**Scope of Accreditation for Testing**

**Certificate No. 21T055/1268**

Laboratory Name TNP test corporation Co., Ltd.

Address 1/8 Moo 4, Banpuek, Mueang Chonburi, Chonburi

Accreditation No. TESTING 0675

Laboratory Status ☑ Permanent ☐ Site ☐ Temporary ☐ Mobile

| Field of Testing | Parameter | Test Method |
|---|---|---|
| Civil field | | |
| 1. Iron and steel | - Yield strength 0.2%<br>- Tensile strength<br>- Elongation | - ASME SA-370-17, Section II, Part A<br>- ASTM A 370-20<br>- ASTM E 8/E8M-21<br>- BS EN 10002-1 : 2001<br>- ISO 6892-1 : 2019<br>- JIS Z 2241 : 2011 |
| | - Bending<br>Guided-bend jig | - ASME SA-370-17, Section II, Part A<br>- ASTM A 370-20<br>- ASTM E 290-14<br>- ASTM E 8/E8M-21 |
| | - Impact energy up to 400 J temperature -196˚C to room temp. | - ASME SA-370-17, Section II, Part A<br>- ASTM A 370-20<br>- ASTM E 23-16b<br>- BS EN ISO 148-1 : 2016<br>- JIS Z 2242 : 2005 |
| | - Vickers hardness<br>(HV 5 and HV 10) | - ASTM E 92-17<br>- ISO 6507-1 : 2005 |

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| Field of Testing | Parameter | Test Method |
|---|---|---|
| Civil field | | |
| 1. Iron and steel (cont.) | - Qualitative analysis of structure by optical microscope for macrostructure analysis<br>- Microstructure analysis | - ASM Handbook Vol.9 : Metallography and microstructure : 2004 |
| | - Microstructure analysis by replica technique | - ASTM E 1351-01 (Reapproved 2012)<br>- ECCC Recommendations-Volume 6 (Issue 1) 2005 |
| | - Grain size measurement by plate I | - ASTM E 112-13 Plate I |
| | - Determining volume fraction by systematic manual point count | - ASTM E 562-2011 |
| | - Chemical composition<br>● Aluminium 0.014% to 0.093% by mass<br>● Carbon 0.02% to 1.10% by mass<br>● Chromium 0.037% to 2.09% by mass<br>● Cobalt 0.006% to 0.20% by mass<br>● Copper 0.082% to 0.50% by mass<br>● Manganese 0.31% to 1.19% by mass<br>● Molybdenum 0.007% to 0.788% by mass | - ASTM E 415-17 |

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| Field of Testing | Parameter | Test Method |
|---|---|---|
| Civil field | | |
| 1. Iron and steel (cont.) | - Chemical composition (ต่อ)<br>● Molybdenum<br>0.007% to 0.788% by mass<br>● Nickel<br>0.064% to 4.13% by mass<br>● Niobium<br>0.003% to 0.12% by mass<br>● Nitrogen<br>0.009 6% to 0.055% by mass<br>● Phosphorous<br>0.006% to 0.085% by mass<br>● Silicon<br>0.023% to 1.54% by mass<br>● Sulfur<br>0.01% to 0.047 6% by mass<br>● Tin<br>0.005% to 0.047% by mass<br>● Titanium<br>0.002% to 0.2% by mass<br>● Vanadium<br>0.008% to 0.3% by mass | - ASTM E 415-17 |
| 2. Stainless steel | - Intergranular corrosion test | - ASTM A 262-15 Practice E<br>- ISO 3651-2 : 1998 Method A |
| | - Pitting corrosion test<br>(Ferric chloride corrosion test) | - ASTM A 923-14 Method C<br>- ASTM G 48-11 (Reapproved 2015) Method A, B |

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| Field of Testing | Parameter | Test Method |
|---|---|---|
| Civil field | | |
| 2. Stainless steel (cont.) | - Chemical composition<br>● Chromium 17.0% to 22.6% by mass<br>● Nickel 7.5% to 13.0% by mass<br>● Molybdenum 0.01% to 3.00% by mass<br>● Manganese 0.01% to 1.78% by mass<br>● Carbon 0.007% to 0.25% by mass<br>● Phosphorous 0.063% to 0.15% by mass<br>● Sulfur 0.003% to 0.047 6% by mass | - ASTM E 1086-14 |
| 3. Steel bars for reinforced concrete : round bars | - Tensile strength<br>- Yield strength 0.2%<br>- Elongation | - TIS 20-2559 (2016) |
| 4. Steel bars for reinforced concrete : deformed bars | - Tensile strength<br>- Yield strength 0.2%<br>- Elongation | - TIS 24-2559 (2016) |

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Laboratory Status ☑ Permanent ☐ Site ☐ Temporary ☐ Mobile

| Field of Testing | Parameter | Test Method |
|---|---|---|
| Civil field | | |
| 5. Ferrous and non-ferrous | - Yield strength 0.2%<br>- Tensile strength<br>- Elongation | - ASME SA-370-17, Section II, Part A<br>- ASTM A 370-20<br>- ASTM E 8/E8M-21<br>- JIS Z 2241-2011 |
| | - Impact energy up to 400 J temperature -196°C to room temp. | - ASME SA-370-17, Section II, Part A<br>- ASTM A 370-20<br>- ASTM E 23-16b |
| | - Vickers hardness (HV 5 and HV 10) | - ASTM E 92-17<br>- ISO 6507-1-2005<br>- ASME Section IX, 2015 |
| | - Qualitative analysis of structure by optical microscope for microstructure analysis | - ASM Handbook Vol.9 : Metallography and microstructure : 2004 |
| | - Microstructure analysis by replica technique | - ASTM E1351-01 (Reapproved 2012) |

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| Field of Testing | Parameter | Test Method |
|---|---|---|
| Civil field | | |
| 6. Weld specimen for steel | - Tensile strength | - API Standard 1104 Twenty-first Edition, September 2013 Errata 3, July 2014<br>- ASME SA-370-17, Section II, Part A<br>- ASME Section IX, 2015<br>- ASTM A 370-20<br>- ASTM E 8/E8M-21<br>- AWS D 1.1/D1.1M : 15 |
| | - Impact energy up to 400 J temperature -196˚C to room temp. | - ASME SA-370-17, Section II, Part A<br>- ASME Section IX, 2015<br>- ASTM A 370-20<br>- ASTM E 23-16b<br>- BS EN ISO 148-1 : 2016 |
| | - Bending<br>Guided-bend jig | - ASME SA-370-17, Section II, Part A<br>- ASME Section IX, 2015<br>- ASTM A 370-20<br>- ASTM E 290-14<br>- ASTM E 8/E8M-21 |
| | - Macrostructure analysis | - ASME Section IX, 2015<br>- AWS D 1.1/D1.1M : 15 |

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| Field of Testing | Parameter | Test Method |
|---|---|---|
| Civil field | | |
| 6. Weld specimen for steel (cont.) | - Vickers hardness (HV 5 and HV 10) | - ASTM E 92-17<br>- AWS D 1.1/D1.1M : 15<br>- ISO 6507-1-2005<br>- ASME Section IX, 2015 |
| | - Intergranular corrosion test | - ASTM A 262-15 Practice E<br>- ISO 3651-2 : 1998 Method A |
| 7. Weld specimen for stainless steel and duplex steel | - Pitting corrosion test (Ferric chloride corrosion test) | - ASTM A 923-14 Method C<br>- ASTM G 48-11 (Reapproved 2015) Method A |
| | - Determining volume fraction by systematic manual point count | - ASTM E 562-2011 |
| 8. Weld specimen for Al and Al-alloy | - Tensile strength | - ASME Section IX, 2015<br>- AWS D1.2/D1.2M : 15 |
| | - Bending Guided-bend jig | - ASME SA-370-17, Section II, Part A<br>- ASTM A 370-20<br>- ASTM E 290-14<br>- ASTM E 8/E8M-21 |

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| Field of Testing | Parameter | Test Method |
|---|---|---|
| Civil field | | |
| 8. Weld specimen for Al and Al-alloy (cont.) | - Impact energy up to 400 J temperature -196˚C to room temp. | - ASME SA-370-17, Section II, Part A<br>- ASTM A 370-20<br>- ASTM E 23-16b<br>- BS EN ISO 148-1 : 2016 |
| | - Vickers hardness (HV 5 and HV 10) | - ASTM E 92-17<br>- ISO 6507-1-2005<br>- ASME Section IX, 2015 |
| | - Macrostructure analysis | - ASME Section IX, 2015 |

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| Field of Testing | Parameter | Test Method |
|---|---|---|
| Civil field<br>1. Iron and steel | - Microstructure analysis by replica technique | - ASTM E 1351-01 (Reapproved 2012) |
| 2. Non-ferrous metal<br>- Al and Al-alloy<br>- Cu and Cu alloy<br>- Brass | - Microstructure analysis by replica technique | - ASTM E 1351-01 (Reapproved 2012) |
| 3. Weld specimen for steel | - Microstructure analysis by replica technique | - ASTM E 1351-01 (Reapproved 2012) |
| 4. Weld specimen for Al and Al-alloy | - Microstructure analysis by replica technique | - ASTM E 1351-01 (Reapproved 2012) |

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(Mr. Ekanit Romyanon)

Director

Office of the National Standardization Council

for Secretary-General, Thai Industrial Standards Institute