ASME Code and PED - The new Section VIII Division 2 - really everything new?

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1. Summary

ASME has published a completely rewritten Section VIII Division 2. Under the PED this Division evidences advantages compared to the preceding editions. Numerous changes have been compiled to a modern pressure vessel Code, which has the potential for an international best-seller. Compliance with PED is not guaranteed, but made easier than in the past. Now it is up to the users to vote for the success of the new Division 2.

2. ASME Code and PED

ASME Boiler and Pressure Vessel Code, published by the American Society of Mechanical Engineers, is frequently used to fulfil the European Pressure Equipment Directive (PED). Not much in Germany, however in the south of the EU, and even more in the Middle East and overseas ASME Code is the most frequently used Code for pressure equipment. Manufacturers, Contractors, Engineering companies and Owners of pressure equipment like to specify ASME Code, and often use this well known Code also under the PED.

Comparison of ASME and PED, although published in many occasions, are not really appropriate. The PED is a regulation at the location of installation, and enforced by laws in the entire EU. ASME Code on the other hand is a technical standard in this context. It is not enforced by law in the EU, and used for the technical details of the design and fabrication of pressure equipment.

To comply with the PED, Guideline 9/6 can be used as a help for the manufacturer to prepare his design package and to perform the hazard analysis as required by the PED. All Essential Safety Requirements published in Annex 1 of the PED shall be met.

Annex 1 Chapter 1 through 6 are compulsory while chapter 7 requirements, if not met, may be replaced by evidence that "appropriate measures have been taken to achieve an equivalent overall level of safety." The evaluation shall be documented by the manufacturer in the design package, which will be submitted to the Notified Body for approval in cases where the chosen conformity assessment module specifies this.

All Codes, specifications, and standards, when used should be used entirely. "Cherry picking" is certainly not recommended.

3. ASME Section VIII

Section VIII comprises of three Divisions. Division 1 is the most commonly used Code for Pressure Vessels all over the world. Division 2, written for "Engineered Pressure Vessels" shows a much more sophisticated design approach. It contains methods for stress analysis, fatigue and creep analysis, combined with a sophisticated scope of non-destructive examination and amplified requirements on fabrication and material control. The more complex design approach requires certification by an experienced Professional Engineer (RPE). The specific efforts to meet all the additional requirements is compensated by a higher utilisation of material strength to carry stresses.

The use of Section VIII Division 2 is suitable in cases where the saved material could compensate the additional efforts, or when the purchaser of the vessel specifies Division 2.

Section VIII Division 3 was first published in 1997. It specifically addresses pressure vessels designed for high pressures exceeding 70 MPa.

4. The new Section VIII Division 2

On July 1st, 2007 the 2007 Edition of the ASME Code was published, including Section VIII Div. 2, which was completely re-written. A new book. For all pressure vessels contracted for after Jan 1st, 2008 the new rules are mandatory, except when Code Case 2575 is specified. This case extends the transition period until June 30th, 2009.

The new Division 2 was developed in a completely new structure:

PART 1 - GENERAL REQUIREMENTS

PART 2 - RESPONSIBILITIES AND DUTIES

PART 3 - MATERIALS REQUIREMENTS

PART 4 - DESIGN BY RULE REQUIREMENTS

PART 5 - DESIGN BY ANALYSIS REQUIREMENTS

PART 6 - FABRICATION REQUIREMENTS

PART 7 - INSPECTION AND EXAMINATION REQUIREMENTS

PART 8 - PRESSURE TESTING REQUIREMENTS

PART 9 - PRESSURE VESSEL OVERPRESSURE PROTECTION

Nine parts are addressing the key aspects of pressure vessel construction. Additional requirements are specified in Normative Annexes to the parts. Guidance and information is attached in Informative Annexes.

Not only the structure is new, also the technical contents and numerous details have been changed significantly. The result is a real new Code for pressure vessels. Many of the changes are answering demands arising from international users. The Design Specification and the Design Report for example may be certified by an RPE or by another competent, and experienced person acceptable to the authorities at the location of installation. A change that was requested by the industry for many years.

The design approach was revised completely. Now Design by Formula is not more mandatory when Design by Analysis is performed. In the design rules, the use of computers has been considered, the method for stress analysis and even the criteria for establishing allowable design stress values were changed. Even more changes were planned and may be expected in the upcoming Editions and Addenda.

The non-destructive examination was revised to reflect examination groups and allowing spot-examination, all quite similar to EN 13445. Even material toughness requirements and the hydrostatic test pressure were changed to the values specified in the PED.

Consequently some, but not all discrepancies to the PED in technical details were eliminated, which will make it easier to fulfil PED with a Division 2 vessel. Some requirements of the PED are still not met by Division 2. The required Hazard Analysis, Particular Material Appraisals for ASME material, material certification (3.2), approval of Welding procedures and personnel qualification by the Notified Body are still unanswered by Division 2, just to mention the major topics.

5. Experience

The past ten years have proven that ASME Code may well be used by contractors and manufacturers to demonstrate compliance to the PED.

Difficulties have been detected in many areas, and further problems will be to show in the future. The most critical areas are:

- Mixing of Codes (where interfaces are defined improperly, or conflicts are not considered)
- Incompetent manufacturers, contractors, engineers, inspectors
- Material certification
- Differences in safety culture
- Incomplete or inadequate specifications for pressure equipment

The new Section VIII Division 2 will not solve all of these problems, but it will be easier to use in the PED environment than preceding editions.

The first year of experience with the new Division 2 has shown some manufacturers joyfully working in the new environment, some carefully stepping ahead with proven design under the new rules, and some anxiously awaiting the next specification, and afraid to open the new book.

The coming years will show how the new ASME approach will prove it’s standing in the international engineering world and how it will evolve further on.

Vergleichbar?

Druckgeräterichtlinie

Verordnung am Aufstellort

und ASME Code

Technisches Regelwerk

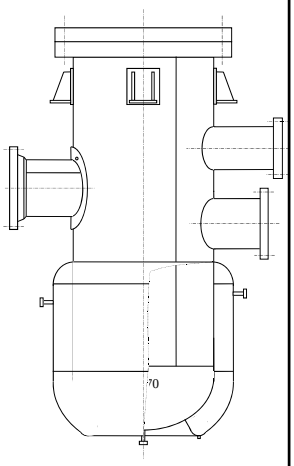
Anwenden des ASME Code mit PED

- Prüfen ob das Regelwerk die grundlegenden Anforderungen (Anhang 1) erfüllt,
- wenn nicht, zusätzliche Anforderungen zum Regelwerk festlegen!
  - Das Regelwerk möglichst als Gesamtheit anwenden (Leitlinie 9/6) “do not cherry pick!”
    - Anhang 1 Absätze 1 bis 6 sind verbindlich!
    - Falls die besonderen quantitativen Anforderungen, Abs. 7 vom Regelwerk nicht erfüllt werden, ist ein gleichwertiges Gesamtsicherheitsniveau nachzuweisen

  - Anwenden eines Anerkannten Regelwerks allein führt nicht zur Konformitätsvermutung!!!!
  - Die Bewertung MUSS dokumentiert werden!

ASME Code und PED

Artikel 3: (1) Die unter den Nummer 1.1, 1.2, 1.3 und 1.4 angeführten Druckgeräte müssen die in Anhang I genannten grundlegenden Anforderungen erfüllen.



ANHANG I – Grundlegende Sicherheitsanforderungen

Vorbemerkungen

1. **Allgemeines**
2. **Entwurf**
3. **Fertigung**
4. **Werkstoffe**
5. **Befeuerte(..) Druckgeräte**
6. **Rohrleitungen**
7. **Besondere quantitative Anforderungen für bestimmte Druckgeräte**

ASME Code Section VIII

Section VIII Division 1
- bis 3,000 psi (20 MPa), darüber besondere Anforderungen
- einfache Berechnungsmethoden
- keine Spannungsanalyse gefordert
- international weitverbreitete Anwendung für Druckbehälter

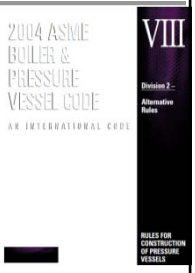
Section VIII Division 2 – Alternative Rules
- früher: bis 10,000 psi (70 MPa)
- Design by Rule / Design by Analysis
- Betreiber muß Betriebsbedingungen festlegen (User´s Design Specification)
- Hersteller muß Herstellungsbericht erstellen (Manufacturer´s Design Report)
- UDS wird erstellt / MDR wird zertifiziert von befähigten Personen
- höhere Festigkeitsausnutzung
- höhere Anforderungen an die Fertigung / umfangreichere zerstörungsfreie Prüfung
- geringere Wandstärken sparen Kosten
- enthält Kriterien für die Bewertung der Spannungsanalyse, Ermüdung, Dauerfestigkeit

Section VIII Division 3
- über 10,000 psi
- Spannungsanalyse ist gefordert
- vorgespannte Komponenten werden berücksichtigt
- umfangreiche zerstörungsfreie Prüfung verpflichtend
- sehr eingeschränkte Materialauswahl und Fertigung
- zwei Registered Professional Engineers sind gefordert

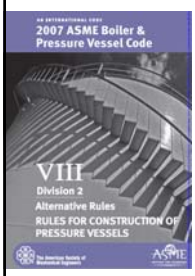
SEC82.PPT 10-05

Section VIII Division 2

Section VIII Division 2



Alte Ausgaben bis 2004 mit 2006 Addenda
bis 10,000 psi (70 MPa)
Designgrundlagen aus den 1950er Jahren
Nicht für Computereinsatz gemacht
Immer: Design by Rule, zusätzlich Design by Analysis und Lastwechsel, Ausnahmel
Betreiber muß Betriebsbedingungen festlegen (User´s Design Specification)
Hersteller muß Entwurf erstellen (Manufacturer´s Design Report)
UDS und MDR werden zertifiziert von RPE (Registered Professional Engineer)
Besondere Anforderungen an Material, Fertigung, Prüfung, Abnahme, Dokumentatic



Ausgabe 2007 (und 2008 Addenda)
Komplett neue erstelltes Regelwerk
Design by Rule, ODER Design by Analysis
User´s Design Specification und Manufacturer´s Design Report genauer vorgegeben
RPE (Registered Professional Engineer) oder Befähigte Person als Prüfer von UDS und MDR
Komplett andere Festlegung der Berechnungsmethode
Computerfreundliche Grundlagen (Vision!)
Erhöhte Ausnutzung der Festigkeit
Anpassungen an EN 13445 und damit an die PED
Optionen für stichprobenbasierte Prüfung, UT statt RT.
Ziel: Modernes Weltklasseregelwerk für hochwertige Druckbehälter

SEC82.PPT 10-05

VIII-2 Code Case 2575

KALENDER

1.7.2007 - Erscheinen der Edition 2007, mit der neuen Section VIII Division 2

1.1.2008 - Edition 2007 tritt in Kraft und löst die Edition 2004, Addenda 06 regulär ab.

Als Übergangslösung kann per Code Case 2575 die alte Ausgabe noch weiter verwendet werden, wenn in der Design Specification für den Auftrag vorgesehen.

1.7.2009 Ende der Übergangsfrist nach Code Case 2575.

Achtung: Es gilt das Datum des Auftrages!

„Altaufträge“ müssen nicht geändert werden.

VIII-2 Code Case 2575

CASES OF ASME BOILER AND PRESSURE VESSEL CODE

CASE 2575

Approval Date: September 23, 2007

The ASME Boiler and Pressure Vessel Standards Committee took action to eliminate Code Case expiration dates effective March 11, 2005. This means that all Code Cases listed in this Supplement and beyond will remain available for use until annulled by the ASME Boiler and Pressure Vessel Standards Committee.

Case 2575

Use of 2004 Edition Through 2006 Addenda for Pressure Vessel Construction

Section VIII, Division 2

Inquiry: Under what conditions may the 2004 Edition through 2006 Addenda of Section VIII, Division 2 be used in lieu of the 2007 Edition for construction of pressure vessels ordered after December 31, 2007?

Reply: It is the opinion of the Committee that U2 Certificate Holders may continue to use the 2004 Edition through 2006 Addenda of Section VIII, Division 2 to construct pressure vessels under the following conditions:

(a) Vessels must be contracted prior to July 1, 2009.

(b) The 2004 Edition through 2006 Addenda of Section II shall be used.

(c) This Case number shall be listed on line 5 of the Manufacturer's Data Report as well as underneath the Code Symbol Stamp on the vessel nameplate.

ASME Code Section VIII, Division 2

Inhalt:

PART 1 - GENERAL REQUIREMENTS (Allgemeines)

PART 2 - RESPONSIBILITIES AND DUTIES (Verantwortlichkeiten)

PART 3 - MATERIALS REQUIREMENTS (Material)

PART 4 - DESIGN BY RULE REQUIREMENTS (Berechnungsformeln)

PART 5 - DESIGN BY ANALYSIS REQUIREMENTS (FEM Berechnungen)

PART 6 - FABRICATION REQUIREMENTS (Fertigung)

PART 7 - INSPECTION AND EXAMINATION REQUIREMENTS (Abnahme und Prüfungen)

PART 8 - PRESSURE TESTING REQUIREMENTS (Druckfestigkeitsprüfung)

PART 9 - PRESSURE VESSEL OVERPRESSURE PROTECTION (Schutz gegen Überdruck)

Am Ende jedes Parts:

Annexes (normativ)

Annexes (informativ)

FMPRO.PPT 03-09

Section VIII - 2 Alternative Rules - Edition 2007

PART 1 - *GENERAL REQUIREMENTS*

1.1 General

1.2 Scope

1.3 Standards Referenced by This Division

1.4 Units of Measurement

1.5 Technical Inquires

1.6 Tables

Annex 1.A Submittal Of Technical Inquiries To The Boiler And Pressure Vessel Standards Committee

Annex 1.B Definitions

Annex 1.C Guidance For The Use Of US Customary And SI Units In The ASME Boiler And Pressure Vessel Codes

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Section VIII - 2 Alternative Rules - Edition 2007

PART 2 - *RESPONSIBILITIES AND DUTIES*

2.1 General

2.2 User Responsibilities

2.3 Manufacturer's Responsibilities

2.4 The Inspector

Annex 2.A Guide For Certifying A **User's Design Specification**

Annex 2.B Guide For Certifying A **Manufacturer's Design Report**

Annex 2.C Report Forms And Maintenance Of Records

Annex 2.D Guide For Preparing Manufacturer's Data Reports

Annex 2.E Quality Control System

Annex 2.F Contents And Method Of Stamping

Annex 2.G Obtaining And Using Code Stamps

Annex 2.H Guide To Information Appearing On The Certificate Of Authorization

SEC82.PPT 01/2008

VIII-2 User´s Design Specification

Part 2.2.2
User's Design Specification

The User's Design Specification shall include but not necessarily be limited to the following:

- Installation Site
- Jurisdictional authority
- Environmental conditions (wind, seismic, snow, temperature)
- Vessel Identification
- Outline drawings (openings, connections, closures with type and location, …)
- Support method
- Design conditions (temperature, design pressure, MDMT, …)
- Operating conditions (operating pressure and temperature, fluid properties, …)
- Design fatigue life
- Materials of construction
- Loads and load cases
- Overpressure protection

SEC82.PPT 08-05

VIII-2 Manufacturer´s Responsibilities

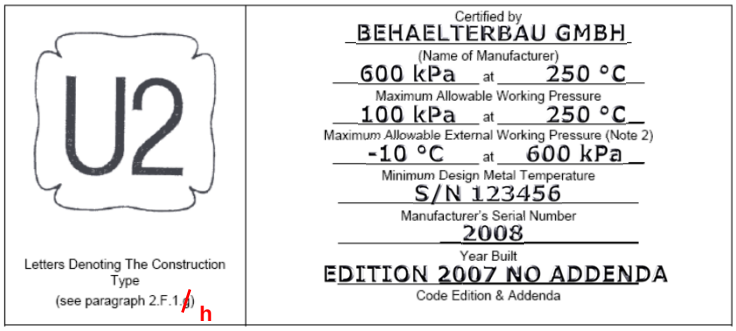
2.3.4 Manufacturer's Data Report
The Manufacturer shall certify compliance to the requirements of this Division by the completion of the appropriate Manufacturer's Data Report as described in Annex 2.C and Annex 2.D.

2.3.5 Manufacturer's Construction Records
The Manufacturer shall prepare, collect and maintain construction records and documentation as fabrication progresses, to show compliance with the Manufacturer's Design Report (e.g., NDE reports, repairs, deviations from drawings, etc.) An index of the construction records files, in accordance with the Manufacturer's Quality Control system, shall be maintained current (see paragraph 2.C.3). These construction records shall be maintained by the Manufacturer for three years after stamping of the vessel.

2.3.6 Quality Control System
The Manufacturer shall have and maintain a Quality Control System in accordance with Annex 2.E.

SEC82.PPT 08-05

VIII-2 Stamping



Notes:
1) Information within parentheses is not part of the required marking. Phrases identifying data may be abbreviated; minimum abbreviations shall be MAWP, MDMT, S/N, and year, respectively.
2) The maximum allowable external working pressures required only when specified as a design condition.
h) The construction type, all of the applicable construction types shall be included.
   1) F – Forged
   2) W – Welded
   3) WL – Welded layered

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PART 3 – *MATERIAL REQUIREMENTS*

3.1 General Requirements
3.2 Materials Permitted For Construction of Vessel Parts
3.3 Supplemental Requirements for Ferrous Materials
3.4 Supplemental Requirements for Cr–Mo Steels
3.5 Supplemental Requirements for Q&T Steels with Enhanced Tensile Properties
3.6 Supplemental Requirements for Nonferrous Materials
3.7 Supplemental Requirements for Bolting
3.8 Supplemental Requirements for Castings
3.9 Supplemental Requirements for Hubs Machined From Plate
3.10 Material Test Requirements
3.11 Material Toughness Requirements
3.12 Allowable Design Stresses
3.13 Strength Parameters
3.14 Physical Properties
3.15 Design Fatigue Curves
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PART 3 – *MATERIAL REQUIREMENTS* *(continued)*

3.16 Nomenclature
3.17 Definitions
3.18 Tables
3.19 Figures
Annex 3.A Allowable Design Stresses
Annex 3.B Requirements for Material Procurement (Currently Not Used)
Annex 3.C ISO Material Group Numbers (Currently Not Used)
Annex 3.D Strength Parameters
Annex 3.E Physical Properties
Annex 3.F Design Fatigue Curves

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PART 4 – *DESIGN BY RULE REQUIREMENTS*

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4.2 Design Rules for Welded Joints

4.3 Design Rules for Shells Under Pressure

4.4 Design Rules for Shells Under External Pressure and Allowable Compressive Stresses

4.5 Design Rules for Shells Openings in Shells and Heads

4.6 Design Rules for Flat Heads

4.7 Design Rules for Spherically Dished Bolted Covers

4.8 Design Rules for Quick Actuating (Quick Opening) Closures

4.9 Design Rules for Braced and Stayed Surfaces

4.10 Design Rules for Ligaments

4.11 Design Rules for Jacketed Vessels

4.12 Design Rules for NonCircular Vessels

4.13 Design Rules for Layered Vessels

4.14 Evaluation of Vessels Outside of Tolerance

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Section VIII - 2 Alternative Rules - Edition 2007

PART 4 – *DESIGN BY RULE REQUIREMENTS* *(continued)*

4.15 Design Rules for Supports and Attachments

4.16 Design Rules for Flanged Joints

4.17 Design Rules for Clamped Connections

4.18 Design Rules for Shell and Tube Heat Exchangers

4.19 Design Rules for Thin-Wall Expansion Joints

Annex 4.A Currently Not Used

Annex 4.B Guide For The Design And Operation Of Quick-Actuating (Quick-Opening) Closures

Annex 4.C Basis For Establishing Allowable Loads For Tube-To-Tubesheet Joints

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PART 5 – ***DESIGN BY ANALYSIS REQUIREMENTS***

5.1 General Requirements
5.2 Protection Against Plastic Collapse
5.3 Protection Against Local Failure
5.4 Protection Against Collapse From Buckling
5.5 Protection Against Failure From Cyclic Loading
5.6 Supplemental Requirements for Stress Classification in Nozzle Necks
5.7 Supplemental Requirements for Bolts
5.8 Supplemental Requirements for Perforated Plates
5.9 Supplemental Requirements for Layered Vessels
5.10 Experimental Stress Analysis
5.11 Fracture Mechanic Evaluations
5.12 Definitions
5.13 Nomenclature
5.14 Tables
5.15 Figures
.....

Section VIII - 2 Alternative Rules - Edition 2007

PART 5 – ***DESIGN BY ANALYSIS REQUIREMENTS*** *(continued)*

Annex 5.A Linearization Of Stress Results For Stress Classification
Annex 5.B Histogram Development And Cycle Counting For Fatigue Analysis
Annex 5.C Alternative Plasticity Adjustment Factors And Effective Alternating Stress For Elastic Fatigue Analysis
Annex 5.D Stress Indices
Annex 5.E Design Methods For Perforated Plates Based On Elastic Stress Analysis
Annex 5.F Experimental Stress Analysis

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PART 6 – *FABRICATION REQUIREMENTS*

6.1 General Fabrication Requirements
6.2 Welding Fabrication Requirements
6.3 Special Requirements for Tube-To-Tubesheet Welds
6.4 Preheating and Heat Treatment of Weldments
6.5 Special Requirements For Clad or Weld Overlay Linings, and Lined Parts
6.6 Special Requirements for Tensile Property Enhanced Q and T Ferritic Steels
6.7 Special Requirements for Forged Fabrication
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PART 7 – *INSPECTION AND EXAMINATION REQUIREMENTS*

7.1 General
7.2 Responsibilities and Duties
7.3 Verification and Examination Prior To Welding
7.4 Examination of Welded Joints
7.5 Examination Method and Acceptance Criteria
7.6 Final Examination of Vessel
7.7 Leak Testing
7.8 Acoustic Emission
7.9 Tables
7.10 Figures
Annex 7.A Responsibilities And Duties For Inspection And Examination Activities

SEC82.PPT 01/2008

VIII-2 Part 7: Inspector´s Duties

Among others things it is the duty of the Inspector to

- make all the inspections specified by the rules of this Division,
- make other inspections as considered necessary,
- verify that the Manufacturer has a valid Certificate of Authorization and is working according to an approved Quality Control System,
- verifying that the Manufacturer of the completed vessel has the User's Design Specification on file,
- verify that both the User's Design Specification and the Manufacturer's Design Report are certified in accordance with the requirements of Division 2,
- to certify the Manufacturer's Data Report.

He does not have the duty of establishing the accuracy of the design analysis, however, he has the duty of establishing that the required analysis has been performed.

Some typical required inspections and verifications that are defined in the applicable rules are included in the Inspector's responsibility for inspection and examination as summarized in Annex 7A

SEC82-eng.PPT 09-08

VIII-2 Part 7: Inspector´s Duties

7.A.4 Tables

Table 7.A.1 – Inspection And Examination Activities and Responsibilities/Duties

Inspection And Examination Activities	Time of Examination	Paragraph Reference		Manufacturer's Responsibilities	Inspector's Duties
		Procedure	Acceptance Criteria		
The Certificate Of Authorization From ASME Boiler And Pressure Vessel Committee	Before Start Of All Work	Annex 2.G Annex 2.E	NA	Obtain the Certificate and maintain Quality Control System	Verify the validity of Certificate and that Quality Control System is in place and being followed
Manufacturers Quality Control System					
The Applicable Drawings And Documents					
Compliance Of All Material Used In The Fabrication Of The Vessel Or Part Including Sample Test Coupons					
Repair Of Material Defects					
Proper Fitting And Cleaning Of Parts For Welding	Before Welding	6.1.3 6.1.4 6.1.5 6.1.6	7.3.6	Examine all parts to make certain they have been properly fitted/aligned and the surfaces to be joined have been cleaned for welding	Verify that all parts have been properly fitted/aligned and the surfaces to be jointed have been cleaned for welding
Any Repairs For Defects By Welding	During Fabrication	6.2.7	7.4.2 through 7.4.6	Make certain that weld defects are acceptably repaired and reexamined	Verify that weld defects are acceptably repaired and reexamined
Control For Required Heat Treatments	During Fabrication	6.4	7.3.3 7.A.3.2.5	Control to assure that all required heat treatments are performed	Verify that the heat treatments, including PWHT have been performed properly
Impact Tests For Welds As Production Test	After Welding	3.11.8	3.11.8	Perform tests and provide records	Verify that impact tests have been performed and that the results are acceptable
Certification of Qualification of Nondestructive	After Welding	7.5.3	7.A.3.2.6.c	Certify that each operator meets	Verify that each operator meets requirements of

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Section VIII - 2 Alternative Rules - Edition 2007

PART 8 – ***PRESSURE TESTING REQUIREMENTS***

8.1 General Requirements

8.2 Hydrostatic Testing

8.3 Pneumatic Testing

8.4 Alternative Pressure Testing

8.5 Documentation

8.6 Nomenclature

SEC82.PPT 01/2008

VIII-2 Part 8 – General Requirements

8.1 General Requirements

8.1.1 Selection of Pressure Test Methods

a) Except as otherwise permitted in paragraphs 8.1.1.b and 8.1.1.c, a completed vessel designed for internal pressure shall be subjected to a hydrostatic test performed in accordance with paragraph 8.2. Pressure tests of vessels designed for vacuum or partial vacuum only shall be tested in accordance with paragraph 8.1.3.1. A vessel shall be considered a completed vessel after:

1) All fabrication has been completed, except for operations that could not be performed prior to the test such as weld end preparation, or cosmetic grinding on the base material that does not affect the required thickness including corrosion allowance.

2) All examinations have been performed, except those required after the test.

SEC82.PPT 03-09

VIII-2 Part 8 – General Requirements

8.1 General Requirements

8.1.1 Selection of Pressure Test Methods

b) Subject to the limitations and additional nondestructive weld examination requirements that may be imposed elsewhere in this Division, a pneumatic test performed in accordance with paragraph 8.3 may be substituted for a hydrostatic test if any of the following are true.

1) The vessel is constructed and supported such that the weight of the hydrostatic test fluid could cause permanent visible distortion.

2) The vessel cannot be readily dried and is to be used in services where traces of the testing liquid cannot be tolerated.

3) The vessel is so constructed that brittle fracture is not a credible mode of failure at the pressure test conditions.

4) The pneumatic test is monitored by acoustic emission examination in accordance with Article 12 of Section V.

SEC82.PPT 03-09

VIII-2 Part 8 - Hydrostatic Testing

8.2 Hydrostatic Testing

8.2.1 Test Pressure

a) Except as noted for vessels of specific construction identified in paragraph 8.1.3, them minimum hydrostatic test pressure shall be the greater of:

$PT = 1.43 \cdot MAWP$ (8.1) or $P_T = 1.25 \cdot MAWP \cdot \left(\frac{S_T}{S} \right)$ (8.2)

b) The ratio S_T/S in Equation (8.2) shall be the lowest ratio for the pressure-boundary materials, excluding bolting materials, of which the vessel is constructed.

c) The test pressure is the pressure to be applied at the top of the vessel during the test. This pressure plus hydrostatic head is used in the applicable design equations to check the vessel under test conditions, see Part 4, paragraph 4.1.6.2.a.

d) The requirement of paragraph 8.2.1.a represents the minimum required hydrostatic test pressure. The upper limits of the test pressure shall be determined using the method in paragraph 4.1.6.2.a. Any intermediate value of pressure may be used.

(…)

SEC82.PPT 08-09

Regelwerke als Gesamtkonzept begreifen

Zutaten: Regelwerk für Druckgeräte

- Material,
- Auslegung (Design),
- Fertigung (Fabrication),
- Schweissen (Welding)
- Prüfen (Examination)
- Druckprobe (Testing)
- Zusammenbau, Montage (Assembly)

Immer wieder gern vergessen:

- Qualitätssicherung (Quality Control)
- Herstellerzulassung (Accreditation)
- Vorprüfung (Design Appraisal)
- Abnahme (Inspection)
- Konformitätserklärung (Certification)
- Dokumentation
- Pressure Relief (Überdruckschutz)

Aufeinander abgestimmt,

Gehören zusammen,

Gesamt-konzept

DGRL: Leitlinie 9/6

Frage: Ist es möglich, beim Entwurf und der Fertigung von Druckgeräten entsprechend der Druckgeräterichtlinie eine oder mehrere harmonisierte Normen, Regelwerke oder Spezifikationen teilweise anzuwenden?

Antwort: Die verschiedenen Teile (Entwurf, Fertigung, Prüfung, ...) einer harmonisierten Norm, eines Regelwerkes oder einer Spezifikation für Druckgeräte bilden ein zusammenhängendes Dokument, dem gefolgt werden sollte.

Dennoch ist die teilweise Anwendung einer harmonisierten Norm, eines Regelwerkes oder einer Spezifikation nicht verboten.

Unter diesen Umständen ist zu ermitteln, welche grundlegenden Anforderungen von den entsprechenden Teilen der harmonisierten Normen, Regelwerke oder Spezifikationen erfasst sind.

Zusätzlich müssen die grundlegenden Anforderungen, die nicht von den entsprechenden Teilen der harmonisierten Normen, Regelwerke oder Spezifikationen erfasst sind, analysiert werden, um die Gültigkeit der gewählten Lösungen zu beurteilen.

Wenn mehrere unterschiedliche Teile von harmonisierten Normen, Regelwerken oder Spezifikationen angewandt werden, ist zu prüfen, ob es zwischen diesen Teilen keine Unvereinbarkeiten oder Widersprüchlichkeiten besonders bei den Anwendungsdaten gibt (zulässige Spannung, Sicherheitsbeiwert, Umfang der Prüfung, ...)

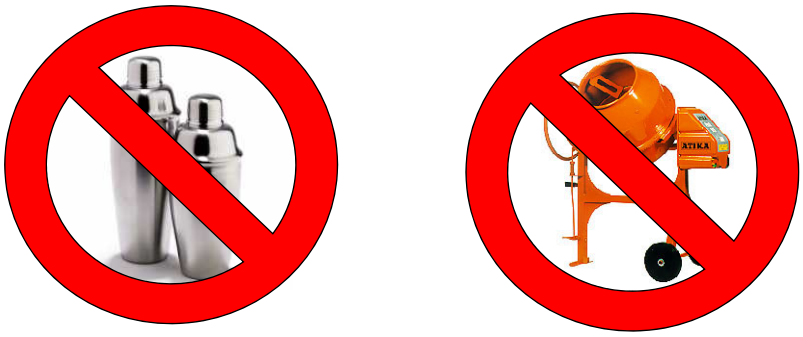
Akzeptiert von der Arbeitsgruppe Leitlinien am: 10.06.1999

Akzeptiert von der Arbeitsgruppe "Druck" am: 08.11.1999

Mischen von Regelwerken?

Bitte keine Regelwerke mischen.

Do not mix Codes, please.



Zusammenfassung

Section VIII Division 2 - 2007 wurde komplett neu erstellt!

Section VIII Division 2 hat sich der PED angenähert, diese aber nicht erreicht!

Hersteller und Benannte Stelle sind hier gefordert

ASME Code kann ein Baustein zur Erfüllung der DGRL sein.

Aber: Gefahrenanalyse ist erforderlich!

ASME Material braucht ein „PMA“ und 3.1 oder 3.2 Zeugnis

Benannte Stelle (und Prüfstelle) sind erforderlich.

Verfahren und Personal müssen von der Prüfstelle oder benannter Stelle geprüft werden.

Anhang 1 muß nachweislich erfüllt werden.

International ist die neue Section VIII Div. 2 der „Code of the Future for Engineered Pressure Vessels“