

ASME BPVC Section VIII Division 2

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We help manufacturers worldwide in understanding and applying the ASME Code.

Below we have highlighted key features of the new ASME Section VIII Division Code to show some of the differences to the old Section VIII Division 2 or Section VIII Division 1. This should help engineers and technicians broaden their understanding of these requirements, and prove useful as a reference document for personnel involved in fabrication or quality management.

Responsibilities and duties	Paragraph
Cyclic operating conditions and whether or not a fatigue analysis of the vessel is required shall be determined in the UDS	2.2.2.1.f.2
What to be included in the manufacturer's design report is listed in detail.	2.3.3.1
Certification of subcontracted service shall be described.	2.3.7
PE certifying the User's design specification shall be other than the PE who certifies the Manufacturer's design report.	2.A/B.2.1.a
As an alternative to an RPE, the PE shall comply with the local requirements where the specification or the report is prepared and with the requirements of the jurisdiction where the vessel will be installed.	2.A/B.2.3
According to 2.3.5 the Manufacturer shall maintain the following records, amongst others: A list of all material used for fabrication with Materials Certifications and Material Test Reports, and a record of any repairs to pressure retaining material that require a radiographic examination. The record of the repairs shall include the location of the repair, examination results, and the repair procedures. Fabrication information including all heat treatment requirements, forming and rolling procedure when prepared.	2.C.3.1.d.1 and 2
Inspection and test plan must identify all inspections required by the user.	2.C.3.1.d.2
For final marking MAWP, applicable Code Edition and Addenda and letters for type of construction shall be applied.	2.F.1.d,g and h
For final marking of parts MAWP at max. temperature and at MDMT shall be applied.	2.F.4.1.d and e
Name plate to be at least 0,5 mm thick.	2.F.5.a
For final marking on nameplates or directly, characters always have to be at least 8 mm.	2.F.7.1

Material requirements	Paragraph
For transferring markings by the manufacturer all steel stamping shall be done with commercially available "low stress" dies.	3.2.7.2.b
Plates of ferrous materials 50 mm and over in nominal thickness shall be ultrasonically tested.	3.3.3.1
Clad plates of SA-263, SA-264 and SA-265 shall be ultrasonically tested if cladding is counted for strength.	3.3.3.2
All forgings of ferrous materials 50 mm and over in nominal thickness shall be ultrasonically tested.	3.3.4.1
Following final machining of forgings of ferrous materials all accessible surfaces of thick or complex forgings shall be examined by MT or PT.	3.3.5.1
Plates of nonferrous materials 50 mm and over in nominal thickness shall be ultrasonically tested.	3.6.2
All forgings of nonferrous materials 50 mm and over in nominal thickness shall be ultrasonically tested.	3.6.3.1
Following final machining of forgings of nonferrous materials all accessible surfaces of thick or complex forgings shall be examined by PT.	3.6.4.1
All bolts, studs, and nuts over 25 mm nominal bolt size shall be examined by MT or PT.	3.7.2.b
All bolts, studs, and nuts over 50 mm nominal bolt size shall be ultrasonically examined over the entire surface prior threading.	3.7.2.c/d
P-No. 1, Group 1 and 2 materials that are post-weld heat treated below the lower transformation temperature are not exempted from additional specimens.	3.10.3.2
For thick and complex forgings that are contour shaped or machined to essentially the finished product configuration prior to heat treatment, the registered engineer who prepares the Design Report shall designate the surfaces of the finished product subject to high tensile stresses in service.	3.10.4.2.c
For ASME B16.5 and B16.47 impact testing is not required for temperatures no colder than -18°C or, when heat treated, - 29°C.	3.11.2.4.a
For the determination of the allowable stresses the design factor on the specified min. tensile strength is set to 2.4.	3.12 ASME II, Part D

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Design by Rule requirements	Paragraph
Design by rule in the time-dependent or creep range of material properties is included provided that fatigue screening criteria as per 5.5.2.2 (based on experience) is fulfilled	4.1.1.4
The minimum thickness permitted for shells and heads, after forming and regardless of product form and material, shall be 1.6 mm exclusive of any corrosion allowance.	4.1.2
The design thickness of the vessel part shall be determined using the design-by-rule methods of Part 4 with the load and load case combinations. Alternatively, the design thickness may be established using the design-by-analysis procedures in Part 5, even if this thickness is less than that established using Part 4 design-by-rule methods.	4.1.5.1
Safety factors are defined for design load combinations.	4.1.5.3 - Table 4.1.1-4.1.2
Weld joint types are introduced, fillet welds are type 10, lap joints are excluded.	4.2.3 - Table 4.2.2
Weld joint efficiency is introduced.	4.2.4 - Table 7.2
Weld category E for welded joints attaching non-pressure parts is new.	4.2.5.6
Design rules for torispherical heads are limited to a crown radius smaller or equal the inside skirt diameter ($L \leq D$). Exceeding the limits the head can be analysed according to Part 5.	4.3.6.1.b
A torispherical head may be fabricated of a spherical dome with smaller thickness than the knuckle region.	4.3.6.2
Rules for combination of pressure and supplemental loads are provided.	4.3.10
Rules for the design of cone-to-cylinder junctions are specified.	4.3.11, 4.3.12
Rules for the design of stiffeners for cylindrical shells under external pressure are less conservative.	4.4.5
The design rules for combined loadings and allowable compressive stresses include the effect of the cylinder length and buckling.	4.4.12
The design procedure for openings is more refined and exact. No exemption is provided for small openings.	4.5
Out-of-tolerance can be justified by the manufacturer using analysis methods as per Part 5 or API 579-1/ASME FFS-1 (Fitness for Service). However the owner has to agree and fatigue damage is to be analysed.	4.14
Design Rules for supports and attachments are provided. For lug and leg supports amongst others PD5500 is suggested for design.	4.15

Design by analysis requirements	Paragraph
In the time-dependent or creep range of material properties a design by Elastic Analysis (EA) is allowed provided that fatigue screening criteria as per 5.5.2.2 (based on experience) is fulfilled.	5.1.1.3
Von-Mises-stress is used to evaluate the equivalent stress (maximum distortion energy yield criterion).	5.2.2.1.b
Rules for Limit-Load Analysis and Plastic-Elastic Analysis are defined much more detailed.	5.2.3, 5.2.4
Design Rules for a protection against collapse from buckling are introduced describing 3 types of analysis that may use finite element software.	5.4
A fatigue analysis based on a Master Fatigue Curve is provided in Paragraph 5.5.5. for an explicit evaluation of welds. This method is to be approved by the owner/user. The results from this evaluation may differ extremely from the results of the analysis according to Paragraph 5.5.3 or 5.5.4 which use fatigue curves based on tests with smooth bar specimen in combination with FSRF.	5.5.5
Fracture mechanics evaluations are included to determine the MDMT in accordance with AP I579-1/ASME FFS-1 (Fitness for Service). Residual stresses from welding shall be considered in the evaluation.	5.11
Design loads and safety factors for design load combinations are defined for the various stress analysis types.	Table 5.1 – 5.5
For an evaluation of fatigue failure a Fatigue Strength Reduction Factor (FSRF or K) is defined for various weld qualities.	Table 5.11 – 5.12
Rules are provided for a stress classification of elastic finite element analysis results. The mesh insensitive Structural Stress Method is introduced.	Annex 5.A

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Fabrication requirements	Paragraph
Specific requirements for welded joints.	6.2.4

Inspection and examination requirements	Paragraph
NDE personnel be qualified and certified in accordance with their employer's written practice, where SNT-TC-1A or CP-189 shall be used as a guideline. There is no more an option of a Certificate of Competence for PT and MT.	7.3.6
Examination groups for pressure vessels (new introduced).	7.4.2 - Table 7.1
Extent of non-destructive examination.	7.4.3 - Table 7.2
If the required extent of examination is less than 100% the extent and location of NDE is determined in detail (unlike in UW-52 Spot Examination of Welded Joints).	7.4.3.5
Selection of examination methods for Internal (Volumetric) Flaws.	7.4.4 - Table 7.3
Category A and B welds in vessels for which fatigue analysis is mandatory shall be subject to 100% RT or UT. Category C, D, and E welds shall be examined by MT or PT.	7.4.7
All welds for pressure retaining parts shall be visually examined. Examination personnel shall pass the annual eye test.	7.5.2
For SAW welds in 21/4Cr-1Mo-V vessels, UT is required.	7.5.5.1
Personnel performing and evaluating MT, PT and ET shall be qualified and certified as per SNT-TC-1A	7.5.6/7/8 - 7.3.6
Eddy Current Surface Examination Procedure Requirements.	7.5.8
If a fatigue analysis is required, all internal and external pressure boundary components shall be examined by MT or PT after hydro-test.	7.6.1

Fabrication requirements	Paragraph
For test pressure determination the lowest ratio S_T/S for pressure-boundary materials excludes the consideration of bolts.	8.2.1.b
For all pressure tests the manufacturer shall record test fluid and temperature, date of test and reference to a written procedure.	8.5
The paragraphs for relaxation regarding test pressure for enameled (glass-lined) vessels are removed in Edition 2010	

The above list is based on ASME Section VIII Division 2, Edition 2010.

For further information on how we could help your company, including in-house training opportunities, please contact our team at:

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