



# ASTM A335 Chrome Moly Pipe

By Mr. Sum Xu

ASTM A335 Pipe (ASME S/A335, Chrome-Moly) is a seamless ferritic Alloy-Steel Pipe for high temperature service.

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# ASTM A335 Chrome Moly Pipe

ASTM A335 Pipe (ASME S/A335, Chrome-Moly) is a seamless ferritic Alloy-Steel Pipe for high temperature service. Pipe ordered to this specification shall be suitable for bending, flanging (vans toning), and similar forming operations, and for fusion welding. Sometimes referred to as "P Grade", chrome moly pipe is popular in P-Grades P5, P9, P11, P22, and P91.

ASTM A335 standard is issued under the fixed designation A 335/A 335M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision.

The most common use of grades P11, P22, and P91 is in the power industry and petro-chemical plants, Grades P5 and P9 are commonly used in refineries.

Sunny Steel Supply stocks a full range of the following A335 pipe grades:

**Grades:** ASTM A335 P5, P9, P11, P-22, and P91

## Sizes

NPS 1/4" to NPS 24"

Wall Thickness - Schedules 40 through 160, STD, XS, XXS.

Unscheduled heavy wall pipe thicknesses available up to 4 inches.

It also enhances the corrosion resistance of steel, and inhibits pitting. Chromium (or chrome) is the essential constituent of stainless steel. Any steel with 12% or more Chrome is considered stainless. Chrome is virtually irreplaceable in resisting oxidation at elevated temperatures. Chrome raises the tensile, yield, and hardness at room temperatures. The composition chrome moly alloy steel pipe make it ideal for use in power plants, refineries, petro chemical plants, and oil field services where fluids and gases are transported at extremely high temperatures and pressures.

**ASTM A335 Chrome Moly Pipe**

## Chemical Composition:

Grade	Carbon	Manganese	Phosphorous, max	Sulfur, max	Silicon	Molybdenum
ASTM A335 P5	0.15max	0.30-0.60	0.025	0.025	0.50max	0.45-0.65
ASTM A335 P9	0.15max	0.30-0.60	0.025	0.025	0.25-1.00	0.90-1.10
ASTM A335 P11	0.05-0.15	0.30-0.60	0.025	0.025	0.50-1.00	0.44-0.65
ASTM A335 P22	0.05-0.15	0.30-0.60	0.025	0.025	0.50max	0.87-1.13
ASTM A335 P91	0.08-0.12	0.30-0.60	0.020	0.010	0.20-0.50	0.85-1.05
Zr 0.01 max	V 0.18-0.25	N 0.03-0.07	Ni 0.40 max	Al 0.02 max	Cb 0.06-0.10	Ti 0.01 max

## Tensile Requirements

Tensile Strength, min., psi	P-5	P-9	P-11	P-22	P-91	P91 shall not have a hardness not exceeding 250 HB/265 HV [25HRC].
ksi	60	60	60	60	85	
MPa	415	415	415	415	585	
Yield Strength, min., psi						
ksi	30	30	30	30	60	
MPa	205	205	205	205	415	

## Mechanical Properties

Mechanical properties	P1,P2	P12	P23	P91	P92,P11	P122
Tensile strength	380	415	510	585	620	620
Yield strength	205	220	400	415	440	400

A335 is often called chrome moly pipe because of the chemical makeup of Molybdenum (Mo) and Chromium (Cr). Molybdenum increases the strength of steel as well as the elastic limit, resistance to wear, impact qualities, and hardenability. Moly increases the resistance to softening, restrains grain growth and makes chromium steel less susceptible to embrittlement. Moly is the most effective single additive that increases high temperature creep strength.

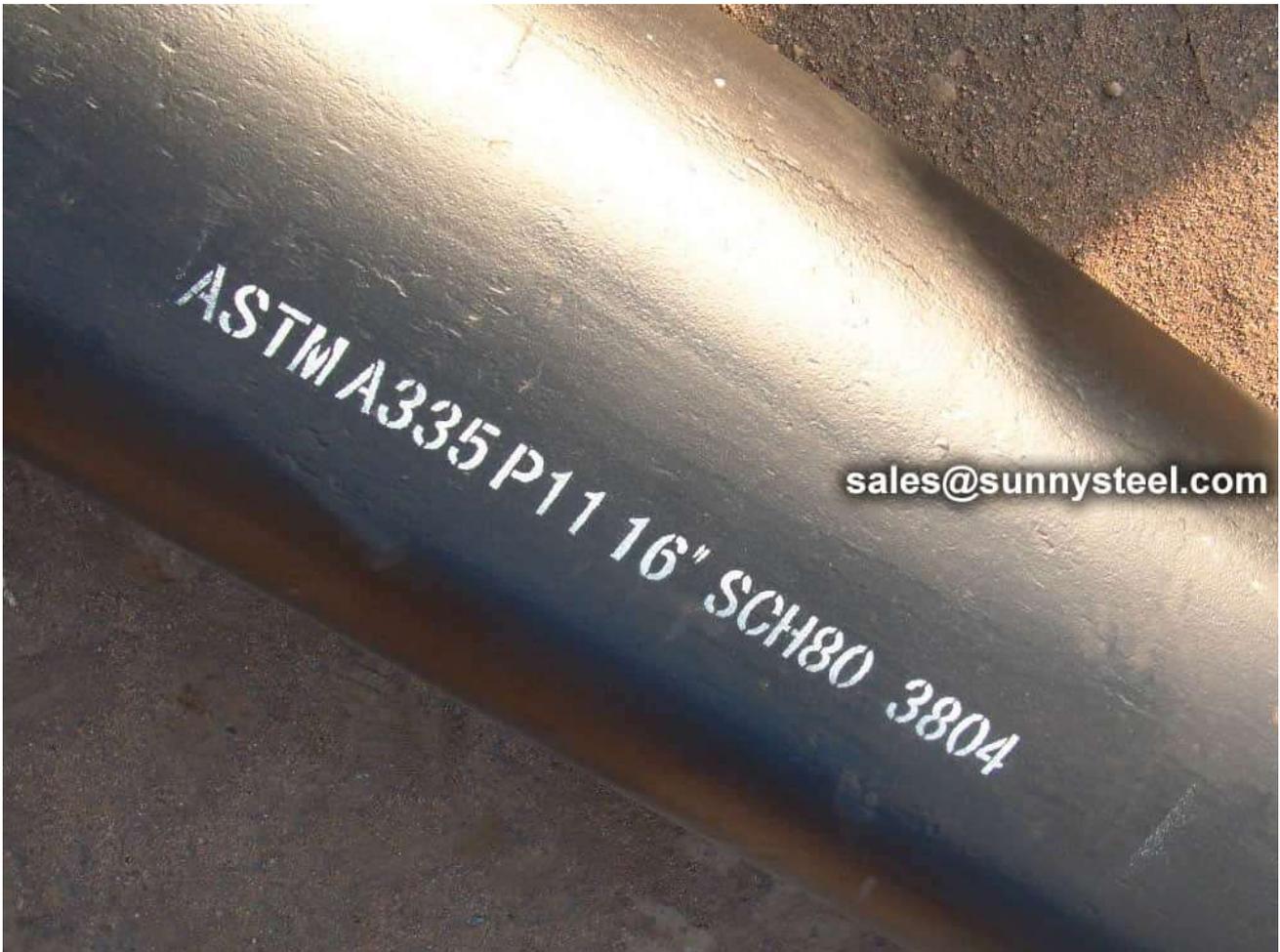
Recommended ASTM A335 alloy pipes/tubes as below:

**ASTM A335 P9 alloy pipe**



The range of ASTM A335 P9 seamless alloy steel pipe sizes that may be examined by each method shall be subjected...

ASTM A335 P11 alloy pipe 



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ASTM A335 P11 is the part of ASTM A335, the pipe shall be suitable for bending, flanging, and similar forming operations, and for fusion welding.

元素	最小	%	最大	+/- [%]
Fe	94.000	97.778	100	0.232
Cr	1.000	1.161	1.500	0.029
Mo	0.440	0.458	0.650	0.012
Mn	0.300	0.436	0.600	0.030
Ni		0.058		0.020
Cu		0.036		0.012
Ti		0.034		0.023
Pb		0.027		0.021
W		0.012		0.010

元素	最小	%	最大	+/- [%]
Fe	94.000	97.932	100	0.231
Cr	1.000	1.145	1.500	0.029
Mo	0.440	0.444	0.650	0.012
Mn	0.300	0.493	0.600	0.030
Cu		0.040		0.013
Ti		0.034		0.023

A335 P22 alloy pipe 



ASTM A335 P22 is the part of ASTM A335, the pipe shall be suitable for bending, flanging, and similar forming operations, and for fusion welding.

**A335 P91 alloy pipe** 🔥



ASTM A335 P91 is the part of ASTM A335, the pipe shall be suitable for bending, flanging...

**ASTM A335 P92 alloy pipes**



ASTM A335 P92 pipe shall be suitable for bending, flanging, and similar forming operations, and for fusion welding.

**A335 P5 High pressure pipes**



The range of ASTM A335 P5 pipe sizes that may be examined by each method shall be subjected to...

**Heat Treatment**

A / N+T

N+T / Q+T

N+T

**Material & Manufacture**

Pipe may be either hot finished or cold drawn with the finishing heat treatment noted below.

**Heat Treatment Requirements**

**ASTM A335 Chrome Moly Pipe**



Grade	Heat Treatment Type P5, P9, P11, and P22	Normalizing Temperature Range F [C]	Subcritical Annealing or Tempering Temperature Range F [C]
A335 P5 (b, c)	Full or Isothermal Anneal		
	Normalize and Temper	*****	1250 [675]
	Subcritical Anneal (P5c only)	*****	1325 - 1375 [715 - 745]
A335 P9	Full or Isothermal Anneal		
	Normalize and Temper	*****	1250 [675]
A335 P11	Full or Isothermal Anneal		
	Normalize and Temper	*****	1200 [650]
A335 P22	Full or Isothermal Anneal		
	Normalize and Temper	*****	1250 [675]
A335 P91	Normalize and Temper	1900-1975 [1040 - 1080]	1350-1470 [730 - 800]
	Quench and Temper	1900-1975 [1040 - 1080]	1350-1470 [730 - 800]

### Permissible Variation in Wall Thickness

NPS [DN] Designator	Tolerance, % from Specified		
		Over	Under
1/8 to 2 1/2 [6 to 65] incl., all t/D ratios		20.0%	12.5%
Above 2 1/2 [65], t/D < or = 5%		22.5%	12.5%
Above 2 1/2 [65], t/D > 5%		15.0%	12.5%

(t = Specified Wall Thickness; D = Specified Outside Diameter)

### Elongation Requirements

Calculated Minimum Elongation Values				
Elongation in 2 in. or 50 mm, min %				
Wall Thickness		P5, P9, P11, P22		P91
in.	mm	Longitudinal	Transverse	Longitudinal
5/16 (0.312)	8	30	20	20
9/32 (0.281)	7.2	28	19	19
1/4 (0.250)	6.4	27	18	18
7/32 (0.219)	5.6	26		17
3/16 (0.188)	4.8	24		16
5/32 (0.156)	4	22		15
7/8 (0.125)	3.2	21		14
3/32 (0.094)	2.4	20		13
1/18 (0.062)	1.6	18		12

## Permissible Variations in Outside Diameter

Outside Diameter at any point shall not vary from standard specified more than:

NPS [DN] Designator	Over		Under	
	in.	mm	in.	mm
1/8 to 1 1/2 [6 to 40], incl.	1/64 (0.015)	0.40	1/64 (0.015)	0.40
Over 1 1/2 to 4 [40 to 100], incl.	1/32 (0.031)	0.79	1/32 (0.031)	0.79
Over 4 to 8 [100 to 200], incl.	1/16 (0.062)	1.59	1/32 (0.031)	0.79
Over 8 to 12 [200 to 300], incl.	3/32 (0.093)	2.38	1/32 (0.031)	0.79
Over 12 [300]	+/- 1% of the specified outside diameter			

## Ordering Information

**ASTM A335 Chrome Moly Pipe**

Orders for material under this specification should include the following, as required, to describe the desired material adequately:

Quantity	Feet, meters, or number of lengths
Name of material	Seamless Alloy Steel Pipe
Grade	P5, P9, P11, P22, P91
Manufacturer	Hot-finished or cold-drawn
Size using one of the following:	
NPS and Schedule Number	
Outside Diameter and Nominal Wall Thickness	
Outside Diameter and Minimum Wall Thickness	
Inside Diameter and Nominal Wall Thickness	
Inside Diameter and Minimum Wall Thickness	
Length	Specific or Random
End Finish	

## Mechanical Tests Specified

Transverse or Longitudinal Tension Test and Flattening Test, Hardness Test, or Bend Test

For material heat treated in a batch-type furnace, tests shall be made on 5% of the pipe from each treated lot. For small lots, at least one pipe shall be tested.

For material heat treated by the continuous process, tests shall be made on a sufficient number of pipe to constitute 5% of the lot, but in no case less than 2 pipe.

Notes for Hardness Test:

P91 shall not have a hardness not exceeding 250 HB/265 HV [25HRC].

Notes for Bend Test:

For pipe whose diameter exceeds NPS 25 and whose diameter to wall thickness ratio is 7.0 or less shall be subjected to the bend test instead of the flattening test.

Other pipe whose diameter equals or exceeds NPS 10 may be given the bend test in place of the flattening test subject to the approval of the purchaser.

The bend test specimens shall be bent at room temperature through 180 without cracking on the outside of the bent portion.

## Hydrostatic Test

The inside diameter of the bend shall be 1 inch [25 mm].

Each length of pipe shall be Hydro tested, at option of manufacture nondestructive electric testing can be used.

## Referenced Documents

- A999/A999M Specification for General Requirements for Alloy and Stainless Steel Pipe
- E213 Practice for Ultrasonic Examination of Metal Pipe and Tubing
- E309 Practice for Eddy-Current Examination of Steel Tubular Products Using Magnetic Saturation
- E381 Method of Macroetch Testing Steel Bars, Billets, Blooms, and Forgings
- E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)
- E570 Practice for Flux Leakage Examination of Ferromagnetic Steel Tubular Products
- B36.10M Welded and Seamless Wrought Steel Pipe
- SAE J 1086 Practice for Numbering Metals and Alloys (UNS)
- SNT-TC-1A Recommended Practice for Nondestructive Personnel Qualification and Certification

## Get in Touch

If you are interested in our products or cooperating with us, even having a comment or a suggestion please contact us now, for more detailed information.

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