Standard Specification form Seamless Carbon Steel Pipe for High-Temperature Service **ASTM A106 / A106M**

*Engineered Fire Piping S.L. | c.del Pino 17, Polígono Industrial La Malena, Yuncos, Toledo – España*

*C.I.F. B - 45762119 | Inscrita en el Registro Mercantil de Toledo*

This specification covers seamless carbon steel pipe for high-temperature service in NPS 1/8 to NPS 48 [DN 6 to DN 1200], with nominal (average) wall thickness as given in ASME B 36.10M

Pipe ordered under this specification shall be suitable for bending, flanging, and similar forming operations, and for welding. When the steel is to be welded, it is presupposed that a welding procedure suitable to the grade of steel and intended use or service will be utilized.

For pipe NPS 1 ½ [DN 40) and under, it shall be permissible to furnish hot finished or cold drawn. Unless otherwise specified, pipe NPS 2 [DN 50) and over shall be furnished hot finished. When agreed upon between the manufacturer and the purchaser, it is permissible to furnish cold-drawn pipe.

The steel shall conform to the requirements as to **Chemical Composition** prescribed in the following Table:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Carbon** | **Manganese** | **Phosforus** | **Sulfur** | **Silicon** | **Chrome** | **Cupper** | **Molybdenum** | **Nickel** | **Vanadium** |
| GRADE | % máx. |
| A | 0,25 A | 0,27-0,93 | 0,035 | 0,035 | 0,1 | 0,4 | 0,4 | 0,15 | 0,4 | 0,08 |
| B | 0,3 B | 0,29-1,06 | 0,035 | 0,035 | 0,1 | 0,4 | 0,4 | 0,15 | 0,4 | 0,08 |
| C | 0,35 C | 0,29-1,06 | 0,035 | 0,035 | 0,1 | 0,4 | 0,4 | 0,15 | 0,4 | 0,08 |

1. *For each reduction of 0.01 % below the specified carbon maximum, an increase of 0.06 % manganese above the specified maximum will be permitted up to a maximum of 1 .35 %.*
2. *Unless otherwise specified by the purchaser, for each reduction of 0.01 % below the specified carbon maximum, an increase of 0.06 % manganese above the specified maximum will be permitted up to a maximum of 1.65 %.*
3. *These five elements combined shall not exceed 1 %.*

The material shall conform to the requirements as to **tensile properties** given as follows

|  |  |  |  |
| --- | --- | --- | --- |
|  | **GRADE A** | **GRADE B** | **GRADE C** |
| Tensile strength, min. psi [MPa] | 48 000 [330] | 60 000 (415] | 70 000 [485 |
| Yield strength, min, psi [MPa] | 30 000 [205] | 5 000 [240] | 40 000 [275] |

**Dimensions, Mass, and Permissible Variations**

The **mass** of any length of pipe shall not vary more than 10 % over and 3.5 % under that specified. Unless

otherwise agreed upon between the manufacturer and the purchaser, pipe in NPS 4 [DN 100] and smaller may be

weighed in convenient lots; pipe larger than NPS 4 [DN 100] shall be weighed separately

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**Diameter**—Except as provided for thin-wall pipe, the tolerances for diameter shall be in accordance with the following table:

|  |  |
| --- | --- |
| **NPS (DN)** | **Permissible Variations in Outside Diameter** |
| Inches (mm)  |  Over Inches /mm  | Under Inches /mm |
| 1/8 to 1 ½ (6 to 40) | 0,015 / 0,4 | 0,015 / 0,4 |
| >1 ½ to 4 (> 40 to100) | 0,031 / 0,8 | 0,031 / 0,8  |
| > 4 to 8 (>100 to 200) |  0,062 / 1,6 | 0,031 / 0,8 |
| > 8 to 18 (>200 to 450) | 0,093 / 2,4  | 0,031 / 0,8 |
| >18 to 26 (>450 to 650) | 0,125 / 3,2 | 0,031 / 0,8 |

**Thickness**—The minimum wall thickness at any point shall not be more than 12.5 % under the specified wall

thickness.

Required **Pipe lengths** shall be specified in the order. If definite lengths are not required, pipe may be

ordered as follows:

* + **Single Random** lengths of 16 to 22 ft [4.8 to 6.7 m] with 5 % 12 to 16 ft [3.7 to 4.8 m],
	+ **Double Random** lengths with a minimum average of 35 ft [10.7 m] and a minimum length of 22 ft [6.7 m] with 5 % 16 to 22 ft [4.8 to 6.7 m].

## Pressure and Mechanical test :

* Hydrostatic Test:

Regardless of pipe-wall stress-level the minimum hydrostatic test pressure required to satisfy these requirements need not exceed 2500 psi [17.0 MPa] for outside diameters of 3.5 in. [88.9 mm] or less, nor 2800 psi [19.0 MPa] for outside diameters over 3.5 in. [88.9 mm]. The hydrostatic pressure shall be maintained for not less than 5 s for all sizes

* Tensile requirements:

The material shall conform to the requirements as to tensile properties prescribed in the individual specifications.

* Flattening Test:

Although testing is not required, pipe shall be capable of meeting the flattening test requirements Supplementary

Requirement if tested,

* Bending Requirements:

For pipe NPS 2 [DN 50] and under, a sufficient length of pipe shall be capable of being bent cold around a cylindrical mandrel, according to the following table:

|  |  |  |
| --- | --- | --- |
|  | **Bending radius** | **Cylindrical Mandrel Diameter** |
| Standard applications pipes | 90 º | 12 x Pipe OD |
| Close coiling applications | 180 º | 8 x Pipe OD |

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 Temperature Service **ASTM A106 / A106M**

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| --- |
| **DIMENSIONS AND WEIGHTS OF WELDED AND SEAMLESS WROUGHT STEEL PIPE ACCORDING TO ASME B36.10M** |
| NPS(Nominal Pipe Size) | DN(Nominal Diameter) | Identification [Standard (STD), Extra-Strong (XS), or Double Extra Strong (XXS)]  | Schedule Nº | Outside Diameter (mm) | Wall Thickness (mm) | Plain end mass kg/m |
|  |  |  |  |  |  |  |
| 1" | 25 | …. | 5 | 33,4 | 1,65 | 1,29 |
| 1" | 25 | …. | 10 | 33,4 | 2,77 | 2,09 |
| 1" | 25 | …. | 30 | 33,4 | 2,90 | 2,18 |
| 1" | 25 | STD | 40 | 33,4 | 3,38 | 2,50 |
| 1" | 25 | XS | 80 | 33,4 | 4,55 | 3,24 |
| 1" | 25 | …. | 160 | 33,4 | 6,35 | 4,24 |
| 1" | 25 | XXS | …. | 33,4 | 9,09 | 5,45 |
| 11/4" | 32 | …. | 5 | 42,2 | 1,65 | 1,65 |
| 11/4" | 32 | …. | 10 | 42,2 | 2,77 | 2,69 |
| 11/4" | 32 | …. | 30 | 42,2 | 2,97 | 2,87 |
| 11/4" | 32 | STD | 40 | 42,2 | 3,56 | 3,39 |
| 11/4" | 32 | XS | 80 | 42,2 | 4,85 | 4,47 |
| 11/4" | 32 | …. | 160 | 42,2 | 6,35 | 5,61 |
| 11/4" | 32 | XXS | …. | 42,2 | 9,70 | 7,77 |
| 11/2" | 40 | …. | 5 | 48,3 | 1,65 | 1,90 |
| 11/2" | 40 | …. | 10 | 48,3 | 2,77 | 3,11 |
| 11/2" | 40 | …. | 30 | 48,3 | 3,18 | 3,53 |
| 11/2" | 40 | STD | 40 | 48,3 | 3,68 | 4,05 |
| 11/2" | 40 | XS | 80 | 48,3 | 5,08 | 5,41 |
| 11/2" | 40 | …. | 160 | 48,3 | 7,14 | 7,25 |
| 11/2" | 40 | XXS | …. | 48,3 | 10,15 | 9,55 |
| 2" | 50 | …. | 5 | 60,3 | 1,65 | 2,39 |
| 2" | 50 | …. | 10 | 60,3 | 2,77 | 3,93 |
| 2" | 50 | …. | 30 | 60,3 | 3,18 | 4,48 |
| 2" | 50 | STD | 40 | 60,3 | 3,91 | 5,44 |
| 2" | 50 | XS | 80 | 60,3 | 5,54 | 7,48 |
| 2" | 50 | …. | 160 | 60,3 | 8,74 | 11,11 |
| 2" | 50 | XXS | …. | 60,3 | 11,07 | 13,44 |
| 2 2/1" | 65 | …. | 5 | 73,0 | 2,11 | 3,69 |
| 2 2/1" | 65 | …. | 10 | 73,0 | 3,05 | 5,26 |
| 2 2/1" | 65 | …. | 30 | 73,0 | 4,78 | 8,04 |
| 2 2/1" | 65 | STD | 40 | 73,0 | 5,16 | 8,63 |
| 2 2/1" | 65 | XS | 80 | 73,0 | 7,01 | 11,41 |
| 2 2/1" | 65 | …. | 160 | 73,0 | 9,53 | 14,92 |
| 2 2/1" | 65 | XXS | …. | 73,0 | 14,02 | 20,39 |
| 3" | 80 | …. | 5 | 88,9 | 2,11 | 4,52 |
| 3" | 80 | …. | 10 | 88,9 | 3,05 | 6,46 |
| 3" | 80 | …. | 30 | 88,9 | 4,78 | 9,92 |
| 3" | 80 | STD | 40 | 88,9 | 5,49 | 11,29 |
| 3" | 80 | XS | 80 | 88,9 | 7,62 | 15,27 |
| 3" | 80 | …. | 160 | 88,9 | 11,13 | 21,35 |
| 3" | 80 | XXS | …. | 88,9 | 15,24 | 27,68 |
| 4" | 100 | …. | 5 | 114,3 | 2,11 | 5,84 |
| 4" | 100 | …. | 10 | 114,3 | 3,05 | 8,37 |
| 4" | 100 | …. | 30 | 114,3 | 4,78 | 12,91 |
| 4" | 100 | STD | 40 | 114,3 | 6,02 | 16,08 |
| 4" | 100 | XS | 80 | 114,3 | 8,56 | 22,32 |
| 4" | 100 | …. | 120 | 114,3 | 11,13 | 28,32 |
| 4" | 100 | …. | 160 | 114,3 | 13,49 | 33,54 |
| 4" | 100 | XXS | …. | 114,3 | 17,12 | 41,03 |
| 5" | 125 | …. | 5 | 141,3 | 2,77 | 9,46 |
| 5" | 125 | …. | 10 | 141,3 | 3,40 | 11,56 |
| 5" | 125 | STD | 40 | 141,3 | 6,55 | 21,77 |
| 5" | 125 | XS | 80 | 141,3 | 9,53 | 30,97 |
| 5" | 125 | …. | 120 | 141,3 | 12,70 | 40,28 |
| 5" | 125 | …. | 160 | 141,3 | 15,88 | 49,12 |
| 5" | 125 | XXS | …. | 141,3 | 19,05 | 57,43 |

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| **DIMENSIONS AND WEIGHTS OF WELDED AND SEAMLESS WROUGHT STEEL PIPE ACCORDING TO ASME B36.10M** |
| NPS(Nominal Pipe Size) | DN(Nominal Diameter) | Identification [Standard (STD), Extra-Strong (XS), or Double Extra Strong (XXS)]  | Schedule Nº | Outside Diameter (mm) | Wall Thickness (mm) | Plain end mass kg/m |
| 6" | 150 | …. | 5 | 168,3 | 2,77 | 11,31 |
| 6" | 150 | …. | 10 | 168,3 | 3,40 | 13,83 |
| 6" | 150 | STD | 40 | 168,3 | 7,11 | 28,26 |
| 6" | 150 | XS | 80 | 168,3 | 10,97 | 42,56 |
| 6" | 150 | …. | 120 | 168,3 | 14,27 | 54,21 |
| 6" | 150 | …. | 160 | 168,3 | 18,26 | 65,57 |
| 6" | 150 | XXS | …. | 168,3 | 21,95 | 79,22 |
| 8" | 200 | …. | 5 | 219,1 | 2,77 | 14,78 |
| 8" | 200 | …. | 10 | 219,1 | 3,76 | 19,97 |
| 8" | 200 | …. | 20 | 219,1 | 6,35 | 33,32 |
| 8" | 200 | …. | 30 | 219,1 | 7,04 | 36,82 |
| 8" | 200 | STD | 40 | 219,1 | 8,18 | 42,55 |
| 8" | 200 | …. | 60 | 219,1 | 10,31 | 53,09 |
| 8" | 200 | XS | 80 | 219,1 | 12,70 | 64,64 |
| 8" | 200 | …. | 100 | 219,1 | 15,09 | 75,92 |
| 8" | 200 | …. | 120 | 219,1 | 18,26 | 90,44 |
| 8" | 200 | …. | 140 | 219,1 | 20,62 | 100,93 |
| 8" | 200 | XXS | …. | 219,1 | 22,23 | 107,93 |
| 8" | 200 | …. | 160 | 219,1 | 23,01 | 111,27 |
| 10" | 250 | …. | 5 | 273,0 | 3,40 | 22,61 |
| 10" | 250 | …. | 10 | 273,0 | 4,19 | 27,78 |
| 10" | 250 | …. | 20 | 273,0 | 6,35 | 41,76 |
| 10" | 250 | …. | 30 | 273,0 | 7,80 | 51,01 |
| 10" | 250 | STD | 40 | 273,0 | 9,27 | 60,29 |
| 10" | 250 | XS | 60 | 273,0 | 12,70 | 81,53 |
| 10" | 250 | …. | 80 | 273,0 | 15,09 | 95,98 |
| 10" | 250 | …. | 100 | 273,0 | 18,26 | 114,71 |
| 10" | 250 | …. | 120 | 273,0 | 21,44 | 133,01 |
| 10" | 250 | XXS | 140 | 273,0 | 25,40 | 155,10 |
| 10" | 250 | …. | 160 | 273,0 | 28,58 | 172,27 |
| 12" | 300 | …. | 5 | 323,8 | 3,96 | 31,24 |
| 12" | 300 | …. | 10 | 323,8 | 4,57 | 35,98 |
| 12" | 300 | …. | 20 | 323,8 | 6,35 | 49,71 |
| 12" | 300 | …. | 30 | 323,8 | 8,38 | 65,19 |
| 12" | 300 | STD | …. | 323,8 | 9,53 | 73,86 |
| 12" | 300 | …. | 40 | 323,8 | 10,31 | 79,71 |
| 12" | 300 | XS | …. | 323,8 | 12,70 | 97,44 |
| 12" | 300 | …. | 60 | 323,8 | 14,27 | 108,93 |
| 12" | 300 | …. | 80 | 323,8 | 17,48 | 132,05 |
| 12" | 300 | …. | 100 | 323,8 | 21,44 | 159,87 |
| 12" | 300 | XXS | 120 | 323,8 | 25,40 | 186,92 |
| 12" | 300 | …. | 140 | 323,8 | 28,58 | 208,08 |
| 12" | 300 | …. | 160 | 323,8 | 33,32 | 238,69 |