

# ASTM A333 Grade 6 Seamless Pipe Specification

## ASTM A333 Grade 6 Low Temperature Carbon Steel Seamless Pipe

ASTM A333 Grade 6 seamless pipe is a low temperature carbon steel pipe designed for pressure piping systems operating at sub-zero temperatures. It is widely used in LNG, LPG, cryogenic service, gas processing, and low-temperature pressure piping systems.

ASTM A333 Grade 6 is the most commonly specified grade under ASTM A333 and is equivalent to ASME SA333 Grade 6.

Keywords: ASTM A333 Grade 6, ASME SA333 Grade 6, low temperature seamless pipe, carbon steel cryogenic pipe

## ASTM A333 / ASME SA333 Standard Introduction

ASTM A333 / ASME SA333 covers seamless and welded carbon and alloy steel pipes intended for low-temperature service. The standard specifies requirements for chemical composition, mechanical properties, heat treatment, impact testing, and dimensional tolerances to ensure adequate notch toughness at low temperatures.

Grade 6 is the most widely used carbon steel grade for low-temperature pressure piping applications.

## ASTM A333 Grade 6 Material Description

ASTM A333 Grade 6 is a low temperature carbon steel specifically developed to maintain impact toughness at temperatures as low as  $-45^{\circ}\text{C}$  ( $-50^{\circ}\text{F}$ ) or lower, depending on project requirements.

Compared with standard carbon steel pipes such as ASTM A106, A333 Grade 6 provides improved low-temperature impact toughness, reduced risk of brittle fracture, and reliable performance in cold and cryogenic environments.

## Chemical Composition of ASTM A333 Grade 6 (Typical, wt.%)

Element	Requirement
Carbon (C)	0.30 max
Manganese (Mn)	0.29 – 1.06
Phosphorus (P)	0.025 max
Sulfur (S)	0.025 max
Silicon (Si)	0.10 min

## Mechanical Properties of ASTM A333 Grade 6 (Typical)

Property	Minimum Requirement
Tensile Strength	$\geq 415$ MPa
Yield Strength	$\geq 240$ MPa
Elongation	$\geq 30$ %

## Heat Treatment Requirements

ASTM A333 Grade 6 seamless pipes shall be supplied in the normalized or normalized and tempered condition. Heat treatment is mandatory to ensure adequate low-temperature impact toughness.

## Low Temperature Impact Testing

ASTM A333 Grade 6 pipes are subject to Charpy V-Notch impact testing. Typical impact test temperature is  $-45^{\circ}\text{C}$  ( $-50^{\circ}\text{F}$ ), unless otherwise specified.

## ASTM A333 Grade 6 Seamless Pipe Size Range

Outside Diameter: 1/8" NB – 24" NB

Wall Thickness: SCH 10 / SCH 20 / SCH 40 / STD / XS / SCH 80 / SCH 160

Manufacturing Process: Seamless (hot finished or cold drawn)

Length: Random length or fixed length

## Dimensional Tolerances

Dimensional tolerances for ASTM A333 Grade 6 seamless pipes generally follow ASME B36.10 and ASTM pipe tolerance requirements, unless otherwise specified in the purchase order.

## Typical Applications of ASTM A333 Grade 6 Pipes

LNG and LPG processing plants, cryogenic pipelines, gas processing facilities, low-temperature pressure piping systems, petrochemical and energy projects.

## Inspection and Testing Requirements

Chemical composition analysis, tensile and mechanical testing, low-temperature impact testing (Charpy V-Notch), hydrostatic test or non-destructive electric test, and dimensional and visual inspection are performed according to ASTM A333.

## Certification and Documentation

EN 10204 3.1 Mill Test Certificate (MTC), Manufacturer Test Report (MTR), third-party inspection (SGS / BV / TUV), and Certificate of Origin (CO) can be provided.

## ASTM A333 Grade 6 vs Other Low Temperature Grades (Overview)

Grade 6 is the most commonly used carbon steel grade for low-temperature service. Grade 3 and Grade 4 have lower strength and are less common, while Grade 7 and Grade 9 are alloy steel grades with improved low-temperature properties. Material selection should always consider design temperature, pressure, and applicable codes.