

**Equivalent Safety Evaluation for ASME B31.9 for Piping
 Not Associated with
 Pressure Vessel, Boilers, or Air Receivers
 (B31.9-2014)**

This evaluation of risk is per Chapter 17, Section EXIST-1 (Qualitative Risk greater than 3)

1. Applicable for B31.9 piping not including a pressure vessel, boiler, air receiver, or supporting piping.
2. This evaluation is for **new** pressure systems that allow workers to be in close proximity without additional shielding while the system is pressurized.
3. A list of reputable manufacturers will be maintained by Engineering Services.
4. The “Equivalent Safety Evaluation” in the table below or the original paragraph in B31.9 may be followed. The equivalency is intended to provide an equivalent level of personnel safety to B31.9, not code compliance.
5. Does not apply to safety class or safety significant pressure systems (see DOE O 420.1C).

B31.9 Paragraph	Equivalency Safety Evaluation (within the allowance of notes above this table)
Chapter I Scope and Definitions	
900 GENERAL	Use as written.
900.1 Scope	This equivalency may be used for all fluids within the scope of B31.9 except steam, steam condensate, and boiler external piping.
900.2 Terms and Definitions	In addition to 900.2 the following definitions also apply: Fully engaged: a bolt or stud shall at least be flush with exit of the nut or fastener. Listed: for the purposes of this equivalency, describes a material or component that conforms to a specification in at least one of the following: Table 926.1, Table I-1, Table I-2, Table I-3, Table I-4, or Table II-1.

Chapter II Design	
PART 1 CONDITIONS AND CRITERIA	
901 DESIGN CONDITIONS	
901.1	Use as written.
901.2	
901.3	
901.4	
901.5	Seismic supports shall accommodate thermal expansion and contraction.
901.6	Supports that are not fixed anchors (hangers) shall be used to accommodate thermal expansion or contraction.
902 DESIGN CRITERIA	
902.1	Use as written.
902.2.1	<p>Listed components shall be the first component selected for the application.</p> <p>Listed: for the purposes of this equivalency, describes a material or component that conforms to a specification in at least one of the following: Table 926.1, Table I-1, Table I-2, Table I-3, Table I-4, or Table II-1.</p> <p>Items listed in ASME B31.1 may also be used.</p> <p>Additional approved components are located in the file "Allowed Unlisted Components Listing per ADMIN-2, Article Z -- Unlisted, Specialty, or Unique Components, para 2 (xls)" on http://engstandards.lanl.gov/unlisted_components.shtml</p> <p>Unlisted components may be used as long as they are listed on the reputable manufacturer's list.</p> <p>A reputable manufacturers' listing will be maintained on the Engineering Services website.</p> <p>NOTE: Institutional Evaluation Suppliers List (IESL) is not necessarily a listing of reputable manufacturers.</p> <p>The Commercial Grade Designation (CGD) qualifies ML-3 & 4 equipment from non-IESL suppliers for use in ML-1 & 2 service, but does not qualify equipment for ASME B31.9 code equivalency to code concerns.</p> <p>Listing on a reputable manufacturer's list requires ratings that are acceptable for the service conditions of temperature, pressure, compatibility, for service and ratings.</p> <p>or</p> <p>Engineering calculations showing a factor of safety of 4:1 (this item would then be entered onto the reputable manufacturer's list as well).</p>

	Items being placed on this list need final approval by the CPSO or Designee.
902.2.2	Use as written.
902.2.3	Use as written.
902.2.4	Use as written.
902.3	Per design may consider other protective measures in order of precedence as follows: engineering controls (barriers, interlocks or controls), procedural controls (access control), and/or PPE with PSO review and approval.
902.4	Use as written.
PART 2 PRESSURE DESIGN OF PIPING COMPONENTS	
903 CRITERIA FOR PRESSURE DESIGN OF PIPING COMPONENTS	Use as written.
904 PRESSURE DESIGN OF COMPONENTS	
904.1 Straight Pipe	Use as written: Note: For $t \geq D/6$ or for $P/SE > 0.385$, calculation of pressure design thickness for straight pipe requires special consideration of factors such as theory of failure, effects of fatigue, and thermal stress. Alternative equations maybe required for heavy walls.
904.2 Curved and Mitered Segments of Pipe	Use as written.
904.3 Branch Connections	Use as written.
904.4 Closures	Use as written.
904.5 Pressure Design of Flanges and Blanks	Use as written.
904.6 Reducers	Use as written.
904.7 Pressure Design of Other Pressure Containing Components	
904.7.1	Use as written.
904.7.2	See 902.2.1.
PART 3 SELECTION AND LIMITATION OF COMPONENTS	
905 PIPE	Use as written.
906 FITTINGS, BENDS, AND INTERSECTIONS	Use as written, see 902.2.1 for additional information.
907 VALVES	

907.1 General 907.1.1 Listed Valves.	Use as written.
907.1.2 Unlisted Valves.	See 902.2.1.
907.2 Marking	Use as written, for reputable manufactured item the manufacturer's identification is acceptable.
908 FLANGES, BLANKS, GASKETS, AND BOLTING	Use as written; note: for gaskets 902.2.1 may also be used (also applies to all 908 items).
PART 4 SELECTION AND LIMITATION OF JOINTS	
910 PIPING JOINTS	Use as written.
911 WELDED JOINTS	Use as written.
912 FLANGED JOINTS	Use as written; Vacuum style flanges for example "ConFlat" CF or KF (QF) flanges may be used after qualification in accordance with this document.
913 MECHANICAL AND PROPRIETARY JOINTS	See 902.2.1. Note to 913.1: Do not use friction fittings with flammable liquids or flammable gases inside buildings.
914 THREADED JOINTS	Use as written.
915 FLARED, FLARELESS, AND COMPRESSION JOINTS	Use as written with the exception that items meeting 902.2.1 are allowed.
916 BELL AND SPIGOT JOINTS	Use as written.
917 BRAZED AND SOLDERED JOINTS	Solder use as written. Brazing shall be in accordance with ESM Chapter 13.
PART 5 EXPANSION, FLEXIBILITY, AND SUPPORT	
919 EXPANSION AND FLEXIBILITY	Paragraph is required to be evaluated and discounted or applied. Does not apply to pressure systems where thermal expansion is not an issue. When pressure systems are used at relatively constant temperature conditions (+/- 10 F), normally within buildings and labs, and ambient temperature is less than 120 degrees F this paragraph is not applicable.
920 LOADS ON PIPE-SUPPORTING ELEMENTS	Piping is not to be used to support equipment (not a piping component). Paragraph is required to be evaluated and discounted or applied. Piping supports may be in accordance with edited LANL Master Spec

	<p>Section 22 0529 for all Normal Fluid Service including pressures above 150 psig. Hangers used at elbows are to be of the supporting guide style not fixed rigid style; the piping supports must allow expansion and contraction of the piping system when required by 919 above.</p> <p>If additional support is required see 921.</p>
921 DESIGN OF PIPE-SUPPORTING ELEMENTS	<p>Use paragraph and subparagraphs as written except add the allowance from ASME B31.3 paragraph 321.1.2, "In general, the location and design of pipe supporting elements may be based on simple calculations and engineering judgment."</p>
PART 6 SYSTEMS	
922 DESIGN REQUIREMENTS PERTAINING TO SPECIFIC PIPING SYSTEMS	
922.1 Pressure Reducing Systems 922.1.1	<p>NOTE: Unlike ASME B31.3 there is no allowed accumulation over pressure of 10% above design pressure.</p> <p>Where pressure reducing valves are used, a relief device or safety valve shall be provided on the low-pressure side of the system. The relief or safety devices shall be located adjoining or as close as practicable to the reducing valve. The combined relieving capacity provided shall be such that the design pressure of the low-pressure system will not be exceeded if the reducing valve fails in the open position. The set point of the relief device shall be set a minimum of 10% less than the low pressure system design pressure so the relief device may function properly.</p> <p>Use as is.</p>
922.1.2 Alternative Systems	Do not apply paragraph 922.1.2.
922.1.3 Bypass Valves	Use as is.
922.1.4 Design of Valves and Relief Devices	Use as is.
922.2 Steam Trap Piping	Use as is.
922.3 Fuel Oil Piping	Use most applicable NFPA code for combustible or flammable liquids.
Chapter III Materials	
923 MATERIALS — GENERAL REQUIREMENTS	
923.1.1 Listed or Published Specifications	Use as is.
923.1.2 Materials Not Listed	Use as is and reference table 902.3.
923.1.3 Used Materials	Use as is.

923.1.4 Limitations on Unknown Materials	Use as is.
923.2 Limitations on Specific Metals	Use as is.
923.3 Limitations on Specific Nonmetals	Use as is.
923.4 Coatings and Linings	Use as is.
923.5 Deterioration in Service	Use as is.
Chapter IV Component Requirements and Standard Practices	
926 DIMENSIONS AND RATINGS OF COMPONENTS	
926.1 Standard Piping Components	Use Table 926.1 in accordance with 902.2.1 in this equivalency evaluation. Items listed in ASME B31.1 may also be used.
926.1.1 Boiler External Piping.	Use as is.
926.2 Standard Practices	Use as is. Other installation practices of approved unlisted components shall follow the manufacturer's instructions, for example Swagelok® or LOKRING™.
926.3 Nonstandard Piping Components	Use as is.
926.4 Abbreviations	Use as is.
Chapter V Fabrication, Assembly, and Erection	
927 WELDED FABRICATION OF METALS	
927.1 General	Welding shall be performed in accordance with the qualification requirements of ESM Chapter 13. Limitations on imperfections and acceptance standards are as stated in B31.9 Chapter VI or in the engineering design.
927.2 Materials	Materials shall be in accordance with ESM Chapter 13.
927.3 Preparation	Preparations shall be in accordance with ESM Chapter 13.
927.4 Rules for Welding	Use ASME B31.8 as written. Welding and Brazing shall be in accordance with ESM Chapter 13.
927.5 Qualification	Qualification shall be in accordance with ESM Chapter 13.

927.6 Qualification Requirements	Qualification Requirements shall be in accordance with ESM Chapter 13.
928 BRAZING AND SOLDERING OF METALS	
928.1 Brazing	Brazing shall be in accordance with ESM Chapter 13.
928.2 Soldering	Use as is.
929 BENDING	
929.1 General	Pipe may be bent to any radius by any hot or cold method that results in a crack free bend surface free of cracks and free of buckles. Cracks and creases in bends are not allowed. Such bends shall meet the design requirements of para. 904.2.1. This shall not prohibit the use of corrugated bends if specified in the engineering design.
930 FORMING	
931 HEAT TREATMENT	Use as is.
934 FABRICATION OF NONMETALS	Use as is.
935 ASSEMBLY	Use as is.
Chapter VI Inspection, Examination, and Testing	
936 INSPECTION AND EXAMINATION	Use as is.
937 LEAK TESTING	Use as is.