**PRECISION MARSHALL STEEL COMPANY**
**One Northpoint Court, Bolingbrook IL 60440**
**Toll Free: 1-800-258-2558 - www.pmsteel.com**

# CERTIFICATION OF DRILL ROD

## PRODUCT INFORMATION

| Grade | Thickness | Heat # | Country of Origin | Purchase Order |
|---|---|---|---|---|
| W1 | 0.6250 | PM20086 | United States | P1450214 |

## CHEMICAL COMPOSITION

C: 0.9100 Mn: 0.3900 P: 0.0080 S: 0.0080 Si: 0.1900 Cr: 0.0800 Mo: 0.0200 Ni: 0.0600 Cu: 0.1100 V: 0.0010

## STANDARD INFORMATION

**STANDARD CHEMICAL COMPOSITION**

| AISI / SAE | UNS | Carbon | Manganese | Silicon | Phosphorous | Sulfur | Chromium | Vanadium | Tungsten | Molybdenum |
|---|---|---|---|---|---|---|---|---|---|---|
| W1 | T72301 | .90/1.05 | .30/.40 | .10/.25 | .025 Max | .025 Max | .30 Max | .10 Max | .15 Max | .10 Max |
| O1 | T31501 | .85/1.00 | 1.00/1.40 | .10/.50 | .030 Max | 0.030 Max | .40/.70 | .30 Max | .40/.60 | -- |
| A2 | T30102 | .95/1.05 | .40/1.00 | .50 Max | .030 Max | 0.030 Max | 4.75/5.50 | .15/.50 | -- | .90/1.40 |
| S7 | T41907 | .45/.55 | .20/.90 | .20/1.00 | .030 Max | 0.030 Max | 3.00/3.50 | .35 Max | -- | .10 Max |
| D2 | T30402 | 1.40/1.60 | .10/.60 | .10/.60 | .030 Max | 0.030 Max | 11.00/13.00 | .50/1.10 | -- | .70/1.20 |
| M2 | T11302 | .78 / 1.05 | .15 / .40 | .03 / .20 | .40 Max | .03 Max | 3.75 / 4.50 | 1.75 / 2.20 | 5.50 / 6.75 | 4.50 / 5.50 |
| H13 | -- | .40 | -- | 1.00 | -- | .100 | 5.25 | 1.00 | - | 1.35 |

**SPECIFICATIONS**

| AISI | SAE | ASTM | FEDERAL |
|---|---|---|---|
| W1 | J-437 | A686-92(2010) (1) | QQ-T-580 Rev.C |
| O1 | J-437 | A681-08 (2) | QQ-T-570 Rev.C |
| A2 | J-437 | A681-08 (2) | QQ-T-570 Rev.C |
| S7 | J-437 | A681-08 (2) | QQ-T-570 Rev.C |
| D2 | J-437 | A681-08 (2) | QQ-T-570 Rev.C |
| M2 | J438-B | A600-92a(2016) | QQT-570 Rev. C |
| H13 | J-437 | A681-08 (2) | QQ-T-570 Rev.C |

*1 Certain heats may not meet the ASTM specification for Manganese*
*2 Certain sizes may not meet the ASTM specification for hardness.*

**SURFACE / STRUCTURE**

| Size | Finish (Max) | Quality (Max Defect) |
|---|---|---|
| .000-.1250 | 10 RMS | 0.000 |
| .1251-.2500 | 15 RMS | 0.000 |
| .2501-.8750 | 20 RMS | 0.000 |
| .8751-2.000 | 30 RMS | 0.000 |
| All CD Flats | 50 RMS | .008/side |

** Grain Size: 5-8 (McQuade-Ehn)*
** Microstructure: 85% min. spheroidization*

**MACHINABILITY**

| Grade | Rating |
|---|---|
| W1 | 100 |
| O1 | 90 |
| A2 | 65 |
| S7 | 95 |
| D2 | 50 |
| M2 | 65 |

## HARDNESS

| Size | W1 | O1 | A2 | S7 | D2 | H13 | M2 |
|---|---|---|---|---|---|---|---|
| .0000-.1250 | 166,000 psi | 116,000 psi | 128,000 psi | 123,000 psi | 131,000 psi | 40-48 HRC | 248 HRB |
| .1251-.2500 | 28 HRC | 100 HRB | 27 HRC | 25 HRC | 28 HRC | 40-48 HRC | 248 HRB |
| .2501-.5000 | 23 HRC | 100 HRB | 27 HRC | 25 HRC | 28 HRC | 40-48 HRC | 248 HRB |
| .5001-2.000 | 96 HRB | 100 HRB | 27 HRC | 25 HRC | 28 HRC | 40-48 HRC | 248 HRB |

** For sizes under 5/32" diameter, a tensile strength is obtained.*

| SIZE | | LENGTH | |
|---|---|---|---|
| Diameter | Tolerance | Length | Tolerance |
| .0000-.1249 | +/-.0003 | 3' | 36" +1/8,-0 |
| .1250-.499 | +/-.0005 | 6' | 72" +1,-0 |
| .500-3.00 | +/-.001 | 12' | 144" +2,-0 |

Precision Marshall Steel Company hereby attests that drill rod items as supplied have been tested and certified to meet all of the standards and limitations for ground flat stock as set forth above.

Material is RoHs, REACH, and Conflict Mineral compliant. The letter confirming compliance can be found on our website or distributor portal.

Certified: Wendy Gabauer
Manager of Materials

Date: 6/20/2022