

ASME Sec VIII Division 1 vs ASME Sec VIII Division 2

Parameters	ASME Sec VIII-Division 1	ASME Sec VIII-Division 2
Design Approach	Division 1 is focused on a design-by-rule approach	Division 2 on design-by-analysis approach
Subsections	General, Construction Type & Material U, UG, UW, UF, UB, UCS, UNF, UCI, UCL, UCD, UHT, ULT	General, Material, Design, Fabrication and others AG, AM, AD, AF, AR, AI, AT, AS
Design Factor	Design Factor used is 3.5 on tensile and other yield and temperature considerations.	Design Factor of 3 (3.0 for Division 2, Class 1 and 2.4 for Division 2, Class 2) on tensile and other yield and temperature considerations.
Pressure Limit	Pressure typically up to 3000 psig.	Pressure usually 600 psig and larger (less than 10000 psi).
Design Rules	Membrane – Maximum stress Generally Elastic analysis. Very detailed design rules with Quality (joint efficiency) Factors. Little stress analysis required; pure membrane without consideration of discontinuities controlling stress concentration to a safety factor of 3.5 or higher	Maximum Shear stress theory is the basis for Shell of Revolution. Generally Elastic analysis Membrane + Bending. Fairly detailed design rules. In addition to the design rules, discontinuities, fatigue and other stress analysis considerations may be required unless exempted and guidance provided for in Appendix 4, 5 and 6
Design Calculations	Normal	requires more detailed calculations than Division 1
Failure theory of Design	Division 1 is based on normal stress theory	Division 2 is based on maximum distortion energy (Von Mises criteria)
Experimental Stress Analysis	Experimental methods of stress analysis are not required in normal case.	Experimental stress analysis is introduced and may be required
Material and Impact Testing	Few restrictions on materials; Impact required unless exempted; UG-20, UCS 66/67 provides extensive exemptions.	More restrictions on materials; impact required in general with similar rules as Division 1.

ASME Sec VIII Division 1 vs ASME Sec VIII Division 2

NDE Requirements	NDE requirements may be exempted through increased design factor	More stringent NDE requirements; extensive use of Radiographic Test, Ultrasonic Test, Magnetic Particle Test and Penetration Test.
Welding and fabrication	Different types with butt welds and others	Extensive use/requirement of butt welds and full penetration welds including non-pressure attachment welds
Fatigue Evaluation	Not mandatory	AD 160 for fatigue evaluation
Manufacturer	Manufacturer to declare compliance in data report	Manufacturer's Design Report certifying design specification and code compliance in addition to data report
Professional Engineer Certification	Normally not required	Professional Engineers' Certification of User's Design Specification as well as Manufacturer's Design Report Professional Engineer shall be experienced in pressure vessel design
Safety Relief Valve	UV Stamp	UV Stamp
Code Stamp and Marking	U Stamp with Addition markings including W, B, P, RES; L, DF, UB, HT and RT	U2 Stamp with Additional marking including HT
Hydrostatic Test Pressure	1.3 times design pressure	1.25 times design pressure
Allowable Stress Value at a specified design temperature	Lower, hence higher design margin	Higher, hence lower design margin.
Shell thickness at same design pressure	Thicker	Thinner
Material Cost		Lower

ASME Sec VIII Division 1 vs ASME Sec VIII Division 2

	Higher	
Minimum Pressure Design Thickness Calculation Equation	$t = PD/2S - 1.2P$	$t = D/2 \{ \text{Exp}(P/S) - 1 \}$
Hydrotest Stress Calculation	In Division 1, hydrotest stresses are not specifically limited and partial penetration nozzle welds are permitted.	In Division 2, hydrotest stress calculations are mandatory as they are limited and full penetration nozzle welds are required
No of Vessels produced Annually	Higher	Lower
Reference Standards	ASME B 1.13M AND ASME B 1.21M related to Screw threads are not listed	Both standards are given as reference