-C401:2015 – DNVGL-OS-C401:2017
	• Bottom ejecting guided bend test fixture	– AWS B4.0:2007

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Field of Testing	Specific Test	Test Method
Civil field 2. Weld test coupon of metal (cont.)	– Bend test (cont.) • Bending device with two supports and a former	– DNV-OS-F101:2012 – DNV-OS-F101:2013 – DNVGL-ST-F101:2017 (Amended 2017) – DNV-OS-C401:2013 – DNVGL-OS-C401:2015 – DNVGL-OS-C401:2017
	• Roller equipped guided bend test jig for bottom ejection of test specimen	– AASHTO/AWS D1.5:2015 – AWS D1.1/D1.1M:2010 – AWS D1.1/D1.1M:2015 – AWS D1.6/D1.6M:2007 – AWS D1.6/D1.6M:2017 – CSA W47.1-09 (reaffirmed 2014)
	• Testing with a former and roller supports	– AS 2205.3.1-2003 – AS 2205.3.1-2003 (R2018) – BS EN 910:1996 – BS EN ISO 15614-1:2004 + A2: 2012 – BS EN ISO 15614-1:2017

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Field of Testing	Specific Test	Test Method
Civil field 2. Weld test coupon of metal (cont.)	– Vickers hardness test • HV5 • HV10	– AS 2205.6.1-2003 – AS 2205.6.1-2003 (R2018) – ASTM E 92-16 – ASTM E 92-17 – ASTM E 384-11$^{\varepsilon 1}$ – ASTM E 384-17 – BS EN 1043-1:1996 – BS EN ISO 9015-1:2011 – BS EN ISO 15614-1:2004 +A2:2012 – BS EN ISO 15614-1:2017 – CSA W47.1-09 (reaffirmed 2014) – DNV-OS-F101:2012 – DNV-OS-F101:2013 – DNVGL-ST-F101:2017 (Amended 2017) – DNV-OS-C401:2013 – DNVGL-OS-C401:2015 – DNVGL-OS-C401:2017
	– Brinell hardness test • HBW 5/750 • HBW 10/3000	– ASTM E 10-17 – ASTM E10-18
	– Rockwell hardness test • HRBS • HRC • HRBW	– ASTM E 18-17$^{\varepsilon 1}$ – ASTM E18-19

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Field of Testing	Specific Test	Test Method
Civil field 2. Weld test coupon of metal (cont.)	– Impact test • Charpy V notch Temperature -196 °C to 30 °C Energy 1 J to 324 J	– AASHTO/AWS D1.5:2015 – AS 2205.7.1-2003 – AS 2205.7.1-2003 (R2018) – ASME BPVC Section VIII, 2015 Division 1 – ASME BPVC Section VIII, 2017 Division 1 – ASME BPVC Section VIII, 2019 Division 1 – ASME BPVC Section IX, 2015 – ASME BPVC Section IX, 2017 – ASME BPVC Section IX, 2019 – ASME B31.1-2014 – ASME B31.1-2016 – ASME B31.3-2012 – ASME B31.3-2014 – ASME B31.3-2018 – ASTM A370-15 – ASTM A370-16 – ASTM A370-17 – ASTM A370-18 – ASTM E 23-12c – ASTM E 23-16b – ASTM E 23-18 – AWS B4.0:2007 – AWS B4.0:2016 – AWS D1.1/D1.1M:2010 – AWS D1.1/D1.1M:2015 – AWS D1.6/D1.6M:2007 – AWS D1.6/D1.6M:2017 – BS EN ISO 148-1:2010 – BS EN ISO 148-1:2016

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Field of Testing	Specific Test	Test Method
Civil field		
2. Weld test coupon of metal (cont.)	– Impact test (cont.) • Charpy V notch Temperature -196 °C to 30 °C Energy 1 J to 324 J	– BS EN ISO 148-1:2018 – BS EN ISO 9016:2011 – BS EN ISO 9016:2012 – BS EN ISO 15614-1:2004+A2:2012 – BS EN ISO 15614-1:2017 – BS EN 875:1995 – CSA W47.1-09 (reaffirmed 2014) – DNV-OS-F101:2012 – DNV-OS-F101:2013 – DNVGL-OS-C401:2017
	– Fracture test (Fillet weld break test)	– AASHTO/AWS D1.5:2015 – AS 2205.4.2-2003 – AS 2205.4.2-2003 (R2018) – ASME BPVC section IX, 2015 – ASME BPVC section IX, 2017 – ASME BPVC section IX, 2019 – AWS B4.0:2007 – AWS B4.0:2016 – AWS D1.1/D1.1M:2010 – AWS D1.1/D1.1M:2015 – AWS D1.6/D1.6 M:2007 – AWS D1.6/D1.6 M:2017 – BS EN 1320:1997 – BS EN ISO 9017:2018 – CSA W47.1-09 (reaffirmed 2014)
	– Nick break test	– API Standard 1104 Twenty- first Edition, September 2013 Errata 3, July 2014 Addendum 1, July 2014

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Field of Testing	Specific Test	Test Method
Civil field		
2. Weld test coupon of metal (cont.)	– Nick break test (cont.)	– API Standard 1104 Twenty-first Edition, September 2013 Errata 3, July 2014 Addendum 2, May 2016 – AS 2205.4.1-2003 – AS 2205.4.1-2003 (R2018) – AWS B4.0:2007 – AWS B4.0:2016
	– Microetching metals and alloys	– ASTM E 407-07 (Reapproved 2015)$^{\varepsilon 1}$
	– Qualitative analysis of structure by optical microscope • Microstructure analysis	– ASM Handbook Volume 9 Metallography and Microstucture:2004
	– Determining volume fraction by systematic manual point count	– ASTM E 562-2011
	– Determining average grain size	– ASTM E 112-13 by Planimetric procedure – AS 1733-1976 by Planimetic method and comparison method (exclude at x75) – AS 1733-1976 (R2018) by Planimetic method and comparison method (exclude at x75)
	– Field metallographic replicas	– ASTM E 1351-01 (Reapproved 2012)

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Field of Testing	Specific Test	Test Method
Civil field		
2. Weld test coupon of metal (cont.)	- Intergranular corrosion test	- ASTM A262-15 Practice E - BS EN ISO 3651-2:1998 Method A
	- Pitting corrosion test (Ferric chloride corrosion test)	- ASTM A 923-08 method C - ASTM A 923-14 method C - ASTM G 48-11 method A - ASTM G 48-11 (Reapproved 2015) method A
	- Macrostructure analysis	- AS 2205.5.1:2003 - AS 2205.5.1:2003 (R2018) - ASME BPVC Section IX, 2015 - ASME BPVC Section IX, 2017 - ASME BPVC Section IX, 2019 - ASTM E 340-13 - ASTM E 340-15 - ASTM E 381-01 (Reapproved 2012) - AWS D1.1/D1.1M:2010 - AWS D1.1/D1.1M:2015 - BS EN 1321:1997 - BS EN ISO 15614-1:2004+A2 : 2012 - BS EN ISO 15614-1:2017 - BS EN ISO 17639:2013 - CSA W47.1-09 (reaffirmed 2014) - DNV-OS-F101:2012 - DNV-OS-F101:2013
	- Ferrite content	- In-house method : W-18-05-01 by using feritscope

Accreditation No. TESTING 0250

Laboratory Status ☑ Permanent ☐ Site ☐ Temporary ☐ Mobile

Field of Testing	Specific Test	Test Method
Civil field 2. Weld test coupon of metal (cont.)	– Chemical composition • Aluminium 0.014% to 0.093% by weight • Carbon 0.02% to 1.10% by weight • Chromium 0.037% to 2.09% by weight • Cobalt 0.006% to 0.20% by weight • Copper 0.082% to 0.50% by weight • Manganese 0.31% to 1.19% by weight • Molybdenum 0.007% to 0.788% by weight • Nickel 0.064% to 4.13% by weight • Niobium 0.003% to 0.12% by weight • Nitrogen 0.009 6% to 0.055% by weight • Phosphorous 0.006% to 0.085% by weight • Silicon 0.023% to 1.54% by weight • Sulfur 0.01% to 0.047 6% by weight • Tin 0.005% to 0.047% by weight • Titanium 0.002% to 0.2% by weight • Vanadium 0.008% to 0.3% by weight	– ASTM E 415-17

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Field of Testing	Specific Test	Test Method
Civil field		
3. Round bars	– Tensile strength – Yield strength – Elongation	– TIS 20-2543 (2000)
	– Bend test	– TIS 20-2543 (2000)
	– Carbon 0.02% to 1.10% by weight – Sulfur 0.01% to 0.047 6% by weight – Phosphorous 0.006% to 0.085% by weight	– TIS 20-2543 (2000) (Refer to ASTM E 415-17)
4. Deformed bars	– Tensile strength – Yield strength – Elongation	– TIS 24-2548 (2005)
	– Bend test	– TIS 24-2548 (2005)
	– Carbon 0.002% to 1.10% by weight – Manganese 0.31% to 1.19% by weight – Phosphorous 0.006% to 0.085% by weight – Sulfur 0.01% to 0.047 6% by weight	– TIS 24-2548 (2005) (Refer to ASTM E 415-17)

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Field of Testing	Specific Test	Test Method
Civil field 1. Iron and steel and weld test coupon of metal	– Ferrite content	– In-house method : W-18-05-01 by using feritscope
	– Field metallographic replicas	– ASTM E 1351-01 (Reapproved 2012)
	– Chemical composition (PMI) • Aluminium 0.014% to 0.093% by weight • Carbon 0.02% to 1.10% by weight • Chromium 0.037% to 2.09% by weight • Cobalt 0.006% to 0.20% by weight • Copper 0.082% to 0.50% by weight • Manganese 0.31% to 1.19% by weight • Molybdenum 0.007% to 0.788% by weight • Nickel 0.064% to 4.13% by weight • Niobium 0.003% to 0.12% by weight • Phosphorous 0.006% to 0.085% by weight • Silicon 0.023% to 1.54% by weight • Sulfur 0.01% to 0.047 6% by weight	– ASTM E 415-17

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Field of Testing	Specific Test	Test Method
Civil field		
1. Iron and steel and weld test coupon of metal (cont.)	- Chemical composition (PMI) (cont.) • Tin 0.005% to 0.047% by weight • Titanium 0.002% to 0.2% by weight • Vanadium 0.008% to 0.3% by weight	- ASTM E 415-17
2. Round bars	- Carbon 0.02% to 1.10% by weight - Sulfur 0.01% to 0.047 6% by weight - Phosphorous 0.006% to 0.085% by weight	- TIS 20-2543 (2000) (Refer to ASTM E 415-17)
3. Deformed bars	- Carbon 0.02% to 1.10% by weight - Manganese 0.31% to 1.19% by weight - Phosphorous 0.006% to 0.085% by weight - Sulfur 0.01% to 0.047 6% by weight	- TIS 24-2548 (2005) (Refer to ASTM E 415-17)

Issue date 22nd August B.E. 2562 (2019)

(Signature)

(Mr.Verakit Rantakittanawat)

Deputy Secretary - General

For Secretary - General

Thai Industrial Standards Institute

Translation Note: In the event of doubt or misunderstanding, the original in Thai shall be the authoritative.