

FACT SHEET

ACCEPTABLE PIPING - SCHEDULE 10-40 STEEL PIPE rev.9-5-17



American Gas Association

This American Gas Association (AGA) fact sheet provides an overview of the requirements for Schedules (Sch) 10 to 40 steel pipe based on ANSI Z223.1/NFPA 54, *National Fuel Gas Code - 2018* (NFGC). The requirements in local jurisdictions or in specific situations, may differ.

This fact sheet is not intended to replace knowledge of applicable local and national codes or address specific situations. The user should consult a competent professional and be thoroughly familiar with all applicable local codes.

ACCEPTABLE GAS PIPING MATERIALS

In the NFGC, Chapter 5 lists all the piping materials that are appropriate for the safe conveyance of the fuel gases. The NFGC provides references to the appropriate material standard, product standard, or other standards, as determined by the ANSI Accredited Standard Committee Z223/NFPA 54, to be acceptable. Where a piping material is not covered in Chapter 5 its use is to be determined by the local authority having jurisdiction under the Code's Section 1.4, Equivalency.

ACCEPTABLE SCHEDULE 10 to 40 STEEL PIPE

Section 5.6, *Acceptable Piping Materials and Joining Methods*, lists the acceptable standards for Sch 10 to 40 steel and wrought-iron pipe as follows:

5.6.2.2 Steel, Stainless Steel, and Wrought-Iron. Steel, Stainless Steel, and wrought-iron pipe shall be at least Schedule 10 and shall comply with the dimensional standards of ANSI/ASME B36.10M, *Welded and Seamless Wrought Steel Pipe*, and one of the following:

- (1) ASTM A53, *Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless*
- (2) ASTM A106, *Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service*
- (4) ASTM A312, *Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes*.

The standard ANSI/ASME B36.10M contains a long table of the dimensional characteristics¹ of pipe from diameters 1/8 in. to 80 in. and the assigned schedule designation number².

The three ASTM standards specify the steel chemical composition, the methods of manufacturing, workmanship, labeling, sampling, and testing. Both also have a section³ on certification that require certification information be provided to the purchaser upon request. For ANSI/ASTM A53 the

standard states, *"The manufacturer or supplier shall, upon request, furnish to the purchaser a certificate of compliance stating that the material has been manufactured, sampled, tested, and inspected in accordance with this specification (including year-date), and has been found to meet the requirements."*

Steel pipe products meeting ANSI/ASTM A53 are commonly referred to as "black pipe," "black iron," and "black steel." For all pipe diameters below 10", Sch 40 pipe is identical to what is called "standard" pipe. Steel pipe meeting ANSI/ASTM A53 is the most commonly installed type of steel pipe used for fuel gas service.

CODE HISTORY OF ACCEPTABILITY

The first AGA post World War II ANSI⁴ Standard to specify a standard for acceptable gas piping was ASA Z21.30, 1950, *Installation of Gas Piping and Gas Appliances in Building*. The standard stated⁵ "Gas piping in buildings shall be wrought iron or steel pipe complying with the American Standard for Wrought Iron and Wrought Steel Pipe, A.S.A. B36.10-1939." A.S.A. B36.10 is a dimensional standard and does not specify the material's chemical composition.

The first *National Fuel Gas Code*, ANSI Z223.1/NFPA 54 – 1974, stated⁶ "Metallic gas pipe shall be steel or wrought-iron pipe complying with American National Standard for Wrought-Steel and Wrought-Iron Pipe, B36.10-1970."

It was only with the publication of the second edition of the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54 – 1980, that the material standards ASTM A53 and ASTM A106 were referenced⁷.

None of these historical Codes required that Sch 40 steel pipe be third-party tested or certified. The current 2018 Edition of Z223.1/NFPA 54 does not require third-party testing or certification of these products.

PIPE SAFETY FACTOR

Sch 40 steel pipe has been used to distribute fuel gas within buildings for over 100 years. The material is robust and has sufficient wall thickness to accommodate field cut threads using readily available tools. Gas distribution systems using Sch 40 steel pipe typically consist of pipe lengths connected by threaded fittings.

¹ Outside diameter, wall thickness, and weight (lb/ft)

² Not all combinations of pipe diameters and wall thicknesses have a schedule number designation

³ Section 20 in ASTM A54; Section 24 in ASTM A106.

⁴ Originally named American Standards Association (A.S.A.)

⁵ Section 2.5.1

⁶ Section 1.2.6.1 (a)

⁷ Section 2.6.2 b.

Typical working pressure for plain end (non-threaded) Sch 40 steel pipe at normal atmospheric temperatures manufactured per ASME B36.10M and ASTM A53 are above 200 psig for pipe diameters ½ in. and greater. A reduction factor of 25% is often applied where screwed fittings are utilized to account for the pipe's thinner pipe wall at exposed threads. The working pressure of a threaded gas piping system would therefore be appropriately 150 psig. Common residential and commercial in-house gas pressures range from ¼ psig (7 in. w.c.) to 2 psig (55 in. w.c.). A Sch. 40 steel threaded piping system carrying 2 psig gas pressure would have a safety factor of 75.

Sch 10 steel pipe is not permitted to use threaded connections and its working pressure utilizing allowed joining methods would be similar to threaded Sch 40 pipe.

THIRD-PARTY TESTING/CERTIFICATION

The *International Fuel Gas Code* (IFGC) and the *ANSI Uniform Plumbing Code* (UPC) both contain fuel gas piping requirements and are adopted by many jurisdictions as their fuel gas code. The IFGC and UPC's 2015 Editions⁸ both currently require that all piping, including Sch 40 steel, be third-party tested or certified. Both model codes have strived to require that all products and materials be "listed", where a product standard exists, to help ensure safe installations. The need for third-party listing of Sch 40 steel pipe is a relatively recent requirement⁹ in both codes.

AGA supports the third-party testing/certification system utilized in the U.S. and recognizes its importance to help ensure safe fuel gas installations. However, AGA has determined that third-party testing or certification of Sch 10 to 40 steel pipe is unjustified, given the material's inherent high safety factor, its long historical use (Sch 40), building trade and code official familiarity, and the lack credible evidence of material failures. As required by the ASTM A53 standard, evidence of material compliance is required to be provided upon request from the steel pipe manufacturer or supplier.

AGA was successful in having the International Fuel Gas Code Committee and the ICC membership approve a revision to eliminate third-party testing/certification of Sch. 10 to 40 steel pipe for fuel gas service for the 2018 Edition. AGA will continue to work to revise the UPC to eliminate its requirement.

SCH 40 PIPE STANDARD SCOPES

The following partial scopes are extracted from the three referenced standards. The full scopes can be found on the ASME and ASTM websites:

ASME B36.10M

This Standard covers the standardization of dimensions of welded and seamless wrought steel pipe for high or low temperatures and pressures.

ASTM A53

1.1 This specification covers seamless and welded black and hot-dipped galvanized steel pipe in NPS 1/8 to NPS 26 [DN 6 to DN 650] (Note 1), inclusive, with nominal wall thickness (Note 2) as given in Table X2.2 and Table X2.3. It shall be permissible to furnish pipe having other dimensions provided that such pipe complies with all other requirements of this specification. Supplementary requirements of an optional nature are provided and shall apply only when specified by the purchaser.

1.3 Pipe ordered under this specification is intended for mechanical and pressure applications and is also acceptable for ordinary uses in steam, water, gas, and air lines. It is suitable for welding, and suitable for forming operations involving coiling, bending, and flanging, subject to the following qualifications:

ASTM A106

1.1 This specification covers seamless carbon steel pipe for high-temperature service (Note 1) in NPS 1/8 to NPS 48 [DN 6 to DN 1200] (Note 2) inclusive, with nominal (average) wall thickness as given in ASME B 36.10M. It shall be permissible to furnish pipe having other dimensions provided such pipe complies with all other requirements of this specification. 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.

⁸ IFGC Section 401.10; UPC Section 301.2

⁹ IFGC 2012 Edition; UPC 2003 Edition