



## WHITEPAPER

WHITEPAPER: ASTM vs ASME - Understanding the relationship between the two

### **What is the difference between the two material standards - ASTM and ASME?**

**There are numerous metals and alloys in the market today and no shortage of classification or standards to warehouse them.<sup>i</sup> This article focuses on two of them- ASTM<sup>ii</sup> and ASME<sup>iii</sup>.**

In the metals industry it is important to understand the interplay between ASTM and ASME specifications because the risk of supplying, fabricating and/or installing incorrect material may be extremely significant.

There are similarities and differences to discuss, but first and foremost let's start with the most important concept – suppliers and manufactures must always follow the designated requirements & specifications invoked for a specified line item or order.

For over a century ASTM and ASME have cooperated with each other in the preparation of material specifications. Often the ASTM and ASME material specifications are the same and the materials may reflect this fact with a dual ASTM and ASME specification. This cooperation is often referred to as "joint action". Basically ASTM creates the material specifications and standard test methods to determine compliance. ASME selects those ASTM materials which will perform adequately in boiler or pressure vessel service and accepts them with stated limitations. For example - we don't make power boilers from copper tubing or paper mache!

Be particularly aware that while most of the ASTM and ASME material specs are nearly identical, there are many ASTM materials that are not acceptable for ASME Code construction.

One example of similar specifications is ASTM A335 and ASME SA-335 Chrome Alloy pipe. When the specifications are basically the same and have been accepted for use by the ASME Committee, it assigns the prefix S followed by the ASTM designation; for example ASTM A335 and ASME SA-335 are similar. It is possible for the material to be produced in compliance with both specifications and thus it may reflect a dual ASTM and ASME

specification on the material and on the certifications such as ASTM/ASME A/SA335 P11.

So how can one tell if there is not a similar ASME specification to an ASTM specification? The answer is to consult the ASME Code Section II of the Edition year referenced in the design standard. To assist in this understanding, further down in this article we have the list of the common ASME materials specs and the corresponding ASTM revision; including exceptions, corrections, and clarifications.

ASTM materials are developed for a variety of uses, including use in *non-pressurized equipment* services such as machinery and equipment. ASTM is not a code, but rather it issues properties of materials through its standards which means that these are not intended as specification design values for use within ASME Code applications. The A prefix in an ASTM specification indicates Ferrous material; the B prefix indicates a Non Ferrous material. The ASTM standards are the most widely used in the United States for steel products. Many ASTM standards have been adopted or extensively recognized and required in many overseas, federal, state, local, municipal and foreign government projects.

ASME material specifications are usually developed and specified for use in the fabrication of *pressurized equipment service* such as tanks, pressure vessels, boilers, heat exchangers, pipe, fittings, piping spools, large liquid, oil and gas storage containers. If you are designing a Section VIII pressure vessel, for example, you should make sure to investigate the ASME standards as well.

As of today all 50 of the United States and all provinces of Canada have adopted, by law, either partially or in its entirety, the ASME Boiler & Pressure Vessel Code (B&PVC) and legally require it when building power plants and boilers, just to name a few constructions. The Code is also widely accepted across the globe currently in over 100 countries.

For the most common products that Tioga supplies, the following list shows those revisions of ASTM specifications for pipe and tube that have been adopted by the 2015 Edition of the ASME Code; including the exceptions, clarifications, and deletions.

**SA-53:** Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless (Identical with ASTM Specification A53/A53M<sup>iv</sup>-01 except for the insertion of test practices in 11.1.1, and editorial correction to Table X4.1.)

**SA-106:** Seamless Carbon Steel Pipe for High-Temp Service (Identical with ASTM Specification A106/A106M-08.)

**SA-213:** Specification for Seamless Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat-Exchanger Tubes (Identical with ASTM Specification A213/A213M-08 except for the additional H grade heat treatment requirements in 6.2 and revision to para. 6.2.2 to include S30432.)

**SA-312/SA-312M:** Seamless and Welded Austenitic Stainless Steel Pipe (Identical with ASTM Specification A312/A312M-13b except for the deletion of 5.2, revision to 6.2 to add "H" grade heat treatment requirements and editorial corrections to the nickel content of UNS S30451 and to the chemistry of UNS S31035 in Table 1.)

**SA-333/SA-333M:** Seamless and Welded Steel Pipe for Low-Temp Service (Identical with ASTM Specification A333/A333M-04a except for the deletion of 12.3 that conflicts with 15.)

**SA-335/SA-335M:** Seamless Ferritic Alloy-Steel Pipe for High-Temp Service (Identical with ASTM Specification A335/A335M-06 except for the addition of hardness requirements for P23 and P911 in 9.3 and 14.2.1, and the correction of the UNS numbers for P9 and P91.)

**SA-376/SA-376M:** Seamless Austenitic Steel Pipe for High-Temp Central-Station Service (Identical with ASTM Specification A376/A376M-06 except for the deletion of HT-O option from 6.2 and 14.1 and clarification of heat treatment requirements in 6.2.)

**SA-691:** Carbon and Alloy Steel Pipe, Electric-Fusion-Welded for High-Pressure Service at High Temperatures (Identical with ASTM Specification A691-98(R02) except that the following additional requirements apply.)

For the most common products in fittings, flanges & forgings, Tioga supplies the following list of ASTM specifications that have been adopted by the 2015 Edition of the ASME Code; including the exceptions, clarifications, and deletions.

**SA-105/SA-105M:** Carbon Steel Forgings, for Piping Applications (Identical with ASTM Specification A105/A105M-05.)

**SA-182/SA-182M:** Forged or Rolled Alloy Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temp Service (Identical with ASTM Specification A182/A182M-14a except for the inclusion of Grade F316Ti in 7.3.1, and the removal of reduced strength levels for Grade F53 in Table 3.)

**SA-234/SA-234M:** Piping Fittings of Wrought Carbon Steel and Alloy for Moderate and Elevated Temperatures (Identical with ASTM Specification A234/A234M-07.)

**SA-350/SA-350M:** Forgings, Carbon and Low-Alloy Steel, Requiring Notch Toughness Testing for Piping Components (Identical with ASTM Specification A350/A350M-02b except for the deletion of 6.1.2 and 14.1, revision to 14.2.5, and test reports have been made mandatory.)

**SA-403/SA-403M:** Wrought Austenitic Stainless Steel Piping Fittings (Identical with ASTM Specification A403/A403M-07 except for the correction of Table 2 Ni minimum for Grade S38815, the deletion of 5.14 and 5.15,

clarified heat treatment requirements in 6.1 (Grade S33228) and 6.4, and the deletion of 304/304L/304N in 14.5.).

At Tioga a deep dive into your requirements is what we love to do. To contact a Tioga sales representative call 800-523-3678 or [sales@tiogapipe.com](mailto:sales@tiogapipe.com) or for a specific location go to <http://goo.gl/PboZNp>.

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<sup>i</sup> The most common industry standards are: ASTM- American Society for Testing and Materials, ASME- American Society of Mechanical Engineers, AISI- American Iron and Steel Institute, API- American Petroleum Institute Steel, U.S. Military- Mil, & ANSI- American National Standards Institute & UNS- Unified Numbering System for Metals and Alloys, JIS- Japanese Industrial Standard, EN- (European Nation Standards), DIN- Deutsche Industrie Norm & BS- British Standards

<sup>ii</sup> ASTM was founded started in the late 1800's and its abbreviation stands for the American Society for Testing and Materials. In 2001, the organization changed its name to ASTM International.

<sup>iii</sup> American Society of Mechanical Engineers

<sup>iv</sup> The M stands for Metric

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