CURSO: DISEÑO DE RECIPIENTES SOMETIDOS A PRESION SEGUN LA NORMA ASME SECT VIII, DIV. 1

CURSO: "DISEÑO DE RECIPIENTES SOMETIDOS A PRESION SEGUN LA NORMA ASME SCT. VIII. DIV. 1"

OBJETIVO GENERAL - SECCION - DISEÑO

DADAS LAS ESPECIFICACIONES DE DISEÑOS, EL PARTICIPANTE ESTARA EN CAPACIDAD DE REALIZAR O ELABORAR DISEÑOS MECANICOS DE RECIPIENTES SOMETIDOS A PRESION BAJO LA NORMA ASME, SECT. VIII, DIV. 1. CON UN MARGEN DE ERROR NO MAYOR AL 10% Y EN UN TIEMPO COMPETITIVO DE 16 HORAS.

CLASIFICACION	SOBRE TIERRA				BAJO TIERRA
TIPOS →	Atmosférico	Baja Presión	Media Presión	Alta Presión	Cavernas
PRODUCTO \ PRESION	(Nota 3)	0 a 2.5 Psia.	2.5 a 15 Psia.	Mayor 15 Psia	
Crudo	●	●	●	NA ~3000 Psia	●
Condensados	●	●	●	●	●
Aceites	●	●	NA	NA	●
Gasolina Natural	●	●	●	NA	●
Butano	NA	●Refrigerado	●Refrigerado	●	●
Propano	NA	●Refrigerado	●Refrigerado	●	●
Gas sin Tratar	NA	●Refrigerado	●Refrigerado	●	●
Ethano	NA	●Refrigerado	●Refrigerado	●	●
Petroquímicos	NA	●Refrigerado	●Refrigerado	●	●
Gas Natural	NA	NA	NA	●	●
GLN	NA	●	●Refrigerado	●	NA
Quimicos para tratamiento	●	●	NA	NA	NA
Fluidos Deshidratantes	●	●	NA	NA	NA
Quimicos Especiales	●	●	●	NA	NA
Materiales Sólidos	●	NA	NA	NA	NA
Agua	●	NA	NA	NA	NA
Codigo Aplicable	API 650 (Nota 1)	API 620/650 (Nota 1)	API 620 ESTEAM	ASME SEC VIII	No disponible

● APLICABLE NA: NO APLICABLE

Notas:

1. INTRODUCCIÓN

LA SOCIEDAD AMERICANA DE INGENIEROS MECÁNICOS (ASME) HA ESTABLECIDOS REGLAS PARA LA CONSTRUCCIÓN DE RECIPIENTES A PRESIÓN Y SUS PARTES.

EL OBJETIVO DE ESTABLECER ESTAS REGLAS ES PERMITIR, CON UN ALTO GRADO DE SEGURIDAD EL DISEÑO, LA FABRICACIÓN E INSPECCIÓN DE RECIPIENTE SOMETIDOS A PRESIÓN, PERMITIENDO CON ELLO UNA LARGA VIDA ÚTIL, ASÍ COMO UN MAYOR MARGEN DE TIEMPO CONTRA EL DETERIORO.

LA CONCEPCIÓN DE CADA UNA DE ESTAS NORMAS SON EL FRUTO DE LA EXPERIENCIA PRACTICA Y EL CONOCIMIENTO TEÓRICO, LO CUAL HA REDUNDADO EN MEJORES DISEÑOS, Y PRUEBA DE ELLO, ES LA ACEPTACIÓN A NIVEL MUNDIAL DEL CÓDIGO ASME COMO HERRAMIENTA EFICAZ PARA LA CONSTRUCCIÓN DE RECIPIENTE A PRESIÓN.

2. CÓDIGOS Y ESPECIFICACIONES DE DISEÑO

2.1 IDENTIFICACIÓN

SECCIÓN	DESCRIPCIÓN
I	Caldera de Potencia
II	Especificaciones de Materiales Parte A. Ferroso Parte B. No Ferroso Parte C. Electrodos
III	Planta de Fuerza Nuclear
IV	Caldera de Calefacción
V	Pruebas no Destructiva
VI	Reglas para Conservación y Operación de Calderas de Calefacción.
VIII	Recipientes a Presión Div. 1 Div. 2/Reglas Alternativa
IX	Requisito para Calificación de Soldadura.
X	Recipiente a Presión de Plástico Reforzado con Fibra de Vidrio
XI	Regla para la Inspección de Planta de Fuerzas Nucleares.

CÓDIGO ASME / RECIPIENTES A PRESIÓN Y CALDERA

CALDERAS DE POTENCIA; FUE EL PRIMER CÓDIGO DE RECIPIENTES A PRESIÓN Y CALDERA. PREPARADO POR EL COMITE DEL ASME REUNIDO EN 1911. ESTE CÓDIGO ES LA SECCIÓN 1. EL PRIMERO FUE EDITADO EN 1914.

HISTORIA DE LOS CÓDIGOS DE RECIPIENTE A PRESIÓN

- **1928 Código de Recipiente a Presión no expuesto al fuego.**
- **1968 Revisión del Código de Recipiente a Presión.**
- **1968 Sección VIII. Div. 2. Fue desarrollado Reglas alternativas para Recipientes a Presión.**
- **1969 Sección X. Recipientes a Presión de Fibra de Vidrio reforzada con Plástico.**

HISTORIA DE LOS CÓDIGOS DE REFERENCIA

- **1924 Sección II. (Materiales).**
- **1937 Sección IX. Calificación de Soldadura (Pero antes de este tiempo la Sección IX apareció como un Suplemento de la Sección VIII).**

- **ADDENDA DE CÓDIGO**

  - **Son revisiones al código; el cual es un cambio/requerimientos previos. Estos cambio serán mandatorio 6 meses después de editado.**

  - **Esta Revisiones son llamadas Addenda.**

Estas addendas se identifica en el Código como las hojas coloreadas. El incluye revisiones a secciones individuales de el Código. Son publicadas anualmente y será enviada automáticamente al comprador.

- **Las ediciones son editadas cada tres años.**

CONFIGURACIÓN DEL COMITE DEL ASME

El Código ASME son escrito, revisado y interpretado por el Comite de Proceso.

El Comite Principal tiene la palabra final sobre Item traído ante por el Subcomité hay Subcomité por cada Código y Subgrupo y Grupo de Trabajo incluido en cada Subcomité.

CONFIGURACIÓN DEL COMITE DEL ASME

El Código ASME son escrito, revisado y interpretado por el Comite de Proceso.

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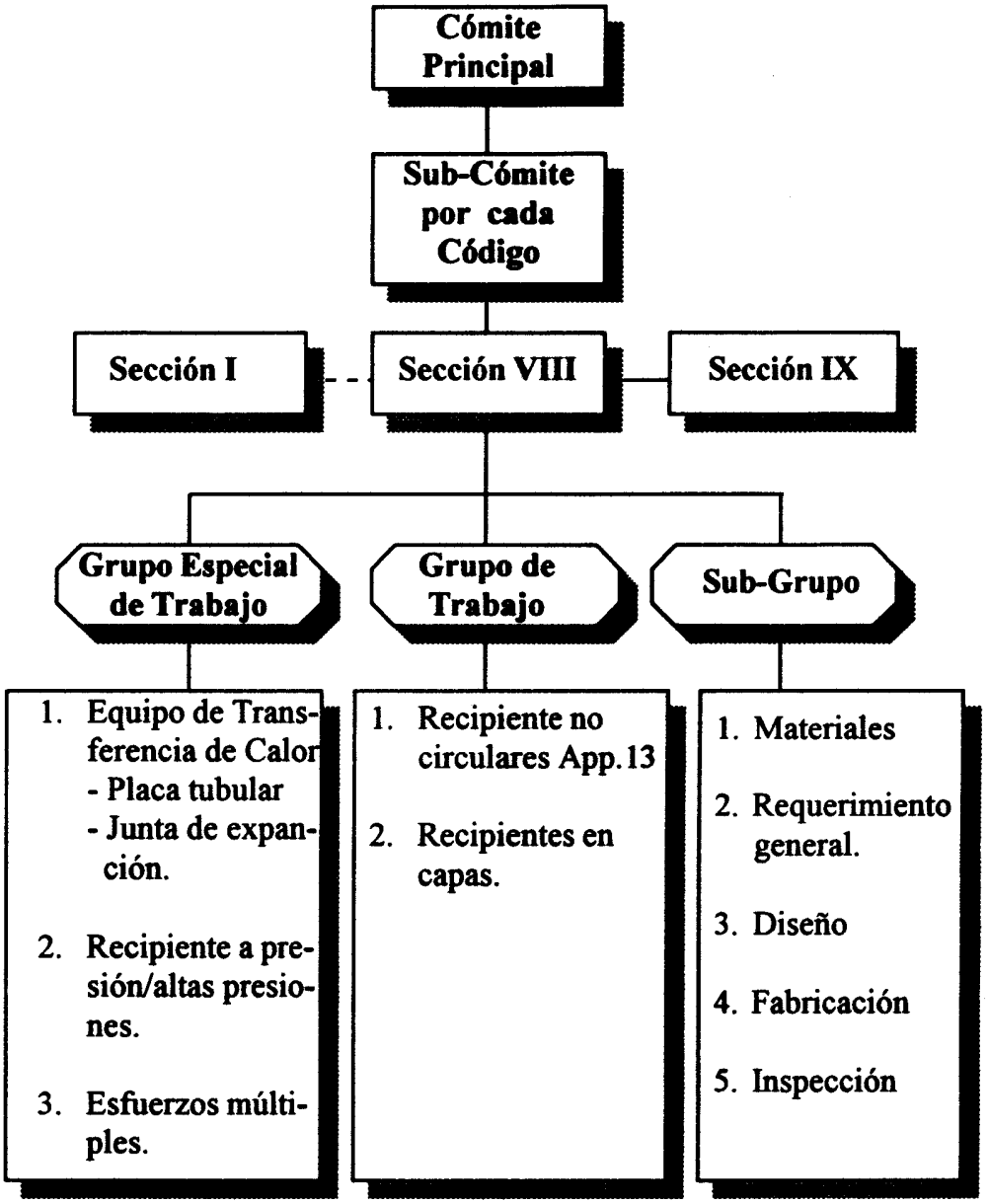
CONFIGURACION DEL COMITE DEL ASME



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R. A. Yeo — Nova Scotia, Canada

2.2 CLASIFICACIÓN

Códigos de Fabricación

. **Sección I.**	**Calderas de Potencia**
. **Sección III.**	**Planta Fuerza Nucleares**
. **Sección IV.**	**Caldera de Calefacción**
. **Sección VIII.Div.1/Div.2**	**Recipiente de Presión**
. **Sección X. (Div.1/Div.2)**	**Recipiente de Fibra de Vidrio**

Códigos de Referencia

. **Sección II.**	**Materiales**
. **Sección V.**	**Ensayos no Destructivos**
. **Sección IX.**	**Requisito para Calificación de Soldadura.**

U-3. Standars Consultados por Sección VIII Div. 1.

- **Esta Sección hace referencia a varios Standards tales como Standards ANSI el cual cubre rating (Presión-Temperatura).**

- **Estos Standards con los años de Edición están listado en la Tabla U-3.**

TABLE U-3
YEAR OF ACCEPTABLE EDITION OF REFERENCED STANDARDS IN THIS DIVISION

	Title	Number	Year
	Unified Screw Threads	ANSI B1.1	1974
	Pipe Threads	ANSI B2.1	1968
	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800	ANSI B16.1	1975
	Steel Pipe Flanges and Flanged Fittings	ANSI B16.5	1981(1)
	Factory-Made Wrought Steel Buttwelding Fittings	ANSI B16.9	1978
	Forged Steel Fittings, Socket-Welding and Threaded	ANSI B16.11	1980
	Cast Bronze Threaded Fittings Class 125 and 250	ANSI B16.15	1978
	Ring-Joint Gaskets and Grooves for Steel Pipe Flanges	ANSI B16.20	1973
	Bronze Pipe Flanges and Flanged Fittings, Class 150 and 300	ANSI B16.24	1979
	Wrought Steel Buttwelding Short Radius Elbows and Returns	ANSI B16.28	1978
	Square and Hex Nuts	ANSI B18.2.2	1972
	Welded and Seamless Wrought Steel Pipe	ANSI B36.10	1979
	Ductile Iron Pipe Flanges and Flanged Fittings, Class 150 and 300	ANSI B16.42	1979
	Large Diameter Carbon Steel Flanges	ANSI/API Std. 605 3rd Ed.	1980
A87	Safety and Relief Valves	ANSI/ASME PTC 25.3	1976(2)
	Piping Fittings of Wrought Carbon Steel	ASTM A 234	1982
	Standard Test Methods for Flash Point by Tag Closed Tester	ASTM D 56	1982
	Standard Test Methods for Flash Point by Pensky-Martens Closed Tester	ASTM D 93	1980
	Marking and Labeling Systems	UL-969	1980

A87 NOTES:
(1) See UG-11(a)(2).
(2) Including the 1977 Addenda.

TABLE UW-12
MAXIMUM ALLOWABLE JOINT EFFICIENCIES[1,5] FOR ARC AND GAS WELDED JOINTS

Type No.	Joint Description	Limitations	Joint Category	Degree of Radiographic Examination		
				(a) Full[2]	(b) Spot[3]	(c) None
(1)	Butt joints as attained by double-welding or by other means which will obtain the same quality of deposited weld metal on the inside and outside weld surfaces to agree with the requirements of UW-35. Welds using metal backing strips which remain in place are excluded.	None	A, B, C, & D	1.00	0.85	0.70
(2)	Single-welded butt joint with backing strip other than those included under (1)	*(a)* None except as in (b) below	A, B, C, & D	0.90	0.80	0.65
		(b) Circumferential butt joints with one plate offset; see UW-13(c) and Fig. UW-13.1, sketch (k)	A, B, & C	0.90	0.80	0.65
(3)	Single-welded butt joint without use of backing strip	Circumferential butt joints only, not over $\frac{5}{8}$ in. thick and not over 24 in. outside diameter	A, B, & C	NA	NA	0.60
(4)	Double full fillet lap joint	*(a)* Longitudinal joints not over $\frac{3}{8}$ in. thick	A	NA	NA	0.55
		(b) Circumferential joints not over $\frac{5}{8}$ in. thick	B & C	NA	NA	0.55
(5)	Single full fillet lap joints with plug welds conforming to UW-17	*(a)* Circumferential joints[4] for attachment of heads not over 24 in. outside diameter to shells not over $\frac{1}{2}$ in. thick	B	NA	NA	0.50
		(b) Circumferential joints for the attachment to shells of jackets not over $\frac{5}{8}$ in. in nominal thickness where the distance from the center of the plug weld to the edge of the plate is not less than $1\frac{1}{2}$ times the diameter of the hole for the plug.	C	NA	NA	0.50

(6)	Single full fillet lap joints without plug welds	*(a)* For the attachment of heads convex to pressure to shells not over ⅝ in. required thickness, only with use of fillet weld on inside of shell; or	A & B	NA	NA	0.45
		(b) for attachment of heads having pressure on either side, to shells not over 24 in. inside diameter and not over ¼ in. required thickness with fillet weld on outside of head flange only	A & B	NA	NA	0.45

NOTES:
(1) The single factor shown for each combination of joint category and degree of radiographic examination replaces both the stress reduction factor and the joint efficiency factor considerations previously used in this Division.
(2) See UW-12(a) and UW-51.
(3) See UW-12(b) and UW-52.
(4) Joints attaching hemispherical heads to shells are excluded.
(5) $E = 1.0$ for butt joints in compression.

critical sections are exposed for examination for the full wall thickness; as in tubesheets drilled with holes spaced no farther apart than the wall thickness of the casting. The examination afforded may be taken in lieu of destructive or radiographic testing required in (2)(b).

(5) For carbon, low alloy, or high alloy steels, higher quality factors may be applied if in addition to the minimum requirements of UG-24 (a)(1), additional examinations are made as follows.

(a) For centrifugal castings, a factor not to exceed 90% may be applied if the castings are examined by the magnetic particle or liquid penetrant methods in accordance with the requirements of Appendix 7.

(b) For static and centrifugal castings a factor not to exceed 100% may be applied if the castings are examined in accordance with all of the requirements of Appendix 7.

(6) The following additional requirements apply when castings (including those permitted in UG-11) are to be used in vessels to contain lethal substances (UW-2).

(a) Castings of cast iron (UCI-2) and cast ductile iron (UCD-2) are prohibited.

A86 *(b)* Each casting of nonferrous material permitted by this Division shall be radiographed at all critical sections (see footnote 1, Appendix 7) without revealing any defects. The quality factor for nonferrous castings for lethal service shall not exceed 90%.

(c) Each casting of steel material permitted by this Division shall be examined per Appendix 7 for severe service applications [7-3(b)]. The quality factor for lethal service shall not exceed 100%.

A86 *(b) Defects.* Imperfections defined as unacceptable by either the material specification or by Appendix 7, 7-3, whichever is more restrictive, are considered to be defects and shall be the basis for rejection of the casting. Where defects have been repaired by welding, the completed repair shall be subject to reexamination and, when required by either the rules of this Division or the requirements of the castings specification, the repaired casting shall be postweld heat treated and, to obtain a 90% or 100% quality factor, the repaired casting shall be stress relieved.

(c) Identification and Marking. Castings to which a quality factor of 90% or 100% is to be applied shall be marked with the manufacturer's and materials identification marking and, in addition, the quality factor shall be clearly stamped on the casting.

UG-25 CORROSION

(a) The user or his designated agent (see U-2) shall specify corrosion allowances other than those required by the rules of this Division. Where corrosion allowances are not provided, this fact shall be indicated on the Data Report.

(b) Vessels or parts of vessels subject to thinning by corrosion, erosion, or mechanical abrasion shall have provision made for the desired life of the vessel by a suitable increase in the thickness of the material over that determined by the design formulas, or by using some other suitable method of protection. (See Appendix E.)

NOTE: When using high alloys and nonferrous materials either for solid wall or clad or lined vessels, refer to UHA-6, UCL-3, and UNF-4, as appropriate

(c) Material added for these purposes need not be of the same thickness for all parts of the vessel if different rates of attack are expected for the various parts.

(d) Except as required in UCS-25, no additional thickness need be provided when previous experience in like service has shown that corrosion does not occur or is of only a superficial nature.

(e) Telltale Holes. Telltale holes may be used to provide some positive indication when the thickness has been reduced to a dangerous degree. Telltale holes shall not be used in vessels which are to contain lethal substances [see UW-2(a)], except as permitted by ULW-76 for vent holes in layered construction. When telltale holes are provided, they shall have a diameter of $\frac{1}{16}$ in. to $\frac{3}{16}$ in. and have a depth not less than 80% of the thickness required for a seamless shell of like dimensions. These holes shall be provided in the opposite surface to that where deterioration is expected. [For telltale holes in clad or lined vessels, see UCL-25(b).]

(f) Openings for Drain. Vessels subject to corrosion shall be supplied with a suitable drain opening at the lowest point practicable in the vessel; or a pipe may be used extending inward from any other location to within $\frac{1}{4}$ in. of the lowest point.

UG-26 LININGS

Corrosion resistant or abrasion resistant linings, whether or not attached to the wall of a vessel, shall not be considered as contributing to the strength of the wall except as permitted in Part UCL (see Appendix F).

(1) Category A. Longitudinal welded joints within the main shell, communicating chambers,[2] transitions in diameter, or nozzles; any welded joint within a sphere, within a formed or flat head, or within the side plates[3] of a flat-sided vessel; circumferential welded joints connecting hemispherical heads to main shells, to transitions in diameters, to nozzles, or to communicating chambers.[2]

(2) Category B. Circumferential welded joints within the main shell, communicating chambers,[2] nozzles, or transitions in diameter including joints between the transition and a cylinder at either the large or small end; circumferential welded joints connecting formed heads other than hemispherical to main shells, to transitions in diameter, to nozzles, or to communicating chambers.[2]

(3) Category C. Welded joints connecting flanges, Van Stone laps, tubesheets, or flat heads to main shell, to formed heads, to transitions in diameter, to nozzles, or to communicating chambers;[2] any welded joint connecting one side plate[3] to another side plate of a flat-sided vessel.

(4) Category D. Welded joints connecting communicating chambers[2] or nozzles to main shells, to spheres, to transitions in diameter, to heads, or to flat-sided vessels, and those joints connecting nozzles to communicating chambers[2] (for nozzles at the small end of a transition in diameter, see Category B).

(b) When butt welded joints are required elsewhere in this Division for Category B, an angle joint connecting a transition in diameter to a cylinder shall be considered as meeting this requirement provided the angle α (see Fig. UW-3) does not exceed 30 deg. All requirements pertaining to the butt welded joint shall apply to the angle joint.

MATERIALS

UW-5 GENERAL

(a) Pressure Parts. Materials used in the construction of welded pressure vessels shall comply with the requirements for materials given in UG-4 through UG-15, and shall be proven of weldable quality. Satisfactory qualification of the welding procedure under Section IX is considered as proof.

(b) Nonpressure Parts. Materials used for nonpressure parts which are welded to the pressure vessel shall be proven of weldable quality as described below.

(1) For material identified in accordance with UG-10, UG-11, UG-15, or UG-93, satisfactory qualification of the welding procedure under Section IX is considered as proof of weldable quality.

(2) For materials not identifiable in accordance with UG-10, UG-11, UG-15, or UG-93, but identifiable as to nominal chemical analysis and mechanical properties or to a material specification not permitted in this Division, satisfactory qualification of the welding procedure under Section IX is considered as proof of weldable quality. The welding procedure need only be qualified once for a given nominal chemical analysis and mechanical properties or material specification not permitted in this Division.

(3) Material which cannot be identified may be proved to be of weldable quality by preparing a butt-joint test coupon from each piece of nonidentified material to be used. Guided bend test specimens made from the test coupon shall pass the tests specified in QW-451 of Section IX.

(c) Two materials of different specifications may be joined by welding provided the requirements of Section IX, QW-250, are met.

(d) Materials joined by electroslag welding shall be limited to ferritic steels and the following austenitic steels which are welded to produce a ferrite containing weld metal: SA-240 Types 304, 304L, 316, and 316L; SA-182 F304, F304L, F316, and F316L; SA-351 CF3, CF3A, CF3M, CF8, CF8A, and CF8M.

(e) Materials joined by the inertia and continuous drive friction welding processes shall be limited to materials assigned P-Numbers in Section IX and shall not include rimmed or semikilled steel.

DESIGN

UW-8 GENERAL

The rules in the following paragraphs apply specifically to the design of pressure vessels and vessel parts that are fabricated by welding and shall be used in conjunction with the general requirements for *Design* in Subsection A, and with the specific requirements for *Design* in Subsection C that pertain to the class of material used.

UW-9 DESIGN OF WELDED JOINTS

(a) Permissible Types. The types of welded joints permitted in arc and gas welding processes are listed

[2] *Communicating chambers* are defined as appurtenances to the vessel which intersect the shell or heads of a vessel and form an integral part of the pressure containing enclosure, e.g., sumps.

[3] *Side plates of a flat-sided vessel* are defined as any of the flat plates forming an integral part of the pressure containing enclosure.