

ASME B31.1 Power Piping Code (2020) Compliance

Vic-Press® for Schedule 10S



APPROVALS/LISTINGS



See Victaulic Publication [10.01](#) for more details.

The American Society of Mechanical Engineers (ASME) established the B31 Pressure Piping Code Committees to promote safety in pressure piping design and construction through published engineering criteria. The basic consideration of the Codes is safety; however, the Codes are not designed to replace competent engineering design or judgement. Most importantly, the Codes do not "approve", "rate", or "endorse" any items of construction; proprietary devices, or activity. The Codes do not put a limit on conservatism and, conversely, the Codes also allow for designs that are capable of more rigorous engineering analysis which justifies less conservative designs. A final point of importance is that the Codes strive to keep abreast of all current technologies regarding improvements to materials, fabrication, and any other new developments in the piping industry.

The Victaulic Vic-Press® for Schedule 10S systems are acceptable for use on ASME B31.1 Power Piping Code applications. Stainless steel pipe conforming to ASTM A-312 (Types 304/304L and Types 316/316L) are permitted by the ASME B31.1 in Table 126.1 as an acceptable piping material. Vic-Press for Schedule 10S fittings are constructed from A-312, Type 304 or Type 316 Stainless Steel making the material a code listed material. Victaulic also recommends the use of ASTM A-312 Schedule 10S stainless steel pipe (Types 304, 304L, 316 or 316L) with the Vic-Press for Schedule 10S systems.

ASME B31.1 permits the use of mechanical joints as a method for joining pipe. The Vic-Press for Schedule 10S system may be qualified for use based upon Paragraph **104.7 Other Pressure Containing Components**, which states:

104.7.2 Specially Designed Components:

The pressure design of components not covered by the standards listed in Table 126.1-1 or for which design formulas and procedures are not given in this Code shall be based on calculations consistent with the design criteria of this Code. These calculations shall be substantiated by one or more of the means stated in A, B, C, and D.

- A. Extensive, successful service experience under comparable conditions with similarly proportioned components of the same or similar material
- B. Experimental stress analysis, such as described in ASME BPVC, Section VIII, Division 2, Annex 5-F
- C. Proof test in accordance with ASME B16.9; MSS SP-97; or ASME BPVC, Section I, A-22
- D. Detailed stress analysis, such as finite element method, in accordance with ASME BPVC, Section VIII, Division 2, Part 5, except that the basic material allowable stress from the Allowable Stress Tables of Mandatory Appendix A shall be used in place of Sm

For any of (a) through (d), it is permissible to interpolate between sizes, wall thicknesses, and pressure classes and to determine analogies among related materials.

Calculations and documentation showing compliance with this paragraph shall be available for the owner's approval and, for boiler external piping, they shall be available for the Authorized Inspector's review.

ALWAYS REFER TO ANY NOTIFICATIONS AT THE END OF THIS DOCUMENT REGARDING PRODUCT INSTALLATION, MAINTENANCE OR SUPPORT.

System No.		Location	
Submitted By		Date	

Spec Section		Paragraph	
Approved		Date	

The calculations referenced in Paragraph 104.7.2 show that Victaulic Vic-Press for Schedule 10S stainless steel fittings and Schedule 10S stainless steel pipe compliant with ASTM A-312 may be used on ASME B31.1 applications in excess of the 500psi (34.5 Bar), the working pressure limit established by Victaulic for Vic-Press for Schedule 10S systems. The ASME B31.1, Paragraph 104.1.2(A) calculations show that the maximum calculated pressure rating for Schedule 10S ASTM A-312, Type 316L, and Type 304L stainless steel pipe is in excess of our 500psi (34.5 Bar) maximum joint rating. (Type 316 and Type 304 stainless steel pipe would have slightly higher maximum design pressures due to a higher maximum allowable material stress per ASME B31.1). Therefore, the Victaulic established 500psi (34.5 Bar) maximum recommended pressure rating is within the design requirements of ASME B31.1. (Note: The stress level at 300°F was chosen as it is the upper limit of the VicPress for Schedule 10S highest temperature seal material.)

Using Equation (9) in Paragraph **104.1.2 Straight Pipe Under Internal Pressure – Seamless, Longitudinal Welded, or Spiral Welded and Operating Below the Creep Range:**

$$P = [2SE(tm - A)] \div [Do - 2y(tm - A)]$$

Where:

P = Maximum Design Pressure

SE = 10,800 psi (Maximum Allowable Material Stress at 300°F for

ASTM A312 Type 304L/316L Pipe) (Table A-3)

tm = Minimum Pipe Wall Thickness

Do = Nominal Pipe Outside Diameter

y = 0.4 (per Table 104.1.2(A))

A = 0 (for plain end pipe)

The Maximum Design Pressures for ASTM A312 Type 304L/316L

Schedule 10 Stainless Steel pipe are:

$\frac{1}{2}$ " = 1971 psi (136 Bar)

$\frac{3}{4}$ " = 1577 psi (109 Bar)

1" = 1710 psi (118 Bar)

1 $\frac{1}{2}$ " = 1080 psi (74 Bar)

2" = 892 psi (61 Bar)

(See Appendix A for the calculations.)

Victaulic substantiates the calculations of Paragraph 104.7.2 by following the requirements of both paragraphs A (extensive experience) and C (proof testing)

Victaulic introduced the technology of Press mechanical pipe joining systems to North America in 1991 with its Pressfit System. Press joining technology was invented in the late 1950's and was first used commercially in Europe during the early 1960's. The Victaulic Pressfit System was a time proven reliable pipe joining solution that became a standard method for joining small bore water and gaseous utility piping. The earlier Victaulic Pressfit System technology used schedule 5 carbon and stainless steel pipe and fittings with working pressures up to 300psi (21 Bar). The introduction of Vic-Press for Schedule 10S stainless steel system has built upon the years of experience and created a more robust product with more commercially available pipe, resulting in improved performance. The 500psi (34.5 Bar) Vic-Press for Schedule 10S working pressure was established through extensive testing of all sizes and configurations and based on safety factors consistent with standard industry practice.

Victaulic has also completed hydrostatic burst pressure testing on Vic-Press for Schedule 10S fittings in accordance with the aforementioned paragraph 104.7.2(C). ASME Boiler and Pressure Vessel code, Section 1, A-22 (A-22.6.3 Bursting Tests) was used to validate published pressure ratings in accordance with the ASME B31.1 maximum allowable working pressure using the formula A-22.6.3.2.1:

$$P = (B \div 4) \times (S \div Sa)$$

Where:

P = Maximum allowable working pressure

B = Bursting test pressure

S = Specified minimum tensile strength (75,000psi)

Sa = Average actual tensile strength of test specimens

(Actual pressure test data is maintained under file and is available for viewing. Please contact your local Victaulic representatives for details.)

In addition to the above methods of qualification, Paragraph **118 SLEEVE COUPLED AND OTHER PROPRIETARY JOINTS** states:

"Coupling type, mechanical gland type, and other proprietary joints may be used where experience or tests have demonstrated that the joint is safe for the operating conditions, and where adequate provision is made to prevent separation of the joint." The press region of an installed Vic-Press for Schedule 10S joint provides a mechanical interlock that prevents separation and the aforementioned experience and testing validate "the joint is safe for the operating conditions", when used within Vic-Press for Schedule 10S system published recommendations.

The conformance of the Vic-Press for Schedule 10S systems to the B31.1 Power Piping Code should also be reviewed by the piping system designer for the type of B31.1 application. Victaulic Vic-Press for Schedule 10S products will be acceptable on B31.1 applications that are within the scope of the Victaulic published performance limitations.

Services such as hot and cold fluids and compressed air and other gases are permitted provided that the system temperature is within published temperature ranges, and the system pressure is equal to or less than the published working pressure of the Vic-Press for Schedule 10S system (500psi/34.5 Bar).

Reference

[18.13: Vic-Press™ Qualification Tests Schedule 10S Type 304/304L and 316/316L Stainless Steel](#)

Appendix A - Calculations:

Pipe Calculations ASME B31.3 Paragraph 104.1.2 Equation #9	
$P = \frac{2SE(t_m - A)}{D_o - 2y(t_m - A)}$	
Where:	
SE =	10,800 psi Maximum Allowable Material Stress at 300°F for ASTM A312 Type 304L/316L Pipe) (Table A-3)
y =	0.4 (per Table 104.1.2(A))
A =	0 (for plain end pipe)
D _o =	Nominal Pipe Outside Diameter
½"	= 0.840"
¾"	= 1.050"
1"	= 1.315"
1 ½"	= 1.900"
2"	= 2.375"
t _m =	Minimum Wall Thickness
½"	= 0.083" - 12.5% = 0.073" (ASTM A-312)
¾"	= 0.083" - 12.5% = 0.073" (ASTM A-312)
1"	= 0.109" - 12.5% = 0.095" (ASTM A-312)
1 ½"	= 0.109" - 12.5% = 0.095" (ASTM A-312)
2"	= 0.109" - 12.5% = 0.095" (ASTM A-312)
½": P =	$\frac{2 \times 10,800 \text{ psi} \times 0.073"}{0.840" - 2 \times 0.4 \times 0.073"} = 1971 \text{ PSI}$
¾": P =	$\frac{2 \times 10,800 \text{ psi} \times 0.073"}{1.050" - 2 \times 0.4 \times 0.073"} = 1577 \text{ PSI}$
1": P =	$\frac{2 \times 10,800 \text{ psi} \times 0.095"}{1.315" - 2 \times 0.4 \times 0.095"} = 1710 \text{ PSI}$
1 ½": P =	$\frac{2 \times 10,800 \text{ psi} \times 0.095"}{1.900" - 2 \times 0.4 \times 0.095"} = 1140 \text{ PSI}$
2": P =	$\frac{2 \times 10,800 \text{ psi} \times 0.095"}{2.375" - 2 \times 0.4 \times 0.095"} = 892 \text{ PSI}$

User Responsibility for Product Selection and Suitability

Each user bears final responsibility for making a determination as to the suitability of Victaulic products for a particular end-use application, in accordance with industry standards and project specifications, as well as Victaulic performance, maintenance, safety, and warning instructions. Nothing in this or any other document, nor any verbal recommendation, advice, or opinion from any Victaulic employee, shall be deemed to alter, vary, supersede, or waive any provision of Victaulic Company's standard conditions of sale, installation guide, or this disclaimer.

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Note

This product shall be manufactured by Victaulic or to Victaulic specifications. All products to be installed in accordance with current Victaulic installation/assembly instructions. Victaulic reserves the right to change product specifications, designs and standard equipment without notice and without incurring obligations.

Installation

Reference should always be made to the Victaulic installation handbook or installation instructions of the product you are installing. Handbooks are included with each shipment of Victaulic products, providing complete installation and assembly data, and are available in PDF format on our website at www.victaulic.com.

Warranty

Refer to the Warranty section of the current Price List or contact Victaulic for details.

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