



U.S. Department of Energy
Office of River Protection
Mr. R. J. Schepens
Manager
P.O. Box 450, MSIN H6-60
Richland, Washington 99352

CCN: 071349

OCT 21 2003

Dear Mr. Schepens:

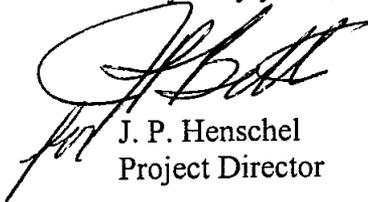
**CONTRACT NO. DE-AC27-01RV14136 – BECHTEL NATIONAL, INC.'S REVISED
RESPONSE TO A-03-OSR-RPPWTP-016-03-FIN**

References: CCN 073356; Letter; J. P. Henschel, BNI; to R. J. Schepens, ORP; "Bechtel National, Inc.'s Response To Inspection Report A-03-OSR-RPPWTP-016; dated October 9, 2003

The purpose of this letter is to provide a revised response to Bechtel National, Inc.'s response to A-03-OSR-RPPWTP-016-03-FIN. The original response transmitted by the referenced letter incorrectly referenced Safety Criterion 2.9-1 when the correct reference is Safety Criterion 2.0-1.

If you have any questions or if we can be of further assistance, please call Mr. George T. Shell at (509) 371-2377.

Very truly yours,



J. P. Henschel
Project Director

ETS/clw

Attachment Revised Response to Finding A-03-OSR-RPPWTP-016-03-FIN

cc:

Adkisson, D. A. w/a	WTP	MS4-A2
Armstead, J. M. w/a	WTP	MS14-3B
Beranek, F. w/a	WTP	MS4-A1
Betts, J. P. w/a	WTP	MS14-3C
DOE Correspondence Control w/a	ORP	H6-60
Duncan, G. M. w/a	WTP	MS4-D2
Ensign, K. R. w/o	ORP	H6-60
Eschenberg, J. w/a	ORP	H6-60
Hamel, W. F. w/o	ORP	H6-60
Hamrick, J. C. w/a	WTP	MS12-2B
Hanson, A. J. w/o	ORP	H6-60
Henschel, J. P. w/a	WTP	MS14-3C
Klein, D. w/a	WTP	MS4-A1
Lindsey, D. W. w/a	WTP	MS12-2B
Papworth, L. G. w/a	WTP	MS14-4B
PDC w/a	WTP	MS11-B
Rasmussen, J. E. w/a	ORP	H6-60
Roth, J. K. w/a	WTP	MS4-A2
Shell, G. T. w/a	WTP	MS14-4B
Short, J. J. w/o	ORP	H6-60
Smith, E. T. w/a	WTP	MS14-4B
Taylor, W. J. w/a	ORP	H6-60
Tosetti, R. J. w/a	WTP	MS4-A2

**RESPONSE TO FINDING
A-03-OSR-RPPWTP-016-03-FIN**

Summary of Finding

SRD Safety Criterion 4.2-2 required the Contractor to adhere to the requirements of ASME Standard B31.3-96, Process Piping, for the design and analysis of piping, including seismic considerations. SRD Safety Criterion 4.2-2 made no reference to ASME Section III.

(Item 1) Contrary to the above, Contractor Engineering Specification 24590-WTP-DC-PS-01-001, Rev. 1, *Pipe Stress Design Criteria*; 24590-WTP-DC-PS-01-002, Rev. 1, *Pipe Support Design Criteria*; 24590-WTP-GPG-ENG-004, Rev. 0, *Engineering Design Guide for Pipe Stress, Pipe Layout and Pipe Spacing*; 24590-WTP-GPG-ENG-005, Rev. 0, *Engineering Design Guide for Pipe Supports*; Calculation 24590-LAW-P6C-LCP-00001, Rev. A (Committed), *LAW Pipe Stress Calc. Pkg.* (24590-LAW-P3-LCP-PB01369); Calculation 24590-PTF-P6C-PWD-00012, Rev. A (Committed), *RPP-WTP-PWD-WT/WU System Pipe Stress Analysis*; Calculation 24590-PTF-PHC-PWD-00024, Rev. A (committed), *RPP-WTP Engineering Support Calculation*; and Calculation 24590-BOF-PHC-RLD-00001, Rev. A (Committed), *Waste Transfer Pipe Support Qualification*, used ASME Section III allowable stresses in the seismic design and analysis of piping instead of ASME B31.3-96 allowable stresses.

SRD Safety Criterion 4.2-2 required the Contractor adhere to the requirements of the ASME B31.3-96, *Process Piping*, and ASME Section VIII, *Boiler and Pressure Vessel Codes, Rules for Construction of Pressure Vessels*, for the design and test of pump cases. Both ASME B31.3-96 and ASME Section VIII contained provisions for the design and testing of centrifugal pumps. SRD Safety Criterion 4.2-2 made no reference to API-610 or API-685.

(Item 2) Contrary to the above, Contractor Engineering Specifications and Material Requisitions 24590-WTP-3PS-MPC0-T0001, Rev. 1, *Centrifugal Pumps to Meet Requirements of API Standard 610, Eighth Edition, and Quality Levels QL-1 and QL-2*; 24590-PTF-3PS-MPC0-T0001, Rev. 0, *PTF Hot Cell Slurry Pumps to Meet Requirements of API Standard 610, Eighth Edition*; 24590-WTP-3PS-MPC0-T0003, Rev. 0, *Sealless Centrifugal Pumps to Meet Requirements of API Standard 685, First Edition, and Quality Levels QL-1 and QL-2*; 24590-QL-MRA-MPC0-00004, Rev. 1, *Pumps, API-610 Slurry (N2KB) (Sensitive) (MS061)*; and 24590-QL-MRA-MPC0-00005, Rev. 0, *Pumps, API-685 Sealless*, used API-610 or API-685 pressure boundary and test attributes instead of those specified by ASME B31.3-96 and ASME Section VIII.

The above items are examples of a Finding for failure to meet contractual requirements to implement the DOE-approved SRD. (See IR-03-016, Section 1.3.2, IR-03-016-02-FIN)

1) BNI Response

BNI agrees with the first part of the finding regarding the use of ASME Section III allowable stresses in pipe stress and pipe support design criteria and pipe design guides, and in some pipe stress and pipe support calculations (Item 1), but disagrees with the finding regarding the use of API 610 and API 685 rather than ASME Section VIII or ASME B31.3 for the design and testing of pumps (Item 2).

Item 1

BNI agrees with the finding.

Item 2

SRD Safety Criterion 4.2-2 states that " Important to Safety liquid and gaseous systems and components, including pressure vessels, tanks, heat exchangers, piping, and valves, shall be designed to retain their hazardous inventory such that the radiological and chemical worker or public exposure standards of Safety Criterion 2.0-1 and /or 2.0-2 are not exceeded." Pumps are not specifically identified in the included components, although logically would be included if they perform a confinement function.

The implementing codes and standards include ASME B31.3-96, "Process Piping," as tailored by Appendix C, and ASME Section VIII, "Boiler and Pressure Vessel Codes, Rules for Construction of Pressure Vessels," and SRD Appendix A.

Neither ASME B31.3-96 nor ASME Section VIII, which are listed as implementing codes in SRD Criterion 4.2-2, applies specifically to pumps.

- ASME B31.3-96, Section 300.1.3(d), excludes "pressure vessels, heat exchangers, pumps, compressors, and other fluid handling or processing equipment, including internal piping and connections for external piping."
- ASME Section VIII, Division 1, does not specifically address pumps. ASME Section VIII, Division 2, Section AG-121(c) exempts "pressure containers which are integral parts or components of rotating or reciprocating mechanical devices, such as pumps, compressors, turbines, generators, engines, and hydraulic or pneumatic cylinders where the primary design considerations and/or stresses are derived from the functional requirements of the device." However, any pressure vessel within these classes not excluded from the scope of this Division by AG-100(b) but which meets all applicable requirements of this Division may be stamped with the U2 Code symbol.
- ASME Section VIII, Division 3, Article KG-120 states that the "following classes of pressure containing equipment are not within the scope of this Division:
 - (c) pressure containing equipment that is an integral part or component of a rotating or reciprocating mechanical device, such as:
 - (1) pumps ..."

Therefore, only specific articles of ASME Section VIII apply to the confinement functions of the pump casing. Portions of ASME B31.3 and ASME Section VIII are referenced in API-610, Eighth Edition, and API-685, First Edition. These codes refer to ASME Section VIII in the materials, design rules, welding, heat treating, and inspection requirements. The details for API-610 and API-685 are provided in the attachment to this response. BNI considers that the API Standards address the applicable sections of ASME Section VIII for confinement boundary integrity of pump casings.

BNI considers that by invoking API-610 and API-685, BNI has complied with SRD 4.2-2 by invoking those portions of ASME Section VIII that address the pressure integrity of pump casings. The API standards define the applicable material, design, welding, heat treating, and inspection portions of the code. The API standards also define hydrostatic test pressures that are applicable to pumps. Although the design pressure and associated hydrostatic test requirements of ASME Section VIII apply to pump casings the API standards provide at least as stringent requirements using the maximum allowable working pressure (MAWP) for the pumps, which is typically higher than the design pressure of the discharge piping. This is because the pump casing is typically designed for different impellers for different applications and a large margin of safety is applied when determining the MAWP. The casings

of pumps built to API-610 and API-685 are hydrostatically tested to 1.5 times the MAWP which would exceed 1.3 times the MAWP specified by ASME Section VIII for vessels or 1.5 times the design pressure specified by ASME B31.3 for piping since the MAWP of the pumps casing typically exceeds the design pressure of system. (See Table 2.) Pumps with seals are not usually hydrostatically tested with the piping systems since seal leakage can exceed allowable hydrostatic leakage from the vessel or piping.

The inspection report indicates that the pump specifications are inadequate since they refer to the MAWP of the pump rather than the design pressure of other system components that would be specified by ASME B31.3 or ASME Section VIII. As part of the normal engineering design practice, BNI checks to ensure that the MAWP of the pumps procured is equal to or is greater than the design pressure of the system piping. Following the inspection, BNI compared the MAWP specified for the pumps against the design pressure of the discharge piping for the ITS pumps that have to comply with SRD Safety Criterion 4.2-2 and found that the MAWP exceeds the design pressure in all cases. While it is conceivable that the design pressure of the discharge piping could exceed the MAWP if there were some other pressure source than the calculated discharge head of the pump, this is not true of any of the WTP ITS pumps that have to comply with SRD Safety Criterion 4.2-2. A comparison of the design pressure of the discharge piping and the MAWP of the pumps used in ITS applications is provided in Table 1 included in the attachment to this response. The comparison shows that in all cases the MAWP is equal to or greater than the design pressure of the discharge piping. In addition, BNI notes that note 35 of Article UG-99 of ASME Section VIII states that: "The maximum allowable working pressure may be assumed to be the same as the design pressure when calculations are not made to determine the maximum allowable working pressure."

Initially in April 2002, an ABCN (24590-WTP-ABCN-ESH-02-016) was initiated to add API-610 and API-685 as implementing standards to Safety Criterion 4.2-2 of the SRD as proposed by the ISM meeting (CCN 032245) to address the confinement boundary. The Process Management Team reviewed the proposed ABCN and raised questions about the applicability of these standards to the full range of ITS pumps and about the desirability of using the API standard requirements in lieu of ASME Section VIII requirements for pump seals and confinement boundaries (CCN 033576). The ABCN was not approved and ASME Section VIII was retained as the standard for pump confinement boundaries.

Three pump specifications have been issued as numeric revisions to date that affect ITS pumps and refer to API-610 or API-685:

- 24590-PTF-3PS-MPC0-T0001, Rev. 0, Engineering Specification for PTF Hot Cell Slurry Pumps to Meet the Requirements of API Standard 610, Eighth Edition, 6/30/2003
- 24590-WTP-3PS-MCP0-T0001, Rev. 1, Engineering Specification for Centrifugal Pumps to Meet Requirements of API 610, Eighth Edition, and for Quality Levels QL-1 and QL-2, 5/30/2003
- 24590- WTP-3PS-MCP0-T0003, Rev. 0, Engineering Specification for Centrifugal Pumps to Meet Requirements of API 685, First Edition, and for Quality Levels QL-1 and QL-2, 6/4/2002

The API-610, Eighth Edition, and API-685, First Edition, standards refer to portions of ASME Section VIII and ASME B31.3. Because BNI considers that API-610 and API-685 contain or exceed the ASME Section VIII requirements that are necessary to meet the confinement boundary requirements of SRD Safety Criterion 4.2-2, BNI complied with SRD.

An ISM team is currently considering the addition of the API standards to the SRD for clarification purposes to provide indication of what portions of ASME Section VIII are required for pressure integrity

purposes. An authorization basis amendment request (ABAR) would be initiated, as appropriate, based on the outcome of the ISM team.

2) Reason for the Finding

Item 1

At the writing of this finding, BNI was in the process of revising the two identified design criteria documents and the two identified design guides to remove references to ASME Section III for SC-I, SC-II and SC-III (chemical release) piping systems.

24590-WTP-ABAR-ENS-03-002 for piping had been submitted to the OSR for approval on March 18, 2003. This ABAR would have included ASME Section III in the SRD. After further discussion with OSR and BNI's ASME B31.3 code consultant, BNI chose to withdraw the ABAR and revise all four design criteria and design guide documents to remove any reference to ASME Section III for SC-I, SC-II and SC-III (chemical release) piping systems. Along with the revision to the design criteria and guide documents, the PSAR would be revised and corrected by ABCN as supported by safety evaluation 24590-WTP-SE-ENS-03-704, Rev. 0. Written notification of this decision had not been disseminated to Plant Design's Stress and Support group who continued to work to the issued design criteria and guide documents.

In parallel with the design criteria and guide document revisions, 24590-WTP-SE-ENS-03-704, Rev. 0, was generated to remove the ASME Section III references from 24590-WTP-PSAR-EHS-01-002-01, Rev 0d. From the time of withdrawal of the ABAR to the submission of the ABCN, a DTD was never generated. As stated in the inspection report (A-03-OSR-RPPWTP-016), this deficiency was identified in 24590-WTP-CAR-QA-03-152, prompted by discussions held during the inspection.

Item 2

BNI considers that there was no valid finding, so there is no reason for a finding.

3) Corrective steps that have been taken and the results achieved

Item 1

- Revision 4 of 24590-WTP-GPP-QA-201, *Corrective Action*, dated May 7, 2003, includes caution on closure of external CARs without external agency approval of proposed corrective actions, and commitment made to DOE RP in CCN 042775.
- 24590-WTP-CAR-QA-03-152 was issued to track the correction of the noted deficiency.
- Safety Evaluation 24590-WTP-SE-ENS-03-704 has been performed to support the revisions to design criteria and design guide documents.
- An ABCN has been issued as part of 24590-WTP-SE-ENS-03-704 to reflect the pipe stress and pipe support design requirements, which are in accordance with the Safety Criterion 4.2-2 requirements for SC-I, SC-II, and SC-III (chemical release) piping and is currently in the approval cycle.
- 24590-WTP-DC-PS-01-001, *Pipe Stress Design Criteria*, has been revised and issued Rev 2.
- 24590-WTP-DC-PS-01-002, *Pipe Support Design Criteria*, has been revised and issued Rev 2.
- 24590-WTP-GPG-ENG-004, Rev 0, *Engineering Design Guide for Pipe Stress, Pipe Layout and Pipe Spacing*, has been revised and issued Rev. 1.

- Revision 4 of 24590-WTP-GPP-QA-201, *Corrective Action*, dated May 7, 2003, includes caution on closure of external CARs without external agency approval of proposed corrective actions.
- Calculation 24590-PTF-P6C-PWD-00012, Rev A (Committed), *RPP-WTP-PWD-WT/WU System Pipe Stress Analysis*, has been reviewed. No revision is required.
- Completed review of all stress and support calculations issued through September 29, 2003.
- Verified results from the revised and reissued calculations will not impact the current routing of the analyzed piping system and will not change issued fabrication/installation drawings.
- Calculation 24590-LAW-P6C-LCP-00001, Rev A (Committed), *LAW Pipe Stress Calculation Package*, this calculation has been revised to remove ASME Section III references. Calculation has been reviewed to verify the pipe stresses do not exceed the B31.3 allowable.

Item 2

No corrective steps have been taken since BNI's position is that there is no violation. 24590-WTP-CAR-QA-03-160 and the associated DTDs, which were initiated because of discussions during the inspection, will be closed or not issued.

4) **The corrective steps that will be taken to avoid further deficiencies**

Item 1

The following additional actions will be taken to correct the deficiencies and avoid further deficiencies:

- Calculation 24590-BOF-PHC-RLD-00001, Rev A (Committed), *Waste Transfer Lines Pipe Support Qualification*, will be revised to remove reference to ASME Section III from the Section 4 of the calculation. Actual calculation computation will not be effected by this change. This is purely editorial as the correct factors were used in the computations. To be signed 10/9/03.
- Calculation 24590-PTF-PHC-PWD-00018, Rev. A (Committed), *RPP-WTP Engineering Support Calculation*. This calculation is in the process of being revised to remove ASME III references. The calculation has been reviewed to verify the pipe stresses do not exceed the B31.3 allowable. The calculation will be revised and signed 10/9/03.
- Calculation 24590-PTF-PHC-PWD-00024, Rev A (Committed), *RPP-WTP Engineering Support Calculation*, currently under review. This calculation is in the process of being revised to remove ASME III references. The calculation has been reviewed to verify the pipe stresses to not exceed the B31.3 allowable. The calculation will be revised and signed 10/9/03.
- 24590-WTP-GPG-ENG-005, Rev 0; *Engineering Design Guide for Pipe Supports*, is currently under revision to make sure it complies with the newly issued design criteria document and issued by 10/24/03.

Item 2

No corrective steps have been taken since BNI's position is that there is no finding.

However, in order to avoid the specific issue that OSR identified regarding the potential difference between the pump MAWP and the ASME Section VIII design pressure, action will be taken to revise the applicable pump data sheets to include a requirement that MAWP of the casing be equal to or greater than the design pressure. The specified pump design pressure shall be equal to or greater than the design pressure of the discharge piping.

5) The date when full compliance with the applicable requirements will be achieved

Item 1

The corrective actions will be completed by October 31, 2003. The safety evaluation for the changes to the design criteria and design guides, 24590-WTP-SE-ENS-03-704, Rev. 0, has been issued, and the ABCN has been incorporated in the September 30, 2003 revision of the PSAR.

Item 2

Since it is BNI's position that there is no finding, no action is required to be in full compliance.

Attachment

Response to Finding A-03-OSR-RPPWTP-016-03-FIN

Partial listing of ASME Section VIII requirements in API-610, Eighth Edition

Article 2.2.1 of API-610 states that:

The stress used in design for any given material shall not exceed the values given for that material in Section II of the ASME Code. For cast materials, the factor specified in Section VIII, Division 1, of the ASME Code shall be applied. Pressure casings of forged steel, rolled and welded plate, or seamless pipe with welded cover shall comply with the applicable design rules of Section VIII, Division 1, of the ASME Code. Manufacturers' data report forms, third party inspections, and stamping, as specified in the code, are not required.

Article 2.11.1.6 of API-610 states that:

Materials, casting factors, and the quality of any welding shall be equal to those required by Section VIII, Division 1, of the ASME Code. The manufacturer's data report forms, as specified in the code, are not required.

Article 2.11.3.1 of API-610 states that:

Welding of piping, pressure containing parts, and wetted parts, as well as any weld repairs to such parts shall be performed and inspected by operators and procedures qualified in accordance with Section VIII, Division 1, and Section IX of the ASME Code.

Article 2.11.3.4.4 of API-610 states that:

Fabricated casings shall be post-weld heat treated in accordance with the requirements of Section VIII, Division 1, of the ASME Code.

Article 2.11.3.5.5 of API-610 states that:

All welds shall be heat treated in accordance with the methods described in Section VIII, Division 1, UW-40, of the ASME Code.

Article 4.2.2.2.2 of API-610, regarding radiography, states that:

The acceptance standard used for welded fabrications shall be Section VIII, Division 1, UW-51 (100 percent) and UW-52 (spot) of the ASME Code. The acceptance standard used for castings shall be Section VIII, Division 1, Appendix 7, of the ASME Code.

Article 4.2.2.3.2 of API-610, regarding ultrasonic inspection, states that:

The acceptance standard used for welded fabrications shall be Section VIII, Division 1, Appendix 12 of the ASME Code. The acceptance standard used for castings shall be Section VIII, Division 1, Appendix 7, of the ASME Code.

Article 4.2.2.4.2 of API-610, regarding magnetic particle inspection, states that:

The acceptance standard used for welded fabrications shall be Section VIII, Division 1, Appendix 6, and Section V, Article 25, of the ASME Code.

Article 4.2.2.5.2 of API-610, regarding liquid penetrant inspection, states that:

The acceptance standard used for welded fabrications shall be Section VIII, Division 1, Appendix 8, and Section V, Article 24, of the ASME Code. The acceptance standard used for castings shall be Section VIII, Division 1, Appendix 7, of the ASME Code.

Partial listing of ASME Section VIII requirements in API-685, First Edition

Article 6.3.1 of API-685 states that:

Unless deflection criteria dictates lower allowable stresses, the stress used in design for any given material shall not exceed the values given for that material (at the maximum operating temperature) in Section II of the ASME Code. For cast materials, the factor specified in Section VIII, Division 1, of the ASME Code shall be applied. Pressure casings of forged steel, rolled and welded plate, or seamless pipe with welded cover shall comply with the applicable design rules of Section VIII, Division 1, of the ASME Code. Manufacturers' data report forms, third party inspections, and stamping, as specified in the code, are not required.

Article 6.11.5 of API-685 states that:

Materials, casting factors, and the quality of any welding shall be equal to those required by Section VIII, Division 1, of the ASME Code. The manufacturer's data report forms, as specified in the code, are not required.

Article 6.13.1 of API-685 states that:

Welding of piping, pressure containing parts, and wetted parts, as well as any weld repairs to such parts, shall be performed and inspected by operators and procedures qualified in accordance with Section VIII, Division 1, and Section IX of the ASME Code.

Article 6.13.4.4 of API-685 states that:

Fabricated casings shall be post-weld heat treated in accordance with the requirements of Section VIII, Division 1, of the ASME Code.

Article 6.13.5.5 of API-685 states that:

All welds shall be heat treated in accordance with the methods described in Section VIII, Division 1, UW-40, of the ASME Code.

Article 8.2.2.2.2 of API-685, regarding radiography, states that:

The acceptance standard used for welded fabrications shall be Section VIII, Division 1, UW-51 (100 percent) and UW-52 (spot) of the ASME Code. The acceptance standard used for castings shall be Section VIII, Division 1, Appendix 7, of the ASME Code.

Article 8.2.2.3.2 of API-685, regarding ultrasonic inspection, states that:

The acceptance standard used for welded fabrications shall be Section VIII, Division 1, Appendix 12 of the ASME Code. The acceptance standard used for castings shall be Section VIII, Division 1, Appendix 7, of the ASME Code.

Article 8.2.2.4.2 of API-685, regarding magnetic particle inspection, states that:

The acceptance standard used for welded fabrications shall be Section VIII, Division 1, Appendix 6, and Section V, Article 25, of the ASME Code.

Article 8.2.2.5.2 of API-685, regarding liquid penetrant inspection, states that:

The acceptance standard used for welded fabrications shall be Section VIII, Division 1, Appendix 8, and Section V, Article 24, of the ASME Code. The acceptance standard used for castings shall be Section VIII, Division 1, Appendix 7, of the ASME Code.

Article 9.1.2.1.1 of API-685 states that:

The containment shell is by definition a pressure containing component and shall meet the requirements of 6.3 except as follows:

a. Section VIII, Division 2, of the ASME Boiler and Pressure Vessel Code may be utilized in lieu of Division 1 for design.

Table 1 Pump MAWP and System Design Pressures

Equipment	MAWP	Design Pressure
FRP-PMP-00001	400	
FRP-PZ-01726-S12A-03-01		400
FRP-PMP-00002A	400	
FRP-PZ-01727-S12A-03-01		182
FEP-PMP-00007A/B	400	
FEP-PZ-00004-S12A-02		183
FEP-PZ-00005-S12A-02		183
FEP-PMP-00008A/B	400	
		183
		183
HLP-PMP-00017A/B	400	
HLP-PX-00015-S12A-03		183
HLP-PX-00024-S12A-03		183
HLP-PMP-00019A/B	400	
HLP-PX-00023-S12A-03		133
HLP-PX-00028-S12A-03		133
HLP-PMP-00021	400	
HLP-PX-00101-S12A-03		125
RDP-PMP-00008A/B	400	
RDP-ZL-0014-00142-S12A-03		
RDP-ZL-0014-00145-S12A-03		85
UFP-PMP-00041A/B	400	
UFP-PX-00035-S14A-03		115
UFP-PX-00108-S14A-03		115
UFP-PMP-00042A/B	450	
UFP-PX-01771-S14A-10		165

Table 2 ASME Section VIII, ASME B31.3, API 610 & 685 Comparison

	ASME Section VIII	ASME B31.3	API 610 (& 685)
Design Pressure	UG-21 Most severe condition of coincident internal or external pressure expected during normal operation	301.2 Most severe condition of coincident internal or external pressure and temperature expected during service	1.4.9 (3.12) Term used by equipment designer and manufacturer. Purchaser's specification should avoid using this term.
MAWP	UG-98 Maximum internal or external pressure, including the hydrostatic head, together with the effect of any combination of loadings which are likely to occur. UG-99 Note 35 (see below)	322.6.3 Pressure relieving devices shall be in accordance with ASME Section VIII. The terms "design pressure" and "piping system" shall be substituted for "maximum allowable working pressure" and "vessel" respectively. Note 11(see below).	1.4.18 (3.28) The maximum continuous pressure for which the manufacturer has designed the equipment when the equipment is operating at the maximum allowable temperature
Hydro Testing	UG-99 Vessels designed for internal pressure shall be subjected to a hydrostatic test pressure which is at least equal to 1.3 times maximum allowable working pressure	345.4.2 The hydrostatic test pressure shall be not less than 1.5 times design pressure	4.3.2.1 (8.3.2.1) All pressure casing components shall be hydrostatically tested at a minimum of 1.5 times maximum allowable working pressure

Note 35- UG-99 states "The maximum allowable working pressure may be assumed to be the same as the design pressure when calculations are not made to determine the maximum allowable working pressure.

Note 11 – The design pressure for pressure relief is the maximum design pressure permitted, considering all components in the piping system.