MATERIAL SELECTION FOR PIPING SYSTEM

ENGINEERING TECHNICAL STANDARDS & PROCEDURES
PT KILANG PERTAMINA INTERNASIONAL
DIREKTORAT PROYEK INFRASTRUKTUR

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TABLE OF CONTENTS

DAFTAR ISI

1. SCOPE

1.1 This general specification provide the minimum materials of construction for the pressure envelope of piping as governed by the process services and supplements the requirements of piping codes ASME B31, and those of the ASME Boiler and Pressure Vessel Code. The materials are also subject to further requirements and limitations regarding chemical, mechanical and dimensional properties per specifications referenced in this standard.

1. LINGKUP

1.1 Spesifikasi umum ini memberikan *minimum material* konstruksi untuk tekanan *envelope* perpipaan sebagaimana diatur oleh proses *service* dan melengkapi persyaratan *code* perpipaan ASME B31, dan persyaratan dari ASME *Code Boiler and Pressure Vessel*. *Material* tersebut juga tunduk pada persyaratan dan batasan lebih lanjut terkait sifat kimia, mekanik dan dimensi sesuai spesifikasi yang dirujuk dalam standar ini.

2. CONFLICTS AND DEVIATIONS

2.1 Any conflicts between this standard and other applicable Engineering Technical Standards & Procedures (ETSP), or OWNER standard, codes, and forms shall be resolved in writing by OWNER.

2.2 All direct requests to deviate from this standard (ETSP) in writing to OWNER, who shall follow internal OWNER procedure and forward such requests to OWNER for approval.

2. KONFLIK DAN DEVIASI

2.1 Apabila terdapat konflik antara standar ini dengan *Engineering Technical Standards & Procedures* (ETSP) yang berlaku lainnya, atau standar PEMILIK, *codes* dan formulir, maka harus diselesaikan secara tertulis oleh PEMILIK.

2.2 Semua permintaan penggunaan standar yang berbeda dari standar ini (ETSP), harus diajukan kepada PEMILIK secara tertulis dengan mengikuti prosedur internal PEMILIK untuk mendapatkan persetujuan.

3. CODE & STANDARD AND REFERENCE DOCUMENT

The following Codes, Standard and Specifications apply to this specification. When an edition date is not indicated for a code or standard or any update in codes and standards in this specification document, the latest edition and addendum in force at the time of purchase shall apply. Material & equipment shall be as a specification or an equal approved by OWNER.

3. STANDAR & KODE DAN DOKUMEN REFERENSI

Kode, standar, dan spesifikasi berikut berlaku untuk spesifikasi ini. Kode dan standar harus menggunakan edisi yang terbaru atau edisi yang berlaku pada saat pembelian. *Material* & peralatan harus sesuai spesifikasi atau setara dengan yang disetujui oleh PEMILIK.

3.1 **PERTAMINA Standards**

MP2-ETS-PIP-GS-0001-01-2018	Pipe, Flange and Fitting Material Requirements
MP2-ETS-PIP-GS-0003-01-2018	General Notes Piping Material Specification
MP2-ETS-PIP-GS-0004-01-2018	Selection of Piping Valves

3.2 **Industry Codes and Standards**

- American Petroleum Institute (API)

API 5L	Specification for Line Pipe

- American Society of Mechanical Engineers

ASME B31.1	Power Piping
ASME B31.3	Process Piping

- National Standard of Corrosion Engineers (NACE)

NACE MR0103	Materials Resistant to Sulfide Stress Cracking In Corrosive Petroleum Refining Environments
NACE MR0175/ISO15156	Materials for Use in H2-Containing Environments in Oil and Gas Production

- International Organization for Standardization (ISO)

ISO 10358	Plastics Pipes and Fittings-Combined Chemical Resistance Classification Table

- NORSOK Standards

3.1 **Standar PERTAMINA**

MP2-ETS-PIP-GS-0001-01-2018	*Pipe, Flange and Fitting Material Requirements*
MP2-ETS-PIP-GS-0003-01-2018	*General Notes Piping Material Specification*
MP2-ETS-PIP-GS-0004-01-2018	*Selection of Piping Valves*

3.2 **Kode dan Standar Industri**

- *American Petroleum Institute* (API)

API 5L	*Specification for Line Pipe*

- *American Society of Mechanical Engineers*

ASME B31.1	*Power Piping*
ASME B31.3	*Process Piping*

- National Standard of Corrosion Engineers (NACE)

NACE MR0103	*Materials Resistant to Sulfide Stress Cracking In Corrosive Petroleum Refining Environments*
NACE MR0175/ISO15156	*Materials for Use in H2-Containing Environments in Oil and Gas Production*

- International Organization for Standardization (ISO)

ISO 10358	*Plastics Pipes and Fittings-Combined Chemical Resistance Classification Table*

- NORSOK Standards

NORSOK M-001 Materials Selection

NORSOK M-001 *Materials Selection*

4. PHILOSOPHY OF MATERIALS SELECTION

4.1 Robust materials selection shall be made to ensure operational reliability and integrity throughout the design life of the pipeline, piping system or process equipment. Reviewing mechanical property requirements and corrosion resistanceis the first step in the selection process.

4.2 The main criteria for materials selection shall be:

- Health and safety of personnel and the public, and protectionof the environment.
- Optimization of cost versus projected design life.
- Consideration of a fall back or repair position.
- Effect on product and process contamination.

4.2.1. Health, Safety and Protection of the Environment

The safety of plant personnel, protection of the environment, conservation of resources, and preservation of assets shall be key objectives in selecting materials of construction.

Materials of construction shall be suitable for the intended service, havingpredictable deterioration rates for the process stream compositions and external environments, at design temperature and pressure, through the design life of the component.

4. FILOSOFI DARI PEMILIHAN *MATERIAL*

4.1 Pemilihan *material* yang kuat harus dilakukan untuk memastikan kehandalan dan integritas operasional sepanjang umur desain pipa, sistem perpipaan atau peralatan proses. Meninjau persyaratan sifat mekanik dan ketahanan korosi adalah langkah pertama dalam proses pemilihan.

4.1 Kriteria utama pemilihan *material* adalah:

- Kesehatan dan keselamatan personil dan publik, dan perlindungan lingkungan.
- Optimalisasi biaya *versus* umur desain yang diproyeksikan.
- Pertimbangan *fall back* atau posisi perbaikan.
- Efek pada produk dan proses kontaminasi.

4.2.1. Kesehatan, Keselamatan, dan Perlindungan Lingkungan

Keselamatan personil pabrik, perlindungan lingkungan, konservasi sumber daya, dan pelestarian aset harus menjadi tujuan utama dalam memilih *material* konstruksi.

Material konstruksi harus sesuai untuk *service* yang dimaksudkan, memiliki *rates* kerusakan yang dapat diprediksi untuk komposisi aliran proses dan lingkungan eksternal, pada suhu dan tekanan desain, selama umur desain

Materials shall be selected to prevent catastrophic failures or major environmental releases. Selected materials shall have low risk of rapid damage mechanisms, such as brittle fracture, stress corrosion cracking (SCC), low cycle fatigue, overload, etc., and have predictable mechanical and corrosion performance.

For pressure containment, only approved materials that are included in recognized codes and specifications, such as API, ASME and ASTM shallbe used.

4.2.2. Cost versus Projected Design Life

Materials of construction shall be selected considering the balance between initial capital expenses, operational integrity reliability, and future inspection and maintenance expenses.

Materials of construction shall be selected to provide a minimum design life of 20 years and predictable performance on an acceptable cost basis. The selection should minimize the risk of short design life and unexpected shutdowns; review impacts on maintenance, expense costs and repair time; and review any potential effects on product and processcontamination.

komponen.

Material harus dipilih untuk mencegah *catastrophic failures* atau *major environmental releases*. *Material* yang dipilih harus memiliki risiko rendah terhadap mekanisme kerusakan yang cepat, seperti *brittle fracture*, *stress corrosion cracking* (SCC), *low cycle fatigue*, kelebihan beban, dan lain-lain, dan memiliki kinerja mekanis dan korosi yang dapat diprediksi.

Untuk penahanan tekanan, hanya *material* yang disetujui yang termasuk dalam *code* dan spesifikasi yang diakui, seperti API, ASME dan ASTM yang akan digunakan.

4.2.2. Biaya *versus* Umur Desain yang Diproyeksikan

Material konstruksi harus dipilih dengan mempertimbangkan keseimbangan antara biaya awal, kehandalan integritas operasional, dan biaya inspeksi juga pemeliharaan di masa mendatang.

Material konstruksi harus ditentukan untuk memberikan umur rencana minimum 20 tahun dan kinerja yang dapat diprediksi berdasarkan biaya yang dapat diterima. Pemilihan harus meminimalkan risiko umur desain yang pendek dan penghentian yang tidak terduga; meninjau dampak pada pemeliharaan, biaya pengeluaran dan waktu perbaikan; dan meninjau setiap efek potensial pada produk dan proses kontaminasi.

In cases were a service life that significantly exceeds design life can be justifiably foreseen, and where materials selection options identified for thedesign life are cost limited and are only marginally adequate; then the useof a service life based total cost of ownership can be made. If more expensive materials options are proven to be the economically superior option, then these shall be proposed as the primary choice.

Dalam kasus di mana umur *service* yang secara signifikan melebihi umur desain dapat diperkirakan secara wajar, dan di mana pilihan pemilihan *material* yang diidentifikasi untuk umur desain adalah biaya terbatas dan hanya sedikit memadai; maka penggunaan total biaya kepemilikan berdasarkan masa pakai dapat dilakukan. Jika pilihan *material* yang lebih mahal terbukti menjadi pilihan yang lebih unggul secara ekonomi, maka ini harus diusulkan sebagai pilihan utama.

4.2.3. Repairability or Fall Back Position

Materials of construction shall be capable of being repaired with reasonable effort in an acceptable (minimum) amount of downtime or practical means of altering or bypassing the affected equipment shall be possible until repairs can be made.

Repairability or fallback position should consider replacement lead times and ease of maintenance, inspection, and repair.

4.2.3. Dapat diperbaiki atau Posisi *Fall Back*

Material konstruksi harus mampu diperbaiki dengan upaya yang wajar dalam jumlah waktu henti (*minimum*) yang dapat diterima atau cara praktis untuk mengubah atau melewati peralatan yang terkena dampak harus dimungkinkan sampai perbaikan dapat dilakukan.

Kemampuan untuk diperbaiki atau posisi mundur harus mempertimbangkan waktu tunggu penggantian dan kemudahan perawatan, inspeksi, dan perbaikan.

4.2.4. Product and Process Contamination

Materials selection shall consider the impact of corrosion rates, surface area, recycle stream rates, solubility, effect of corrosion products on corrosion, and other factors on contamination of the process stream.

4.2.4. Kontaminasi Produk dan Proses

Pemilihan *material* harus mempertimbangkan dampak laju korosi, luas permukaan, *recycle stream rates*, *solubility*, pengaruh produk korosi terhadap korosi, dan faktor lain terhadap kontaminasi aliran proses.

5. MATERIAL SELECTION CRITERIA

5.1 Materials Selection based on Design Temperature

5.1.1. Basic materials selection shall be made on the basis of the design temperature of the pipeline, piping system or process equipment. Table 1 provides an overview of suitable materials of construction for different temperature ranges.

5.1.2. Note that the temperature below which impact testing of carbon steel is mandated is different for pipelines, piping and process equipment.

5.1.3. The minimum design metal temperature (MDMT) shall be established based on all foreseeable operating conditions and possible upset conditions such as auto-refrigeration and shock chilling. The MDMT for carbon steel and low alloy steel pipelines, piping and process equipment shall not be warmer than 0°C.

5.2 Materials selection based on process environment

5.2.1. Materials selection shall be based on an evaluation of all potential degradation mechanisms. All internal and external media shall be considered for the entire design life. Consider the following major degradation types when selecting materials of construction:

a) Environmental cracking

b) Thinning (general or localized)

5. KRITERIA PEMILIHAN *MATERIAL*

5.1 Pemilihan *Material* berdasarkan Suhu Desain

5.1.1. Pemilihan *material* dasar harus dilakukan berdasarkan suhu desain pipa, sistem perpipaan atau peralatan proses. Tabel 1 memberikan gambaran tentang *material* konstruksi yang cocok untuk rentang suhu yang berbeda.

5.1.2. Perhatikan bahwa suhu di bawah yang dipersiapkan untuk pengujian *impact* baja karbon berbeda untuk jalur pipa, perpipaan, dan peralatan proses.

5.1.3. *Minimum design metal temperature* (MDMT) harus ditetapkan berdasarkan semua kondisi operasi yang dapat diperkirakan dan kemungkinan kondisi gangguan seperti pendinginan otomatis dan pendinginan kejut. MDMT untuk pipa baja karbon dan baja paduan rendah, perpipaan dan peralatan proses tidak boleh lebih hangat dari 0°C.

5.2 Pemilihan *material* berdasarkan lingkungan proses

5.2.1. Pemilihan *material* harus didasarkan pada evaluasi semua mekanisme degradasi potensial. Semua media internal dan eksternal harus dipertimbangkan untuk seluruh umur desain. Pertimbangkan jenis degradasi utama berikut ketika memilih *material* konstruksi:

a) Environmental cracking

b) Pengikisan (umum atau lokal)

c) Mechanical Damage

d) Thermal damage

e) Swelling of non-metallics

f) UV degradation of non-metallics

5.2.2. For corrosive services, additional corrosion control measures shall be considered.

5.2.3. When assessing materials for pipelines, piping systems, and process equipment in contact with the service environments listed in Table 2, the impacts of stagnation and intermittent flow (process induced or due to equipment cycling), shall be considered. If the basic materials of construction for the fluids in question cannot adequately meet the intermittent conditions, higher grade materials shall be used.

5.2.4. Piping material for process, water services, utilites, fire fighting system andnon-process sewage system shall be as indicated in Table 3.

5.3 Special Considerations

5.3.1. Wet Sour Service

a) The following components, when purchased in accordance with the Purchase Specifications shown, are considered resistant to sulfide stress cracking:

- Pipe purchased.
- Fittings purchased.
- Flanges purchased.

b) Pipe, fittings, or flanges for use in

c) Kerusakan mekanis

d) Kerusakan termal

e) *Swelling* non-logam

f) Degradasi UV non-logam

5.2.2. Untuk *service* korosif, tindakan pengendalian korosi tambahan harus dipertimbangkan.

5.2.3. Ketika menilai *material* untuk pipa, sistem perpipaan, dan peralatan proses yang bersentuhan dengan lingkungan *service* yang tercantum dalam Tabel 2, dampak stagnasi dan aliran terputus-putus (proses yang disebabkan atau karena siklus peralatan), harus dipertimbangkan. Jika *material* dasar konstruksi untuk fluida yang bersangkutan tidak dapat memenuhi kondisi intermiten secara memadai, *material* dengan kadar yang lebih tinggi harus digunakan.

5.2.4. *Material* perpipaan untuk proses, *service* air, utilitas, sistem pemadam kebakaran dan sistem pembuangan limbah non-proses harus seperti yang ditunjukkan pada Tabel 3.

5.3 Pertimbangan Khusus

5.3.1. Layanan Asam Basah

a) Komponen berikut, bila dibeli sesuai dengan Spesifikasi Pembelian yang ditunjukkan, dianggap tahan terhadap *sulfide stress cracking*:

- Pembelian Pipa.
- Pembelian *fitting*.
- Pembelian *flange*.

b) Pipa, *fitting*, atau *flange* untuk

wet sour services where sulfide stress cracking is a possibility and not purchased to any of the above specifications shall meet the requirements of NACE MR0175/ISO 15156.

c) The following components, when purchased in accordance with the Purchase Specifications shown, are considered resistant to hydrogen induced cracking:

- Seamless pipe purchased to API SPEC 5L, ASTM A106 Grade B, or ASTM A333 Grade 6.

d) Piping, fittings, or flanges not meeting the requirements of this Section shall not be used in wet, sour services where hydrogen induced cracking is a possibility.

5.3.2. Stainless Steels

a) The minimum acceptable austenitic stainless steel is type 316 or 316L (UNS S31600 or UNS S31603).

b) Solid austenitic stainless steel type 304 or 304L is not permitted for piping or equipment due to external chloride stress corrosion cracking concerns.

c) Austenitic stainless steel shall not be used in chloride environments containing more than 50 ppm chloride at temperatures above 50°C. For applications above this threshold temperature, contact the Materials Engineering Standards

digunakan dalam layanan asam basah di mana kemungkinan *sulfidestress cracking* dan tidak dibeli dengan spesifikasi di atas harus memenuhi persyaratan NACE MR0175/ISO 15156.

c) Komponen berikut, bila dibeli sesuai dengan Spesifikasi Pembelian yang ditunjukkan, dianggap tahan terhadap *cracking* akibat hidrogen:

- Pembelian *seamless pipe* ke API SPEC 5L, ASTM A106 *Grade* B, atau ASTM A333 *Grade* 6.

d) Perpipaan, *fitting*, atau *flange* yang tidak memenuhi persyaratan Bagian ini tidak boleh digunakan pada *service* basah dan asam di mana kemungkinan terjadinya *cracking* akibat hidrogen.

5.3.2. *Stainless steel*

a) *Austenitic stainless steel minimum* yang dapat diterima adalah tipe 316 atau 316L (UNS S31600 atau UNS S31603).

b) *Austenitic stainless steel* padat tipe 304 atau 304L tidak diizinkan untuk perpipaan atau peralatan karena masalah *cracking* korosi tegangan klorida eksternal.

c) *Austenitic stainless steel* tidak boleh digunakan di lingkungan klorida yang mengandung lebih dari 50 ppm klorida pada suhu di atas 50°C. Untuk aplikasi di atas suhu ambang batas ini, hubungi Ketua Komite Standar Teknik

Committee Chairman.

d) Duplex stainless steel shall not be used in sour serviceapplications.

e) Ferritic or martensitic stainless steels containing 12% chromium shall not be used for pressure boundary materials except for pumpcasings and/ or valve stems.

5.3.3. High Temperature Hydrogen Service

a) Piping

- All valves shall have API Trim Number 5.
- All valve bodies shall be RT inspected to meet Level 2 RT requirements specified in MSS SP54.
- Carbon steel above 200°C (400°F) and all 1.25Cr-0.5Mo and 2.25Cr-1.0Mo piping shall be post weld heat treated.
- Temper resistant 2.25Cr-1.0Mo filler metal shall not beused for piping construction.

b) Vessels

- 2.25Cr-1.0Mo vessel fabrication shall follow API RP 934-A.
- 2.25Cr-1.0Mo materials shall not be used to fabricatevessels in cyclic services such as coke drums.
- Fabrication of 1.25Cr-0.5Mo vessels with shell thickness between 25 - 100 mm (1”-4”)

Material.

d) *Duplex stainless steel* tidak boleh digunakan dalam aplikasi layanan asam.

e) *Ferritic* atau *martensitic stainless steel* yang mengandung 12% kromium tidak boleh digunakan untuk *material* batas tekanan kecuali untuk *casing* pompa dan/ atau *valve stems*.

5.3.3. *Service* Hidrogen Suhu tinggi

a) Perpipaan

- Semua *valve* harus memiliki API *Trim* Nomor 5.
- Semua *valve bodies* harus diperiksa RT untuk memenuhi persyaratan *Level* 2 RT yang ditentukan dalam MSS SP54.
- Baja karbon di atas 200°C (400°F) dan semua perpipaan 1.25Cr-0.5Mo dan 2.25Cr-1.0Mo harus diberi *post weld heat treated*.
- Logam pengisi *temper resistant* 2.25Cr-1.0Mo yang tidak boleh digunakan untuk konstruksi perpipaan.

b) *Vessels*

- 2.25Cr-1.0Mo fabrikasi *vessel* harus mengikuti API RP 934-A.
- *Material* 2.25Cr-1.0Mo tidak boleh digunakan untuk fabrikasi *vessel* dalam *service* siklus seperti *coke drum*.
- Fabrikasi *vessel* 1,25Cr-0,5Mo dengan ketebalan *shell* antara 25 - 100 mm (1"-

and a maximum operating temperature below 440°C (825°F) shall follow API RP 934-C.

- For low alloy steel vessels over 100 mm (4”) thick in high temperature hydrogen services, 2.25Cr-1.0Mo steels or better shall be used.

4") dan suhu operasi maksimum di bawah 440°C (825°F) harus mengikuti API RP 934-C.

- Untuk *vessel* baja paduan rendah dengan ketebalan lebih dari 100 mm (4”) dalam *service* hidrogen suhu tinggi, baja 2.25Cr-1.0Mo atau lebih baik harus digunakan.

Table 1 – Materials Selection based on Design Temperature (1)

Tabel 1 – Pemilihan Material berdasarkan Suhu Desain (1)

Design Temperature *Suhu Desain*				
$T_d \leq$ -101°C	**-101°C < $T_d \leq$ -45°C**	**- 45°C < $T_d \leq T_{impact}$**	**$T_{impact} < T_d \leq$ 400°C**	**T_d > 400°C**
$T_d \leq$ -150°F	**-150°F < $T_d \leq$ -49°F**	**- 49°F < $T_d \leq T_{impact}$**	**$T_{impact} < T_d \leq$ 800°F**	**T_d > 800°F**
• Austenitic stainless steel (2) • Aluminum	• Austenitic stainless steel • 3.5% Ni steel • 9% Ni steel	• Low temperature carbon steel • Impact tested carbon steel	• Carbon steel (3)	• Low alloy steel (4) • High temperature alloys (5)

T_d Design temperature
Desain Suhu

T_{impact} Temperature below which impact testing of carbon steel is mandated by MP2-ETS-PIP-GS-0003-01-2018 and MP2-ETS-PIP-GS- 0010-01-2018 respectively.
Suhu pengujian yang mana di bawah dampak baja karbon masing-masing disesuaikan dengan MP2-ETS-PIP-GS-0003-01-2018 dan MP2-ETS-PIP-GS-0010-01-2018.

(1) Note that as a second step the process environment needs to be considered. Modify the basic materials selection from this table according to the corrosivity of the process environment.
Perhatikan bahwa sebagai langkah kedua lingkungan proses perlu dipertimbangkan. Modifikasi pemilihan material dasar dari tabel ini sesuai dengan korosivitas lingkungan proses.

(2) Impact testing of austenitic stainless steel welds is required below -101°C for piping and below -196°C for pressure vessels.
Dampak pengujian austenitic stainless steel weld diperlukan di bawah -101°C untuk perpipaan dan di bawah -196°C untuk tekanan vessel.

(3) Only in services where gaseous hydrogen (H_2) is not present. Refer to API RP 941 for materials selection in the presence of hydrogen. Carbon steel shall not be used above 400°C (800°F) which isconsidered the onset temperature for graphitization (see API RP 571).
Hanya dalam service di mana gas hidrogen (H2) tidak ada. Lihat API RP 941 untuk pemilihan material dengan adanya hidrogen. Baja karbon tidak boleh digunakan di atas 400°C (800 °F) yang dianggap sebagai suhu awal untuk graphitization (lihat API RP 571).

(4) Selected based on required mechanical or creep strength.
Dipilih berdasarkan kekuatan mekanik atau creep yang dibutuhkan.

(5) For fired heater tube metal temperatures higher than 371°C (700°F), austenitic stainless steel type 347 shall be used. For reboiler/ fired heater inlet and outlet piping, the minimum metallurgy shall be 9Cr-1Mo steel.
Untuk suhu fired tube metal lebih tinggi dari 371°C (700 °F), austenitic stainless steel tipe 347 harus digunakan. Untuk pipa saluran masuk dan keluar reboiler/ fired heater, minimum metalurgi harus baja 9Cr-1Mo.

Table 2 – Materials Selection based on Process Environment
Tabel 2 – Pemilihan Material berdasarkan pada Lingkungan Proses

Environment *Lingkungan*	**Conc.%** *Kons.%*	**Temp.(°C)** *Suhu. (°C)*	**Max. Piping Velocity (m/s)** *Maks. Kecepatan pipa (m/s)*	**Basic Material** *Mateial Dasar*	**Remarks** *Keterangan*
Acid, hydrochloric *Asam, klorida*	0 - 5	ambient *lingkungan*	1.5	Alloy 400 *Paduan* 400	
	0 - 37	0 - 82	1.5	Alloy B2 *Paduan* B2	
	32 - 37	0 - 50	1.5	Alloy C-276 *Paduan* C-276	
	0 - 37	ambient *lingkungan*	2.4	PTFE/ PFA lined, carbon steel *Setara PTFE/ PFA, baja karbon*	
	0 - 37	0 - 55	2.4	PVC	
	0 - 40	0 - 60	2.4	PE	PE-HD or PE-X
	0 - 37	ambient *lingkungan*	2.4	PP	
	0 - 37	ambient *lingkungan*	2.4	FRP (vinyl ester)	
Acid, hydrofluoric *Asam, hidrofluorik*	0 - 96	0 - 65	2.0	Alloy 400 *Paduan* 400	PWHT (1) to avoid SCC
	97 - 99	66 - 150	2.0	Alloy 400 *Paduan* 400	
	97 - 99	0 - 65	1.0	Carbon steel *Baja karbon*	Base metal: %C > 0.18wt.% & %Cu + %Ni <0.15 wt.% Weld metal: %Cu + %Ni + %Cr <0.15 wt.% PWHT to avoid SCC
	0 - 75	ambient	2.4	PE	PE-HD or PE-X

Environment *Lingkungan*	**Conc.%** *Kons.%*	**Temp.(°C)** *Suhu. (°C)*	**Max. Piping Velocity (m/s)** *Maks. Kecepatan pipa (m/s)*	**Basic Material** *Mateial Dasar*	**Remarks** *Keterangan*
		lingkungan			
Acid, nitric *Asam, nitrat*	0 - 70	0 - 80	4.0	316L	
	71 - 95	0 - 50	4.0	316L	
	0 - 30	ambient *lingkungan*	2.4	PTFE/ PFA lined, carbon steel *Setara PTFE/ PFA, baja karbon*	
	0 - 30	ambient *lingkungan*	2.4	PE	PE-HD or PE-X
Acid, phosphoric *Asam, fosfat*	0 - 85	0 – 70	4.0	316L	
	0 - 85	ambient *lingkungan*	2.4	PTFE/ PFA lined, carbon steel *Setara PTFE/ PFA, baja karbon*	
	0 - 85	0 - 49	2.4	PVC	
	0 - 80	0 - 80	2.4	PP	See ISO 10358 *Lihat ISO 10358*
	0 - 50	-30 - 60	2.4	PE	PE-HD or PE-X
Acid, sulfuric *Asam, sulfat*	0 - 103	0 - 50	4.0	Alloy 20 *Paduan* 20	
	101 - 102	0 - 50	1.0	Carbon Steel *Baja karbon*	Air-free Shall not be flushed with water to avoid severe corrosion damage. *Air-free Harus tidak boleh dibilas dengan air untuk menghindari kerusakan korosi yang parah.*
	90 - 103	0 - 50	1.0	316L	
	0 - 100	0 - 250	5.0	High silicon iron	
	0 - 100	0 - 200	0 - 2.4	PTFE/ PFA lined, carbon steel *Setara PTFE/*	

Environment *Lingkungan*	**Conc.%** *Kons.%*	**Temp.(°C)** *Suhu. (°C)*	**Max. Piping Velocity (m/s)** *Maks. Kecepatan pipa (m/s)*	**Basic Material** *Mateial Dasar*	**Remarks** *Keterangan*
				PFA, baja karbon	
	50 - 90	1 - 20	2.4	PVC	See ISO 10358 *Lihat ISO 10358*
	50 - 90	1 - 60	2.4	CPVC	See ISO 10358 *Lihat ISO 10358*
	0 - 80	1 - 40	2.4	PP	See ISO 10358 *Lihat ISO 10358*
	0 - 80	1 - 40	2.4	PE-HD	See ISO 10358 *Lihat ISO 10358*
Acid, sulfamic *Asam, sulfamat*	0 - 20	0 - 93	4.6	Alloy 20 *Paduan* 20	Welded with Alloy 625 filler wire *Di las dengan filler wire Paduan 625*
	0 - 100	0 - 200	2.4	PTFE/ PFA lined, carbon steel *Setara PTFE/ PFA, baja karbon*	
ADIP (Amino-diisopropanol) ADIP (*Amino-diisopropanol*)	10 - 30	0 - 150	0.9	Carbon steel *Baja karbon*	No copper or aluminum alloys *Tidak ada paduan tembaga atau almunium*
Air, Plant *Udara, Kilang*	-	0 - 200	-	Galvanized steel *Baja galvanis*	
	-	0 - 400	-	Carbon steel *Baja karbon*	
	-	0 - 90	2.4	PP	
	-	0 - 60	2.4	PE	PE-HD or PE-X
Air, Instrument	-	0 - 200	18.3	Galvanized steel	

Environment *Lingkungan*	**Conc.%** *Kons.%*	**Temp.(°C)** *Suhu. (°C)*	**Max. Piping Velocity (m/s)** *Maks. Kecepatan pipa (m/s)*	**Basic Material** *Mateial Dasar*	**Remarks** *Keterangan*
Udara, Instrumentasi				*Baja galvanis*	
	-	0 - 400	18.3	Carbon steel *Baja karbon*	
	-	0 - 400	18.3	316L	Instrument tubing only *Hanya tubing instrument*
Ammonia anhydrous *Amonia anhidrat*	0 - 100	0 - 50	4.6	Carbon steel *Baja karbon*	No copper alloys *Tidak ada paduan tembaga*
Amine, lean *Amine, lemah*	-	0 - 190	3.0	Carbon steel *Baja karbon*	
	-	0 - 190	4.0	316L	
	-	0 - 70	2.4	PP lined carbon steel *Baja karbon setara PP*	
Amine, rich *Amine, rich*	-	0 - 190	1.5	Carbon steel *Baja karbon*	
	-	0 - 190	4.0	316L	
	-	0 - 70	2.4	PP lined carbon steel *Baja karbon setara PP*	
Carbon dioxide, Dry *Karbon dioksida, Kering*	0 - 100	0 - 400	18.3	Carbon steel *Baja karbon*	
	0 - 100	0 - 100	2.4	FRP (epoxy resin)	
Carbon dioxide, Wet Karbon dioksida, Basah	0 - 100	0 - 93	10.0	316L	
	0 - 100	0 - 60	2.4	FRP (vinyl ester resin)	
Chemicals, injection, corrosion, and scale inhibitor,	0 - 100	0 - 93	4.6	316L	Also applies to permanent chemical

Environment *Lingkungan*	**Conc.%** *Kons.%*	**Temp.(°C)** *Suhu. (°C)*	**Max. Piping Velocity (m/s)** *Maks. Kecepatan pipa (m/s)*	**Basic Material** *Mateial Dasar*	**Remarks** *Keterangan*
boiler treatment *Bahan kimia, injeksi, korosi, dan skala inhibitor, perawatan boiler*					storage tanks *Juga berlaku untuk tangki penyimpanan bahan kimia permanen*
Chlorine, Dry *Klorin, Kering*	0 - 100	0 - 70	18.3	Carbon steel *Baja karbon*	
Chlorine, Wet *Klorin, Basah*	0 - 100	0 - 70	10.0	Alloy C-276 *Paduan* C-276	> 2000 ppm water *Air > 2000 ppm*
Chlorine/ water (2) *Klorin/ Air* (2)	0 – 10	0 - 160	2.4	PTFE/ PFA lined, carbon steel *Setara PTFE/ PFA, baja karbon*	
	0 - 10	0 - 70	2.4	CPVC	
	0 - 10	0 - 49	2.4	PVC	
	0 - 10	0 - 60	2.4	PE	PE-HD or PE-X
	0 - 10	0 - 60	2.4	FRP (vinyl ester)	
Crude oil or products *Products atau Minyak mentah*	-	-	-	-	See Hydrocarbon *Lihat Hidrokarbon*
Freon *Freon*	0 - 100	0 - 70	3.0	Carbon steel *Baja karbon*	
Hydraulic oil *Oli hidrolik*	-	-	4.0	316/ 316L	
	-	-	4.0	Alloy 400 *Paduan* 400	Offshore only *Hanya Offshore Lepas pantai*
	-	0 - 160	4.0	PTFE/ PFA linedcarbon steel *Setara PTFE/ PFA, baja*	

Environment *Lingkungan*	**Conc.%** *Kons.%*	**Temp.(°C)** *Suhu. (°C)*	**Max. Piping Velocity (m/s)** *Maks. Kecepatan pipa (m/s)*	**Basic Material** *Mateial Dasar*	**Remarks** *Keterangan*
				karbon	
	-	0 - 60	4.0	FRP (vinyl ester)	
Hydrocarbon, upstream(3), liquids, < 30mg/l solids *Hidrokarbon, upstream/ hulu (3), cairan, <30mg / l padatan*	-	0 - 275	6.0	Carbon steel (4) *Baja karbon* (4)	
	-	0 - 400	> 7.0	Corrosion resistant alloys (CRAs) (4)	See NACE MR0175 / ISO 15156 *Lihat NACE MR0175 /ISO 15156*
	-	0 - 70	2.4	PE-HD lined carbon steel (5) *Baja karbon (5) setara PE-HD*	See ISO 23936-1 *Lihat* ISO 23936-1
	-	0 - 65	2.4	RTP (6)	See API 15S *Lihat* API 15S
	-	0 - 100	2.4	FRP (epoxy resin) FRP (*epoksi resin*)	
Hydrocarbon, upstream(3), liquids, containing sand *Hidrokarbon, upstream/ hulu (3), cairan, mengandung pasir*	-	0 - 275	5.0	Carbon steel (4) *Baja karbon* (4)	
	-	0 - 400	7.0	Corrosion resistant alloys (CRAs) (4)	
Hydrocarbon, upstream (3), liquids, large quantity of mud/ silt (7) *Hidrokarbon, upstream/ hulu (3), cairan, lumpur/ endapan lumpur dalam jumlah besar (7)*	-	0 - 275	4.0	Carbon steel (4) *Baja karbon* (4)	
	-	0 - 400	4.0	Corrosion resistant alloys (CRAs) (4)	See NACE MR0175 / ISO 15156, part 3. *Lihat* NACE MR0175 / ISO 15156, *bagian* 3.
Hydrocarbon, upstream(3),	-	0 - 275	60.0	Carbon steel (4)	Non-corrosive service

Environment *Lingkungan*	**Conc.%** *Kons.%*	**Temp.(°C)** *Suhu. (°C)*	**Max. Piping Velocity (m/s)** *Maks. Kecepatan pipa (m/s)*	**Basic Material** *Mateial Dasar*	**Remarks** *Keterangan*
single-phase gas *Hidrokarbon, upstream/ hulu (3), gas single-phase*				*Baja karbon* (4)	*Non- service korosi*
	-	0 - 275	15.0	Carbon steel (4) *Baja karbon* (4)	Corrosive service *Service korosi*
Hydrocarbon, upstream (3), two-phase, < 30 mg/l particles *Hidrokarbon, upstream/ hulu (3), two-phase, partikel < 30 mg/l*	-	0 - 275	25.0	Carbon steel (4) *Baja karbon* (4)	Non-corrosive service *Non- service korosi*
	-	0 - 275	10.0	Carbon steel (4) *Baja karbon* (4)	Corrosive service *Service korosi*
	-	0 - 400	25.0	Corrosion resistant alloys (CRAs) (4)	Corrosive service See NACE MR0175 / ISO 15156, part 3. *Lihat service korosi NACE MR0175 / ISO 15156, bagian 3.*
Hydrocarbon, refining,liquids or gas, sour *Hidrokarbon, penyulingan, cairan atau gas, asam*	-	0 - 275	-	Carbon steel 1.25Cr-0.5Mo (8), 2.25Cr-1.0Mo (8) *Baja karbon* 1.25Cr-0.5Mo (8), 2.25Cr-1.0Mo (8)	
	-	> 275	-	9.0Cr-1.0Mo (9)	H2-free *Bebas*-H2
	-	> 260	-	316/ 316L	H2 present *Disiapkan* H2
Hydrocarbon, refining,liquids or gas, sweet *Hidrokarbon, penyulingan, cairan atau gas, sweet*	-	0 - 400	-	Carbon steel *Baja karbon*	
Hydrocarbon, refining, crude unit overhead line *Hidrokarbon, penyulingan, cairan atau gas, unit saluran*	-	0 - 130	22.8	Carbon steel *Baja karbon*	
	-	0 - 130	45.7	Alloy C-276 clad	

Environment *Lingkungan*	**Conc.%** *Kons.%*	**Temp.(°C)** *Suhu. (°C)*	**Max. Piping Velocity (m/s)** *Maks. Kecepatan pipa (m/s)*	**Basic Material** *Mateial Dasar*	**Remarks** *Keterangan*
overhead crude				carbon steel *Paduan C-276 berlapis baja karbon*	
Hydrogen *Hidrogen*	0 - 100	0 - 200	18.3	Carbon steel *Baja karbon*	
	0 - 100	> 200	18.3	Carbon steel or low alloy steel *Baja karbon atau baja paduan rendah*	See API RP941 *Lihat* API RP941
Hypochlorite (sodium or calcium) *Hipoklorit (natrium atau kalsium)*	0 - 12.5	0 - 80	2.4	CPVC	See ISO 10358 *Lihat* ISO 10358
	0 - 15	0 - 60	2.4	PTFE/ PFA lined carbon steel *Setara PTFE/ PFA, baja karbon*	
	0 - 5	0 - 49	5.0	FRP (epoxy-aromatic cured) FRP (*penyumbatan epoxy-aromatic*)	Clear solutions, without suspended solids *Solusi yang jelas, tanpa padatan tersuspensi*
LPG / NGL	-	> 0	4.0	Carbon steel *Baja karbon*	
	-	Ambient	2.4	PVC	
	-	0 - 50	2.4	PE	PE-HD or PE-X See ISO 10358 Lihat ISO 10358 PE-HD atau PE-X
	-	0 - 93	2.4	FRP (epoxy	

Environment *Lingkungan*	**Conc.%** *Kons.%*	**Temp.(°C)** *Suhu. (°C)*	**Max. Piping Velocity (m/s)** *Maks. Kecepatan pipa (m/s)*	**Basic Material** *Mateial Dasar*	**Remarks** *Keterangan*
				resin) FRP (*epoksi resin*)	
Lube oil / Seal oil *Lube oil / Seal oil*	-	-	6.0	316/ 316L	
Sodium hydroxide(Caustic soda) *Sodium hidroksida (soda kaustik)*	0 - 100	0 - 45	1.5	Carbon steel *Baja karbon*	
	0 - 100	46 - 80	1.5	Carbon steel *Baja karbon*	PWHT mandatory *Wajib* PWHT
	0 - 100	50 - 150	4.0	Alloy 400 *Paduan 400*	
	0 - 100	50 - 150	4.0	Alloy 600 *Paduan* 600	
	0 - 35	0 - 160	2.4	PTFE/ PFA lined, carbon steel *Setara PTFE/ PFA, baja karbon*	
Sulfur, molten *Belerang, cair*	-	MP -195	2.3	Carbon steel *Baja karbon*	Keep dry, moisture causes corrosion. MP denotes melting point. *Tetap kering, kelembaban menyebabkan korosi. MP menunjukkan titik leleh.*
	-	MP -295	4.0	316L	
Notes: *Catatan;*					
(1) Typical PWHT for Alloy 400 in hydrofluoric acid service is 530 – 650°C for 1 hour. *Tipikal PWHT untuk Paduan 400 dalam service asam fluoride adalah 530-650°C untuk 1 jam.*					

Environment *Lingkungan*	Conc.% *Kons.%*	Temp.(°C) *Suhu. (°C)*	Max. Piping Velocity (m/s) *Maks. Kecepatan pipa (m/s)*	Basic Material *Mateial Dasar*	Remarks *Keterangan*
(2) For chlorine concentrations exceeding 10%, contact the Materials Engineering Standards Committee chairman. *Untuk konsentrasi klorin melebihi 10%, hubungi kepala Komite Materials Engineering Standards.*					
(3) All upstream oil and gas production, processing, and pipeline transportation facilities. *Semua fasilitas produksi, pengolahan, dan transportasi pipa hulu minyak dan gas*.					
(4) Sour service requirements to be taken into consideration. *Persyaratan service asam harus dipertimbangkan.*					
(5) Only for liquid hydrocarbons consisting of naphthenic and cyclo-aliphatics. Do not use in aliphatic oraromatic liquid hydrocarbons. *Hanya untuk hidrokarbon cair yang terdiri dari naftenat dan cyclo-aliphatics. Jangan gunakan dalam hidrokarbon cair aliphatic atau aromatic.*					
(6) Limited to a maximum aromatic hydrocarbon content of 15%. *Terbatas pada kandungan hidrokarbon aromatik maksimum 15%.*					
(7) Quantities of mud/silt sufficient for deposition to occur in pipelines. *Kuantitas lumpur/lumpur yang cukup untuk pengendapan terjadi di jaringan pipa.*					
(8) 1.25Cr-0.5Mo and 2.25Cr-1.0Mo steels shall not be used to control corrosion in hydrogen free sulfidation environments. *Baja 1.25Cr-0.5Mo dan 2.25Cr-1.0Mo tidak boleh digunakan untuk mengendalikan korosi di lingkungan sulfidasi bebas hidrogen.*					
(9) 5.0Cr-0.5Mo steel shall be avoided in all refinery applications as this material provides limited corrosion resistance in hydrogen free sulfidation environments. The construction cost difference between 5.0Cr-0.5Mo and 9.0Cr-1.0Mo is not significant, but mixing 5.0Cr-0.5Mo materials with 9.0Cr-1.0Mo materials has caused significant problems in sulfidation environments. 9.0Cr-1.0Mo shall not be used to build pressure vessels. Instead carbon steel clad with ferritic stainless steel type 405 or martensitic stainless steel type 410S vessels shall be used. *Baja 5.0Cr-0.5Mo harus dihindari di semua aplikasi kilang karena material ini memberikan ketahanan korosi yang terbatas di lingkungan sulfidasi bebas hidrogen. Perbedaan biaya konstruksi antara 5.0Cr-0.5Mo dan 9.0Cr-1.0Mo tidak signifikan, tetapi pencampuran material 5.0Cr-0.5Mo dengan material 9.0Cr-1.0Mo telah menyebabkan masalah yang signifikan di lingkungan sulfidasi. 9.0Cr-1.0Mo tidak boleh digunakan untuk membangun bejana tekan. Sebagai gantinya harus digunakan kapal baja karbon yang dilapisi dengan baja tahan karat feritik tipe 405 atau baja tahan karat martensit tipe 410S.*					

Table 3 - Material Selection

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
12CG2T02	DES: ASME B31.3-2014 CAT: NORMAL SERV: (ACWR) AUXILIARY COOLING WATER RETURN (ACWS) AUXILIARY COOLING WATER SUPPLY (DW) DRINKING WATER (UW) UTILITY WATER	B16.42 DIP - CL150 NPS 0.5 - 12 17.539 kg/cm2 @ -29 Deg C 16.315 kg/cm2 @ 100 Deg C	Class 150 Flat Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B,SMLS, GALV • CS A106-B,SMLS	• CS A105N • CS A234-WPB N, SMLS	• CS A105N, B16.5, GALV • CS A105N, B16.5	• NON-ASBW/ NEOPRENE BINDER, FULL (1/8") THK	• CS A307-B, W/ 2 HVY HEX NUTS, CS A194-2H, 2 LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • BRZ B61-C92200 • DI A536-65-45-12, EPOXY COATED I/E • DI A536-65-45-12 TRIM(S): ========== • BRONZE TRIM • AL-BRZ DISC, BUNA-N ST. 416 S STEM • API 594 TRIMAA
12LC2T01	DES: ASME B31.3-2014 & NFPA 24-2016 CAT: NORMAL SERV : (FW) FIRE WATER AND FOAM	B16.42 DIP - CL150 NPS 0.5 - 24 17.539 kg/cm2 @ -29 Deg C 16.315 kg/cm2 @ 100 Deg C	Class 150 Flat Face	None	• CS A106-B,SMLS, GALV • CS A106-B,SMLS • CS API5L-B-PSL2, SAW	• CS A105N • CS A234-WPB N, SMLS, CMT LND PER • CS A234-WPBW N, WLD, 100%X-RAY, C205	• CS A105N, B16.5, GALV • CS A105N, B16.5, CMT LND PER C205 A	• NON-ASBW/ NEOPRENE BINDER, FULL FACE, 3.2mm	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW PCC-1-4, PTFE COATED	BODY: ========== • BRZ B61-C92200 • DI A536-65-45-12, EPOXY COATED I/E • DI A536-65-45-12 TRIM(S): ========== • BRONZE TRIM • AL-BRZ DISC, BUNA-N ST. 416 S STEM
12LC2T02	DES: ASME B31.3-2014 CAT: NORMAL SERV: (SCWR) SEA COOLING WATER RETURN (SCWS) SEA COOLING WATER SUPPLY	B16.42 DIP - CL150 NPS 4 - 48 17.539 kg/cm2 @ -29 Deg C 16.315 kg/cm2 @ 100 Deg C CALCULATED WALL ========== NPS 56 - 56 See PMC for P-T Limits	Class 150 Flat Face	None	• CS A106-B,SMLS • CS API5L-B-PSL2, SAW • CS A671-CC60 CL. 22, EFW, DBLBTT STRT SM,100% X-RAY	• CS A234-WPBN, SMLS, CMT LND PER AWWA C205 • CS A234-WPBWN, WLD, 100% X-RAY, CMT LND PER AWW C205 • ITCSA420-WPL6W, WLD, CMT LND PER C205	• CS A105N, B16.5, CMT LND PER AWWA C205 • CS A105N, B16.5, GALV A• CS A105N, B16.47A, CMT LND PER AWWA C205 • CS A105N, A B16.47A,GALV	• NON-ASBW/ NEOPRENE BINDER, FULL (1/8") THK • PTFE W/ SILICA FILLER, FLAT RING, 1.6mm (1/16") THK	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • DI A536-65-45-12 • DI A536-65-45-12, EPOXY COATED I/E TRIM(S): ========== BUNA-N ST . SS PINS • AL-BRZ DISC, BUNA-N ST. 416 S

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
										STEM
12LC2T21	DES: ASME B31.3-2014 & NFPA 24-2016 CAT: NORMAL SERV: (FW) FIRE WATER AND FOAM	B16.42 DIP - CL150 NPS 0.5 - 24 17.539 kg/cm2 @ -29 Deg C 16.315 kg/cm2 @ 100 Deg C	Class 150 Flat Face	None	• CS A106-B,SMLS, GALV • CS A106-B,SMLS • CS API5L-B-PSL2, SAW	• CS A105N • CS A234-WPB N, SMLS, CMT LND PER • CS A234-WPBW N, WLD, 100%X-RAY, C205	• CS A105N, B16.5, GALV • CS A105N, B16.5, CMT LND PER C205 A	• NON-ASBW/ NEOPRENE BINDER, FULL FACE, 3.2mm	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW PCC-1-4, PTFE COATED	BODY: ========== • BRZ B61-C92200 • DI A536-65-45-12 EPOXY COATED I/E ========== • BRONZE TRIM
13CB2S02	DES: ASME B31.3-2014 CAT: NORMAL SERV: (CWR) CLOSED LOOP COOLING WATER RETURN (CWS) CLOSED LOOP COOLING WATER SUPPLY	B16.42 DIP - CL300 NPS 0.5 - 24 44.867 kg/cm2 @ -29 Deg C 40.99 kg/cm2 @ 120 Deg C	Class 300 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B,SMLS • CS A671-CC60 CL. 22, EFW, DBLBTT STRT SM, 100% X-RAY	• CS A105N • CS A234-WPBN, SMLS • ITCSA420-WPL6W, WLD, 100%X-RAY	• CS A105N, B16.5	• 304 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING,CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50 • CS A307-B, W/ 2 HVY HEX NUTS,CS A194-2H. 2 PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, MFTAL ST • MFR STD TRIM • API 623 TRIM12 • API 600 TRIM12 • API 594 TRIM10
1CA1S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (BDW) (P) BLOWDOWN WATER PROCESS FLUID	B16.5/47 MG 1.3 - CL150 NPS 0.5 - 42 18.768 kg/cm2 @ -45 Deg C 8.93 kg/cm2 @ 340 Deg C CALCULATED WALL ========== NPS 48 - 48 See PMC for P-T Limits	Class 150 Raised Face	1.5mm Nominal (1.2mm Minimum)	• ITCS A333-6,SMLS • CS A671-CC60 CL. 22, EFW, DBLBTT STRT SM, 100% X-RAY	• ITCS A350-LF2CL. 1 • ITCS A420-WPL6, SMLS • ITCSA420-WPL6W, WLD, 100%X-RAY	• ITCS A350-LF2CL. 1, B16.5 • ITCS A350-LF2CL. 1, B16.47A	• 304 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING,CS OUTER RING	• CR-MO A320-L7, W/ 2 HVY HEX NUTS, CR-MO WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • ITCS A350-LF2CL. 1 • ITCSA352-LCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
1CA2B41	DES: ASME B31.3-2014 CAT: NORMAL	B16.5/47 MG 1.3 - CL150 NPS 0.5 - 24	Class 150 Raised Face	3.0mm Nominal (2.4mm	• ITCS A333-6,SMLS	• ITCS A420-WPL6, SMLS	• ITCS A350-LF2CL. 1, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS,	• CR-1/5 MO A320-L7M, W/ 2 HVY HEX NUTS,	BODY: ========== • ITCS A350-LF2CL.

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	SERV: (FG) FUEL GAS (HFL) HP FLARE (VF) FLARE	18.768 kg/cm2 @ -45 Deg C 8.93 kg/cm2 @ 340 Deg C		Minimum)				(1/8") THK,316L SS INNER RING, 316L SS OUTER RING	CR-MO A194-7M,2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	1 • ITCSA352-LCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
1CA2S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (FG) FUEL GAS (P) PROCESS FLUID (PN) PURGE	B16.5/47 MG 1.3 - CL150 NPS 0.5 - 42 18.768 kg/cm2 @ -45 Deg C 8.93 kg/cm2 @ 340 Deg C CALCULATED WALL ========== NPS 48 - 48 See PMC for P-T Limits	Class 150 Raised Face	3.0mm Nominal (2.4mm Minimum)	• ITCS A333-6,SMLS • CS A671-CC60 CL. 22, EFW, DBL BTT STRT SM, 100% X-RAY	• ITCS A350-LF2CL. 1 • ITCS A420-WPL6, SMLS • ITCSA420-WPL6W, WLD, 100%X-RAY	• ITCS A350-LF2CL. 1, B16.5 • ITCS A350-LF2CL. 1, B16.47A	• 304 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING,CS OUTER RING	• CR-MO A320-L7, W/ 2 HVY HEX NUTS, CR-MO WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • ITCS A350-LF2CL. 1 • ITCSA352-LCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12 • MFR STD TRIM
1CA4B41	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID (SPW) SOUR PROCESS	B16.5/47 MG 1.3 - CL150 NPS 0.5 - 24 18.768 kg/cm2 @ -45 Deg C 8.93 kg/cm2 @ 340 Deg C	Class 150 Raised Face	6.0mm Nominal (4.8mm Minimum)	• ITCS A333-6,SMLS	• ITCSA420-WPL6, SMLS	• ITCS A350-LF2CL. 1, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK,316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A320-L7M, W/ 2 HVY HEX NUTS, CR-MO A194-7M,2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • ITCS A350-LF2CL. 1 • ITCSA352-LCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 600 TRIM12 • API 594 TRIM10
1CA4B43	DES: ASME B31.3-2014 CAT: NORMAL	B16.5/47 MG 1.3 - CL150 NPS 0.5 - 24	Class 150 Raised Face	6.0mm Nominal (4.8mm	• ITCS A333-6,SMLS	• ITCSA420-WPL6, SMLS	• ITCS A350-LF2CL. 1, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS,	• CR-1/5 MO A320-L7M, W/ 2 HVY HEX NUTS,	BODY: ========== • ITCS A350-LF2CL.

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	SERV: (FG) FUEL GAS (P) PROCESS FLUID (SPW) SOUR PROCESS	18.768 kg/cm2 @ -45 Deg C 8.93 kg/cm2 @ 340 Deg C		Minimum)				(1/8") THK,316L SS INNER RING, 316L SS OUTER RING	CR-MO A194-7M,2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	1 • ITCSA352-LCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 600 TRIM12 • API 594 TRIM10
1CB1B11	DES: ASME B31.3-2014 CAT: NORMAL SERV: (MEA) AMINE (OR DEA) (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 24 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C	Class 150 Raised Face	1.5mm Nominal (1.2mm Minimum)	• CS A106-B,SMLS	• CS A234-WPBN, SMLS	• CS A105N, B16.5	• 304 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING,CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
1CB1B55	DES: ASME B31.3-2014 CAT: NORMAL SERV: (CAT) CATALYST	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 12 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C	Class 150 Raised Face	1.5mm Nominal (1.2mm Minimum)	• CS A106-B,SMLS	• CS A234-WPBN, SMLS	• CS A105N, B16.5	• 304 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING,CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695	BODY: ========== • CS A216-WCB TRIM(S): ========== • 316 SS BALL/STEM, RTFE ST
1CB1S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AV) VENT ATMOSPHERE (BDW) BLOWDOWN WATER (CH) (FG) FUEL GAS (FO) FUEL OIL (HSN) HIGH SECURITY NITROGEN (OW) OILY WATER	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 42 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C CALCULATED WALL ========== NPS 48 - 48 See PMC for P-T Limits	Class 150 Raised Face	1.5mm Nominal (1.2mm Minimum)	• CS A106-B,SMLS • CS API5L-B-PSL2, SAW • CS A671-CC60 CL. 22, EFW, DBL BTT STRT SM,100% X-RAY	• CS A105N • CS A234-WPB N, SMLS • CS A234-WPBWN, WLD, 100% X-RAY • ITCSA420-WPL6W, WLD, 100%X-RAY	• CS A105N, B16.5 • CS A105N, B16.47A	• 304 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING,CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM8 • 316 SS BALL/STEM, METAL ST • API 623 TRIM8 • API 594 TRIM1 • API 600 TRIM8 • MFR STD TRIM

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	(P) PROCESS FLUID (PA) PLANT AIR (PN) PURGE NITROGEN (PW) PROCESS WATER (VF) FLARE (VFL) VENT FLARE LIQUID									
1CB1S02	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (AV) VENT ATMOSPHERE (P) PROCESS FLUID (PN) PURGE	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 42 19.992 kg/cm2 @ -29 Deg C 5.61 kg/cm2 @ 425 Deg C CALCULATED WALL ========== NPS 46 - 78 See PMC for P-T Limits	Class 150 Raised Face	1.5mm Nominal (1.2mm Minimum)	• CS A106-B, SMLS • CS API5L-B-PSL2, SAW • CS A671-CC60 CL. 22, EFW, DBL BTT STRT SM, 100% X-RAY	• CS A105N • CS A234-WPB N, SMLS • CS A234-WPBWN, WLD, 100% X-RAY • ITCSA420-WPL6W, WLD, 100%X-RAY	• CS A105N, B16.5 • CS A105N, B16.47A	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM8 • 316 SS BALL/STEM, METAL ST • API 623 TRIM8 • API 594 TRIM1 • API 600 TRIM8 • MFR STD TRIM
1CB2B11	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AMD) AMINE DRAIN (AV) VENT ATMOSPHERE (HFL) HP (MEA) AMINE (OR DEA) (VF) FLARE	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 24 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C	Class 150 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS	• CSA234- N, SMLS	• CS A105N, B16.5	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
1CB2B13	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AV) VENT ATMOSPHERE (B) CAUSTIC (CSD) CAUSTIC	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 24 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C	Class 150 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS	• CSA234- N, SMLS	• CS A105N, B16.5	• ALLOY400-FG, SPIRAL WOUND LOW STRESS, (1/8") THK, ALLOY 400 INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM11 • API 623 TRIM11 • API 600 TRIM11 • API 594 TRIM9

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
1CB2B20	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AMD) AMINE DRAIN	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 24 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C	Class 150 Raised Face	3.0mm Nominal (2.4mm Minimum)	• C A106-B, SMLS S	• CS A234-WPB N, SMLS	• CS A105N, B16.5	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, C OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
1CB2B21	DES: ASME B31.3-2014 CAT: NORMAL SERV: (CSD) CAUSTIC DRAIN	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 24 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C	Class 150 Raised Face	3.0mm Nominal (2.4mm Minimum)	• C A106-B, SMLS	• CS A234-WPBN, SMLS	• CS A105N, B16.5	• ALLOY400-FG, SPIRAL WOUND LOW STRESS, (1/8") THK, ALLO 400 INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM11 • API 623 TRIM11 • API 600 TRIM11 • API 594 TRIM9
1CB2B22	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AMD) AMINE DRAIN (D) HYDROCARBON DRAIN (CLOSED	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 24 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C	Class 150 Raised Face	3.0mm Nominal (2.4mm Minimum)	• C A106-B, SMLS	• CS A234-WPBN, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK, 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
1CB2B41	DES: ASME B31.3-2014 CAT: NORMAL SERV: (D) HYDROCARBON DRAIN (CLOSED DRAIN) (FG) FUEL GAS (PW) PROCESS WATER	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 42 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C CALCULATED WALL ========== NPS 48 - 48 See PMC for P-T Limits	Class 150 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS • CS API5L-B-PSL2, SAW • CS A671-CC60 CL. 22, EFW, DBL BTT STRT SM, 100% X-RAY	• CS A234-WPBN, SMLS • CS A234-WPBWN, WLD, 100% X-RAY • ITCSA420-WPL6W, WLD, 100% X-RAY	• CS A105N, B16.5 • CS A105N, B16.47A	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK, 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	(SPW) SOUR PROCESS WATER (VF) FLARE (VFL) VENT FLARE LIQUID (HSL) HEAVY SLOP OIL (LSL) LIGHT SLOP OIL (AF) ACID GAS FLARE									• API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12 • MFR STD TRIM
1CB2B42	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (FG) FUEL GAS (HFL) HP FLARE (VF) FLARE (VFL) VENT FLARE LIQUID	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 42 19.992 kg/cm2 @ -29 Deg C 5.61 kg/cm2 @ 425 Deg C CALCULATED WALL ========== NPS 48 - 120 See PMC for P-T Limits	Class 150 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS • CS API5L-B-PSL2, SAW • CS A671-CC60 CL. 22, EFW, DBL BTT STRT SM, 100% X-RAY	• CS A234-WPBN, SMLS • CS A234-WPBWN, WLD, 100% X-RAY • ITCSA420-WPL6W, WLD, 100% X-RAY	• CS A105N, B16.5 • CS A105N, B16.47A	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK, 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12 • MFR STD TRIM
1CB2B45	DES: ASME B31.3-2014 CAT: NORMAL SERV: (CH) CHEMICALS (HFL) HP FLARE (MEA) AMINE (ORDEA) (P) PROCESS FLUID (VF) FLARE	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 24 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C	Class 150 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS	• CSA234- N, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK, 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 600 TRIM12 • API 594 TRIM10
1CB2S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AV) VENT ATMOSPHERE (BDW) BLOWDOWN WATER (CH)	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 42 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C CALCULATED WALL ==========	Class 150 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS • CS API5L-B-PSL2, SAW • CS A671-CC60 CL. 22, EFW, DBL BTT STRT SM, 100% X-RAY	• CS A105N • CS A234-WPB N, SMLS • CS A234-WPBWN, WLD, 100% X-RAY • ITCSA420-WPL6W, WLD, 100% X-RAY	• CS A105N, B16.5 • CS A105N, B16.47A	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	(D) HYDROCARBON DRAIN (CLOSED DRAIN) (FG) FUEL GAS (FGP) FUEL GASPILOT (H) HYDROGEN (OWS) OILY WATER SEWER (P) PROCESS FLUID (PCS) POTENTIALLY CONTAMINATED (PW) PROCESSWATER (SS) CLEAN WATERSEWER (VF) FLARE (WW) WASTE WATER (HSL) HEAVY SLOP OIL (LSL) LIGHT SLOP OIL	NPS 66 - 78 See PMC for P-T Limits								• 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 600 TRIM12 • API 594 TRIM10 • MFR STD TRIM • API 600 TRIM8
1CB2S02	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (AV) VENT ATMOSPHERE (D) HYDROCARBON DRAIN (CLOSED DRAIN) (P) PROCESS FLUID (VF) FLARE (VFL) VENT FLARE LIQUID	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 42 19.992 kg/cm2 @ -29 Deg C 5.61 kg/cm2 @ 425 Deg C CALCULATED WALL NPS 48 - 54 See PMC for P-T Limits	Class 150 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS • CS API5L-B-PSL2, SAW • CS A671-CC60 CL. 22, EFW, DBLBTT STRT SM, 100% X-RAY	• CS A105N • CS A234-WPB N, SMLS • CS A234-WPBWN, WLD, 100% X-RAY • ITCSA420-WPL6W, WLD, 100%X-RAY	• CS A105N, B16.5 • C A105N, SP-44 • S A105N, B16.47A	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: • CS A105N • CS A216-WCB TRIM(S): • API 602 TRIM12 • 316 SS BALL/STEM METAL ST • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12 • MFR STD TRIM
1CB2S07	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (AV) VENT ATMOSPHERE (BDW) BLOWDOWN WATER (BFW) (COC) COLD CONDENSATE (HOC) HOT CONDENSATE (LC) LOW PRESSURE STEAM	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 42 19.992 kg/cm2 @ -29 Deg C 5.61 kg/cm2 @ 425 Deg C CALCULATED WALL NPS 48 - 54 See PMC for P-T Limits	Class 150 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS • CS API5L-B-PSL2, SAW • CS A671-CC60 CL. 22, EFW, DBLBTT STRT SM, 100% X-RAY	• CS A105N • CS A234-WPB N, SMLS • CS A234-WPBWN, WLD, 100% X-RAY • ITCSA420-WPL6W, WLD, 100%X-RAY	• CS A105N, B16.5 • CS A105N, B16.47A	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: • CS A105N • CS A216-WCB TRIM(S): • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12 • MFR STD TRIM

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	(LLC) LOW LOW PRESSURE CONDENSATE (LLS) LOW LOW PRESSURE (LS) LOW PRESSURESTEAM (MS) MEDIUM PRESSURESTEAM									
1CB4B13	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AV) VENT ATMOSPHERE (B) CAUSTIC (P) PROCESS FLUID (PA) PLANT AIR	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 24 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C	Class 150 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B,SMLS	• CSA234- N, SMLS	• CS A105N, B16.5	• ALLOY400-FG, SPIRAL WOUND LOW STRESS, (1/8") THK, ALLO Y 400 INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM11 • API 623 TRIM11 • API 600 TRIM11 • API 594 TRIM9
1CB4B41	DES: ASME B31.3-2014 CAT: NORMAL SERV: (FG) FUEL GAS (P) PROCESS FLUID (SPW) SOUR PROCESS (VF) FLARE	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 36 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C	Class 150 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B,SMLS • CS A671-CC60 CL. 22, EFW, DBL BTT STRT SM, 100% X-RAY	• CS A234-WPBN, SMLS • ITCS A420-WPL6W, WLD, 100% X-RAY	• CS A105N, B16.5 • CS A105N, B16.47A	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK,316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
1CB4B42	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 24 19.992 kg/cm2 @ -29 Deg C 5.61 kg/cm2 @ 425 Deg C	Class 150 Raised Face	6.0mm Nominal (4.8mm Minimum)	• C A106-B, SMLS	• CS A234-WPBN, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK,316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 600 TRIM12 • API 594 TRIM10

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
1CB4B43	DES: ASME B31.3-2014 CAT: NORMAL SERV: (FG) FUEL GAS (P) PROCESS FLUID (PN) PURGE (PW) PROCESS WATER (SPW) SOUR PROCESS WATER (VF) FLARE	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 42 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C CALCULATED WALL ========== NPS 46 - 72 See PMC for P-T Limits	Class 150 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B, SMLS • CS A671-CC60 CL. 22, EFW, DBL BTT STRT SM, 100% X-RAY	• CS A234-WPBN, SMLS • ITCS A420-WPL6W, WLD, 100% X-RAY	• CS A105N, B16.5 • CS A105N, B16.47A	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK, 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12 • MFR STD TRIM
1CB4B44	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 24 19.992 kg/cm2 @ -29 Deg C 5.61 kg/cm2 @ 425 Deg C	Class 150 Raised Face	6.0mm Nominal (4.8mm Minimum)	• C A106-B, SMLS	• CS A234-WPBN, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK, 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
1CB4B45	DES: ASME B31.3-2014 CAT: NORMAL SERV: (MEA) AMINE (OR DEA) (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 24 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C	Class 150 Raised Face	6.0mm Nominal (4.8mm Minimum)	• C A106-B, SMLS	• CS A234-WPBN, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK, 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
1CB4B47	DES: ASME B31.3-2014 CAT: NORMAL SERV: (CH) CHEMICALS (MEA) AMINE (OR DEA) (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 24 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C	Class 150 Raised Face	6.0mm Nominal (4.8mm Minimum)	• C A106-B, SMLS	• CS A234-WPBN, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK, 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
										• API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
1CB4S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 32 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C	Class 150 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B,SMLS • CS API5L-B-PSL2, SAW • CS A671-CC60 CL. 22, EFW, DBLBTT STRT SM,100% X-RAY	• CS A105N • CS A234-WPB N, SMLS • CSA234-WPBW, WLD, 100% X-RAY • ITCSA420-WPL6W, WLD, 100%X-RAY	• CS A105N, B16.5 • CS A105N, B16.47A	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING,CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
1CB9B5	DES: ASME B31.3-2014 CAT: NORMAL SERV: (CAT) CATALYST	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 24 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C	Class 150 Raised Face		• CS A106-B,SMLS • ITCS A333-6,SMLS	• CS A234-WPB N, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8")THK W/O INNER RING, 316L SS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A216-WCB TRIM(S): ========== • 316 SS BALL/STEM, RTFE ST
1CB9B5	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (CAT) CATALYST	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 12 19.992 kg/cm2 @ -29 Deg C 5.61 kg/cm2 @ 425 Deg C	Class 150 Raised Face		• CS A106-B,SMLS • ITCS A333-6,SMLS	• CS A234-WPB N, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8")THK W/O INNER RING, 316L SS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A216-WCB TRIM(S): ========== • 316 SS BALL/STEM, RTFE ST
1CB9B57	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AV) VENT ATMOSPHERE (CAT) CATALYST (IA) INSTRUMENT AIR (P) PROCESS FLUID (PN) PURGE	B16.5/47 MG 1.1 - CL150 NPS 0.5 - 12 19.992 kg/cm2 @ -29 Deg C 8.74 kg/cm2 @ 345 Deg C	Class 150 Raised Face		• CS A106-B,SMLS • ITCS A333-6,SMLS	• CS A234-WPB N, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING,CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM16 • API 623 TRIM16 • API 594 TRIM12 • API 600 TRIM16
1CJ3S01	DES: ASME B31.3-2014	B16.5/47 MG 1.9 - CL150	Class 150	4.5mm	• 1-1/4 CR-1/2 MO	• 1-1/4 CR-1/2 MO	• 1-1/4 CR-1/2 MO	• 316L SS-FG,	• CR-MO-V A193-B16,	BODY:

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	CAT: NORMAL SERV: (P) PROCESS FLUID	NPS 0.5 - 26 20.196 kg/cm2 @ -29 Deg C 5.61 kg/cm2 @ 425 Deg C	Raised Face	Nominal (3.6mm Minimum)	A335-P11, SMLS	A182-F11 CL. 2 • 1-1/4 CR-1/2 MO A234-WP11 CL. 1, SMLS	A182-F11 CL. 2 N&T, B16.5 • 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T, B16.47A	SPIRAL WOUND LOW STRESS, (1/8") THK,316L SS INNER RING, 316L SS OUTER RING	W/ 2 HVY HEX NUTS, CR-MO A194-7, 2WSHRS, LOW ALLOY PCC-1 1-	========== • 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T • 1-1/4 CR-1/2 MO A217-WC6 TRIM(S): ========== • API 602 TRIM8 • 316 SS BALL/STEM, METAL ST. WC COATED BALL/ST • API 623 TRIM8 • API 594 TRIM1 • API 600 TRIM8 • MFR STD TRIM
1LT1F35	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AD) ACID DRAIN (CH) CHEMICALS (SA) SULFURIC	B16.5/47 MG 1.1 - CL150 NPS 1 - 6 19.992 kg/cm2 @ -29 Deg C 11.952 kg/cm2 @ 260 Deg C	Class 150 Raised Face	1.5mm Nominal (1.2mm Minimum)	• CS A53-B TYPEE, ERW	• CS A234-WPBN, SMLS, PTFE LND, F1545	• CS A105N, B16.5 • CS A105, B16.5, PTFE LND, F1545		• 316 SS A193-B8MA CL. 1A, W/ 2HVY HEX NUTS, 316SS A194-8MA, 2 WSHRS, PRECIPITATION HARDENING PCC-1-	BODY: ========== • CS A216-WCB • CS A216-WCB, PFA FULLY LINED BODY TRIM(S): • PFA ENCAPSS BALL/STEM, PTFE ST • PFA LND • PTFE BALL • PFA ENCAPSS DISC/STEM
1NU2B35	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AD) ACID DRAIN (SA) SULFURIC	B16.5/47 MG 3.17 - CL150 NPS 0.5 - 8 16.218 kg/cm2 @ -29 Deg C 13.27 kg/cm2 @ 120 Deg C	Class 150 Raised Face	3.0mm Nominal (2.4mm Minimum)	• ALLOY 20 B729-N08020 ANN, SMLS • ALLOY 20 B464-N08020 ANN, WLD, 100%X-RAY • ALLOY 20 B474-N08020 CL 1 ANN., EFW, DBL BTT, STRT SM, 100% X-RAY	• ALLOY 20B366 -WP20CB-S ANN., SMLS • ALLOY 20B366 -WP20CB-WX ANN., WLD, 100% X-RAY	• ALLOY 20 B462-N08020 ANN, B16.5	• ALLOY20-PTFE, SPIRAL WOUND LOW STRESS, (1/8") THK, ALLOY 20 INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY S PCC-1-4, PTFE COATED	BODY: ========== • ALLOY 20 A351-CN7M TRIM(S): ========== • API 602 TRIM13 • API 623 TRIM13 • API 594 TRIM13
1SA1B05	DES: ASME B31.3-2014	B16.5/47 MG 2.1 - CL150	Class 150	1.5mm	• 304/304L SS	• 304/304L SS A403	• 304/304L SS	• 304 SS-FG, SPIRAL	• CR-MO A193-B7, W/	BODY:

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	CAT: NORMAL SERV: (DMW) DEMINERALIZED WATER (LO) LUBE OIL	NPS 0.5 - 36 19.38 kg/cm2 @ -29 Deg C 13.05 kg/cm2 @ 218 Deg C	Raised Face	Nominal (1.2mm Minimum)	• 304/304L SS A312-TP304/304L, SMLS • 304/304L SS A312-TP304/304L, EFW, DBL BTT, STRT SM, 100% X-RAY	-WP304/304L-S, SMLS • 304/304L SS A403 -WP304/304L-WX, WLD, 100% X-RAY	A182-F304/304L, B16.5 • 304/304L SS A182-F304/304L, B16.47A	WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, 304 SS OUTER RIN	2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY G PCC-1-, MECH GALV B695 CL.50	========== • 316/316L SS A182-F316/F316L • 316 SS A351-CF8M TRIM(S): ========== • 316 SS BALL/STEM, PEEK ST • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • MFR STD TRIM • API 600 TRIM12
1SA1S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AV) VENT ATMOSPHERE (P) PROCESS FLUID (PN) PURGE (VF) FLARE	B16.5/47 MG 2.1 - CL150 NPS 0.5 - 30 19.38 kg/cm2 @ -29 Deg C 2.47 kg/cm2 @ 510 Deg C	Class 150 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 304/304L SS A312-TP304/304L, SMLS • 304/304L SS A312-TP304/304L, EFW, DBL BTT, STRT SM, 100% X-RAY	• 304/304L SS A182-F304/304L • 304/304L SS A403 -WP304/304L-S, SMLS • 304/304L SS A403 -WP304/304L-WX, WLD, 100% X-	• 304/304L SS A182-F304/304L, B16.5 • 304/304L SS A182-F304/304L, B16.47A	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • 316/316L SS A182-F316/F316L • 316 SS A351-CF8M TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10
1SA1S25	DES: ASME B31.3-2014 CAT: NORMAL SERV: (DPA) DRY PLANT AIR (IA) INSTRUMENT	B16.5/47 MG 2.1 - CL150 NPS 0.5 - 12 19.38 kg/cm2 @ -29 Deg C 14.484 kg/cm2 @ 150 Deg C	Class 150 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 304/304L SS A312-TP304/304L, SMLS • CS A106-B, SMLS	• 304/304L SS A182-F304/304L • CS A234-WPBN, SMLS	• 304/304L SS A182-F304/304L, B16.5 • CS A105N, B16.5	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • 316/316L SS A182-F316/F316L • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, PEEK ST • API 623 TRIM8 • API 600 TRIM8 • API 594 TRIM1 • MFR STD TRIM
1SA9B55	DES: ASME B31.3-2014 CAT: NORMAL	B16.5/47 MG 2.1 - CL150 NPS 0.5 - 24	Class 150 Raised Face		• 304/304L SS A312-TP304/304L, SMLS	• 304/304L SS A403 -WP304/304L-S, SMLS	• 304/304L SS A182-F304/304L, B16.5	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2	BODY: ========== • 316 SS A351-CF8M

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	SERV: (CAT) CATALYST	19.38 kg/cm2 @ -29 Deg C 2.47 kg/cm2 @ 510 Deg C						SS INNER RING,CS OUTER RING	WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695	TRIM(S): ========== • 316 SS BALL/STEM, RTFE ST
1SC1S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 2.1 - CL150 NPS 0.5 - 24 19.38 kg/cm2 @ -29 Deg C 2.47 kg/cm2 @ 510 Deg C	Class 150 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 304H SS A312-TP304H, SML A312-TP304H, EFW DBL BTT, STRT SM 100% X-	• 304H SS A182-F304H • 304H SS A403 -WP304H-S, SMLS • 304H SS A403 -WP304H-WX 100% X-RAY	• 304H SS A182-F304H,B16.5	• 304H SS-FG, SPIRAL WOUND, 3.2mm (1/8")THK 304H SS INNER RING, 304 SS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695	BODY: ========== • 304H SS A182-F304H • 304H SS A351-CF10 TRIM(S): ========== • API 602 TRIM15 • API 623 TRIM15 • 304 SS TRIMW/ FHF
1SD1B11	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AMD) AMINE DRAIN (MEA) AMINE (OR DEA)	B16.5/47 MG 2.2 - CL150 NPS 0.5 - 24 19.38 kg/cm2 @ -29 Deg C 2.47 kg/cm2 @ 510 Deg C	Class 150 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 316/316L SS A312-TP316/316L, SMLS • 316/316L SS A312-TP316/316L, EFW, DBL BTT, STRT SM,100% X-RAY	• 316/316L SS A403 -WP316/316L-S, SMLS • 316/316L SS A403 -WP316/316L-WX, WLD, 100% X-RAY	• 316/316L SS A182-F316/F316L, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK,316L SS INNER RING, 316L SS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • 316/316L SS A182-F316/F316L • 316 SS A351-CF8M TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10
1SD1B41	DES: ASME B31.3-2014 CAT: NORMAL SERV: (FG) FUEL GAS	B16.5/47 MG 2.2 - CL150 NPS 0.5 - 24 19.38 kg/cm2 @ -29 Deg C 2.47 kg/cm2 @ 510 Deg C	Class 150 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 316/316L SS A312-TP316/316L, SMLS • 316/316L SS A312-TP316/316L, EFW, DBLBTT, STRT SM, 100% X-RAY	• 316/316L SS A403 -WP316/316L-S, SMLS • 316/316L SS A403 -WP316/316L-WX, WLD, 100% X-	• 316/316L SS A182-F316/F316L, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK,316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, COATED	BODY: ========== • 316/316L SS A182-F316/F316L • 316 SS A351-CF8M TRIM(S): ========== • 316 SS BALL/STEM, METAL ST • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10
1SD1S01	DES: ASME B31.3-2014	B16.5/47 MG 2.2 - CL150	Class 150	1.5mm	• 316/316L SS	• 316/316L SS	• 316/316L SS	• 316L SS-FG,	• CR-MO A193-B7, W/	BODY:

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	CAT: NORMAL SERV: (CD) CHEMICAL DRAIN (CH) CHEMICALS (P) PROCESS FLUID	NPS 0.5 - 24 19.38 kg/cm2 @ -29 Deg C 2.47 kg/cm2 @ 510 Deg C	Raised Face	Nominal (1.2mm Minimum)	A312-TP316/316L, SMLS • 316/316L SS A312-TP316/316L, EFW, DBL BTT, STRT SM,100% X-RAY	A182-F316/F316L • 316/316L SS A403 -WP316/316L-S, SMLS • 316/316L SS A403 -WP316/316L-WX, WLD, 100% X-	A182-F316/F316L, B16.5	SPIRAL WOUND LOW STRESS, (1/8") THK,316L SS INNER RING, 316L SS OUTER RING	2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	========== • 316/316L SS A182-F316/F316L • 316 SS A351-CF8M TRIM(S): ========== • 316 SS BALL/STEM, PEEK ST • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10
1SD1S35	DES: ASME B31.3-2014 CAT: NORMAL SERV: (ACV) ACID VENT (AD) ACID DRAIN (AF) ACID GAS (P) PROCESS FLUID (SA) SULFURIC ACID (WAD) WEAK ACID	B16.5/47 MG 3.17 - CL150 NPS 0.5 - 36 16.218 kg/cm2 @ -20 Deg C 13.27 kg/cm2 @ 120 Deg C	Class 150 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 316/316L SS A312-TP316/316L, SMLS • 316/316L SS A312-TP316/316L, EFW, DBL BTT, STRT SM,100% X-RAY	• 316/316L SS A182-F316/F316L • 316/316L SS A403 -WP316/316L-S, SMLS • 316/316L SS A403 -WP316/316L-WX, WLD, 100% X-	• 316/316L SS A182-F316/F316L, B16.5 • 316/316L SS A182-F316/F316L, B16.47A	• ALLOY20-PTFE, SPIRAL WOUND LOW STRESS, (1/8") THK, ALLOY 20 INNER RING,C OUTER RING • ALLOY20 CORE-PTFE, GROOVED METAL W/ COVERING LAYER, 3.2mm (1/8")THK ALLOY RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY S PCC-1-4,MECH GALV B695 CL.50	BODY: ========== • ALLOY 20 A351-CN7M TRIM(S): ========== • ALLOY 20 BALL/STEM, METAL ST • API 602 TRIM13 • API 623 TRIM13 • API 594 TRIM13
3CA2B41	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID (SPW) SOUR PROCESS WATER (VF) FLARE (VFL) VENT FLARE LIQUID	B16.5/47 MG 1.3 - CL300 NPS 0.5 - 24 48.96 kg/cm2 @ -45 Deg C 37.6 kg/cm2 @ 340 Deg C	Class 300 Raised Face	3.0mm Nominal (2.4mm Minimum)	• ITCS A333-6,SMLS	• ITCS A420-WPL6, SMLS	• ITCS A350-LF2 CL. 1, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK,316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A320-L7M, W/ 2 HVY HEX NUTS, CR-MO A194-7M,2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • ITCS A350-LF2 CL. 1 • ITCS A352-LCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 600 TRIM12 • API 594 TRIM10
3CA2S01	DES: ASME B31.3-2014 CAT: NORMAL	B16.5/47 MG 1.3 - CL300 NPS 0.5 - 24	Class 300 Raised Face	3.0mm Nominal (2.4mm	• ITCS A333-6,SMLS • CS A671-CC60 CL. 22, EFW, DBL BTT	• ITCS A350-LF2 CL. 1 • ITCS A420-WPL6	• ITCS A350-LF2 CL. 1, B16.5 • ITCS A350-LF2 CL.	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304	• CR-MO A320-L7, W/ 2 HVY HEX NUTS, CR-MO	BODY: ========== • ITCS A350-LF2 CL.

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	SERV: (P) PROCESS FLUID (PW) PROCESS WATER (VF) FLARE	48.96 kg/cm2 @ -45 Deg C 37.6 kg/cm2 @ 340 Deg C CALCULATED WALL ========== NPS 30 - 48 See PMC for P-T Limits		Minimum)	STRT SM, 100% X-RAY	SMLS • ITCSA420-WPL6W, WLD, 100%X-RAY	1, B16.47A	SS INNER RING,CS OUTER RING	WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	1 • ITCSA352-LCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12 • MFR STD TRIM
3CA4B13	DES: ASME B31.3-2014 CAT: NORMAL SERV: (B) CAUSTIC (P) PROCESS FLUID (VF) FLARE	B16.5/47 MG 1.3 - CL300 NPS 0.5 - 24 48.96 kg/cm2 @ -45 Deg C 37.6 kg/cm2 @ 340 Deg C	Class 300 Raised Face	6.0mm Nominal (4.8mm Minimum)	• ITCS A333-6,SMLS	• ITCSA420-WPL6, SMLS	• ITC A350-LF2 CL 1, B16.5	• ALLOY400-FG, SPIRAL WOUND, 3.2mm (1/8")THK ALLOY 400 INNER RING, CS OUTER RING	• CR-MO A320-L7, W/ 2 HVY HEX NUTS, CR-MO A194-7,2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • ITCS A350-LF2CL. 1 • ITCSA352-LCB TRIM(S): ========== • API 602 TRIM11 • ALLOY 400 BALL/STEM. ST • API 623 TRIM11 • API 594 TRIM9 • API 600 TRIM11 • MFR STD TRIM
3CA4B41	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID (SPW) SOUR PROCESS WATER (VF) FLARE (VFL) VENT FLARE LIQUID	B16.5/47 MG 1.3 - CL300 NPS 0.5 - 24 48.96 kg/cm2 @ -45 Deg C 37.6 kg/cm2 @ 340 Deg C	Class 300 Raised Face	6.0mm Nominal (4.8mm Minimum)	• ITCS A333-6,SMLS • CS A671-CC60 CL. 22, EFW, DBLBTT STRT SM, 100% X-RAY	• ITCSA420-WPL6, SMLS • ITCS A420-WPL6W, WLD, 100% X-RAY	• ITC A350-LF2 CL 1, B16.5 • ITCS A350-LF2 CL 1, B16.47A	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK,316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A320-L7M, W/ 2 HVY HEX NUTS, CR-MO A194-7M,2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • ITCS A350-LF2CL. 1 • ITCSA352-LCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12 • MFR STD TRIM
3CA4B43	DES: ASME B31.3-2014	B16.5/47 MG 1.3 - CL300	Class 300	6.0mm	• ITCS A333-6,SMLS	• ITCSA420-WPL6,	• ITC A350-LF2 CL	• 316L SS-FG,	• CR-1/5 MO	BODY:

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	CAT: NORMAL SERV: (FG) FUEL GAS (P) PROCESS FLUID (SPW) SOUR PROCESS	NPS 0.5 - 24 48.96 kg/cm2 @ -45 Deg C 37.6 kg/cm2 @ 340 Deg C CALCULATED WALL ========== NPS 30 - 42 See PMC for P-T Limits	Raised Face	Nominal (4.8mm Minimum)	• CS A671-CC60 CL. 22, EFW, DBL BTT STRT SM, 100% X-RAY	SMLS • ITCS A420-WPL6W, WLD, 100% X-RAY	1, B16.5 • ITCS A350-LF2 CL. 1, B16.47A	SPIRAL WOUND LOW STRESS, (1/8") THK, 316L SS INNER RING, 316L SS OUTER RING	A320-L7M, W/ 2 HVY HEX NUTS, CR-MO A194-7M, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	========== • ITCS A350-LF2 CL. 1 • ITCS A352-LCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12 • MFR STD TRIM
3CA4B47	DES: ASME B31.3-2014 CAT: NORMAL SERV: (MEA) AMINE (OR DEA)	B16.5/47 MG 1.3 - CL300 NPS 0.5 - 24 48.96 kg/cm2 @ -45 Deg C 37.6 kg/cm2 @ 340 Deg C	Class 300 Raised Face	6.0mm Nominal (4.8mm Minimum)	• ITCS A333-6, SMLS	• ITCS A420-WPL6, SMLS	• ITC A350-LF2 CL. 1, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK, 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A320-L7M, W/ 2 HVY HEX NUTS, CR-MO A194-7M, 2 WSHRS, LOW ALLOY PCC-1-4, COATED	BODY: ========== • ITCS A350-LF2 CL. 1 • ITCS A352-LCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
3CA4S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 1.3 - CL300 NPS 0.5 - 24 48.96 kg/cm2 @ -45 Deg C 37.6 kg/cm2 @ 340 Deg C	Class 300 Raised Face	6.0mm Nominal (4.8mm Minimum)	• ITCS A333-6, SMLS • CS A671-CC60 CL. 22, EFW, DBL BTT STRT SM, 100% X-RAY	• ITCS A350-LF2 CL. 1 • ITCS A420-WPL6, SMLS • ITCS A420-WPL6W, WLD,	• ITCS A350-LF2 CL. 1, B16.5	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, CS OUTER RING	• CR-MO A320-L7, W/ 2 HVY HEX NUTS, CR-MO WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695	BODY: ========== • ITCS A350-LF2 CL. 1 • ITCS A352-LCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
3CB1S01	DES: ASME B31.3-2014 CAT: NORMAL	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24	Class 300 Raised Face	1.5mm Nominal (1.2mm	• CS A106-B, SMLS • CS A671-CC60 CL. 22, EFW, DBL BTT	• CS A105N • CS A234-WPBN, SMLS	• CS A105N, B16.5 • CS A105N, B16.47A	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2	BODY: ========== • CS A105N

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	SERV: (BDW) BLOWDOWN WATER (CH) CHEMICALS (FO) FUEL OIL (P) PROCESS FLUID (PW)	52.122 kg/cm2 @ -29 Deg C 38.56 kg/cm2 @ 345 Deg C CALCULATED WALL ========== NPS 30 - 48 See PMC for P-T Limits		Minimum)	STRT SM, 100% X-RAY	• ITCSA420-WPL6W, WLD, 100%X-RAY		SS INNER RING,CS OUTER RING	WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	• CSA216-WCB TRIM(S): ========== • API 602 TRIM8 • 316 SS BALL/STEM, METAL ST • API 623 TRIM8 • API 600 TRIM8 • API 594 TRIM1 • MFR STD TRIM
3CB1S02	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (IA) INSTRUMENT AIR (NG) NATURAL GAS (P) PROCESS FLUID (PW) PROCESS WATER	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24 52.122 kg/cm2 @ -29 Deg C 29.376 kg/cm2 @ 425 Deg C CALCULATED WALL ========== NPS 30 - 48 See PMC for P-T Limits	Class 300 Raised Face	1.5mm Nominal (1.2mm Minimum)	• CS A106-B,SMLS • CS A671-CC60 CL. 22, EFW, DBL BTT STRT SM, 100% X-RAY	• CS A105N • CS A234-WPBN, SMLS • ITCSA420-WPL6W, WLD, 100%X-RAY	• CS A105N, B16.5 • CS A105N, B16.47A	• 304 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING,CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CSA216-WCB TRIM(S): ========== • API 602 TRIM8 • 316 SS BALL/STEM, METAL ST • API 623 TRIM8 • API 600 TRIM8 • API 594 TRIM1
3CB2B11	DES: ASME B31.3-2014 CAT: NORMAL SERV: (MEA) AMINE (OR DEA) (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24 52.122 kg/cm2 @ -29 Deg C 38.56 kg/cm2 @ 345 Deg C	Class 300 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B,SMLS • ITCS A333-6,SMLS	• CS A234-WPBN, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 304 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING,CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CSA216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, PEEK ST • API 623 TRIM12 • API 600 TRIM12 • API 594 TRIM10 • MFR STD TRIM

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
3CB2B13	DES: ASME B31.3-2014 CAT: NORMAL SERV: (B) CAUSTIC (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24 52.122 kg/cm2 @ -29 Deg C 38.56 kg/cm2 @ 345 Deg C	Class 300 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A234-WPB N, SMLS • ITCS A420-WPL6, SMLS	• CS A105N, B16.5	• ALLOY 400-FG, SPIRAL WOUND, 3.2mm (1/8") THK ALLOY 400 INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM11 • API 623 TRIM11 • API 594 TRIM9 • API 600 TRIM11
3CB2B41	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AV) VENT ATMOSPHERE (FG) FUEL GAS (P) PROCESS FLUID (PW) PROCESS WATER (SPW) SOUR PROCESS WATER (VF) FLARE (VFL) VENT FLARE LIQUID	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24 52.122 kg/cm2 @ -29 Deg C 38.56 kg/cm2 @ 345 Deg C	Class 300 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A234-WPBN, SMLS • ITCS A420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS. (1/8") THK, 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS. A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 600 TRIM12 • API 594 TRIM10
3CB2B42	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (FG) FUEL GAS (P) PROCESS FLUID (SPW) SOUR PROCESS	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24 52.122 kg/cm2 @ -29 Deg C 29.376 kg/cm2 @ 425 Deg C	Class 300 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A234-WPBN, SMLS • ITCS A420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS. (1/8") THK, 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS. A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
3CB2S01	DES: ASME B31.3-2014 CAT: NORMAL	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24	Class 300 Raised Face	3.0mm Nominal (2.4mm	• CS A106-B, SMLS • CS A671-CC60 CL. 22, EFW, DBLBTT	• CS A105N • CS A234-WPBN, SMLS	• CS A105N, B16.5 • C A105N, SP-44 • S A105N, B16.47A	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2	BODY: ========== • CS A105N

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	SERV: (D) HYDROCARBON DRAIN (CLOSED DRAIN) (DCO) DECANT OIL (P) PROCESS FLUID (PW) PROCESS WATER	52.122 kg/cm2 @ -29 Deg C 38.56 kg/cm2 @ 345 Deg C CALCULATED WALL ========== NPS 26 - 48 See PMC for P-T Limits		Minimum)	STRT SM, 100% X-RAY	• ITCSA420-WPL6W, WLD, 100%X-RAY		SS INNER RING,CS OUTER RING	WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	• CSA216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12 • MFR STD TRIM
3CB2S02	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (D) HYDROCARBON DRAIN (CLOSED DRAIN)	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24 52.122 kg/cm2 @ -29 Deg C 29.376 kg/cm2 @ 425 Deg C CALCULATED WALL ========== NPS 30 - 48 See PMC for P-T Limits	Class 300 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B,SMLS • CS A671-CC60 CL. 22, EFW, DBL BTT STRT SM, 100% X-RAY	• CS A105N • CS A234-WPBN, SMLS • ITCSA420-WPL6W, WLD, 100%X-RAY	• CS A105N, B16.5 • C A105N, SP-44 • S A105N, B16.47A	• 304 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING,CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CSA216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12 • MFR STD TRIM
3CB2S07	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (AV) VENT ATMOSPHERE (BDW) BLOWDOWN WATER (BFW) (COC) COLD CONDENSATE (HC) HIGH PRESSURE (LC) LOW PRESSURE STEAM CONDENSATE (LLC) LOW LOW PRESSURE CONDENSATE (LLS) LOW LOW PRESSURE (LS) LOW PRESSURE STEAM (MC) MEDIUM PRESSURE	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24 52.122 kg/cm2 @ -29 Deg C 29.376 kg/cm2 @ 425 Deg C CALCULATED WALL ---------- NPS 26 - 48 See PMC for P-T Limits	Class 300 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B,SMLS • CS A671-CC60 CL. 22, EFW, DBL BTT STRT SM, 100% X-RAY	• CS A105N • CS A234-WPBN, SMLS • ITCSA420-WPL6W, WLD, 100%X-RAY	• CS A105N, B16.5 • CS A105N, B16.47A	• 304 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING,CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CSA216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12 • MFR STD TRIM

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	(MS) CONDENSATE MEDIUM PRESSURESTEAM									
3CB4B11	DES: ASME B31.3-2014 CAT: NORMAL SERV: (MEA) AMINE (OR DEA) (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24 52.122 kg/cm2 @ -29 Deg C 38.56 kg/cm2 @ 345 Deg C	Class 300 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B,SMLS • ITCS A333-6,SMLS	• CS A234-WPBN, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 304 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING,CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
3CB4B13	DES: ASME B31.3-2014 CAT: NORMAL SERV: (B) CAUSTIC (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24 52.122 kg/cm2 @ -29 Deg C 38.56 kg/cm2 @ 345 Deg C	Class 300 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B,SMLS • ITCS A333-6,SMLS	• CS A234-WPBN, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• ALLOY400-FG, SPIRAL WOUND, 3.2mm (1/8")THK ALLOY 400 INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM11 • API 623 TRIM11 • API 600 TRIM11 • API 594 TRIM9
3CB4B41	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID (SPW) SOUR PROCESS	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24 52.122 kg/cm2 @ -29 Deg C 38.56 kg/cm2 @ 345 Deg C	Class 300 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B,SMLS • ITCS A333-6,SMLS	• CS A234-WPBN, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK,316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12 • MFR STD TRIM
3CB4B43	DES: ASME B31.3-2014 CAT: NORMAL	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24	Class 300 Raised Face	6.0mm Nominal (4.8mm	• CS A106-B,SMLS • ITCS A333-6,SMLS • CS A671-CC60CL.	• CS A234-WPBN, SMLS • ITCSA420-WPL6,	• CS A105N, B16.5 • CS A105N, B16.47A	• 316L SS-FG, SPIRAL WOUND LOW STRESS,	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS,	BODY: ========== • CS A105N

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	SERV: (FG) FUEL GAS (P) PROCESS FLUID (PN) PURGE (PW) PROCESSWATER (SPW) SOUR PROCESS WATER (VF) FLARE	52.122 kg/cm2 @ -29 Deg C 38.56 kg/cm2 @ 345 Deg C CALCULATED WALL ========== NPS 32 - 36 See PMC for P-T Limits		Minimum)	22, EFW, DBLBTT STRT SM,100% X-RAY	SMLS • ITCSA420-WPL6W, WLD, 100%X-RAY		(1/8") THK,316L SS INNER RING, 316L SS OUTER RING	A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	• CSA216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SSBALL/STEM, METAL ST • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12 • MFR STDTRIM
3CB4B44	DES: ASMEB31.3-2014 CAT: ELEVATEDTEMPERATURE SERV: (P) PROCESSFLUID	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24 52.122 kg/cm2 @ -29 Deg C 29.376 kg/cm2 @ 425 Deg C CALCULATED WALL ========== NPS 32 - 32 See PMC for P-T Limits	Class 300 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B,SMLS • ITCS A333-6,SMLS • CS A671-CC60CL. 22, EFW, DBLBTT STRT SM,100% X-RAY	• CS A234-WPBN, SMLS • ITCSA420-WPL6, SMLS • ITCSA420-WPL6W, WLD,	• CS A105N, B16.5 • CS A105N, B16.47A	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK,316L SS INNER RING, 316L SS OUTER RING	• CR-1/5MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, COATED	BODY: ========== • CS A105N • CSA216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
3CB4B47	DES: ASMEB31.3-2014 CAT: NORMAL SERV: (MEA) AMINE (OR DEA)	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24 52.122 kg/cm2 @ -29 Deg C 38.56 kg/cm2 @ 345 Deg C	Class 300 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B,SMLS • ITCS A333-6,SMLS	• CS A234-WPBN, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK,316L SS INNER RING, 316L SS OUTER RING	• CR-1/5MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, COATED	BODY: ========== • CS A105N • CSA216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
3CB4S01	DES: ASMEB31.3-2014 CAT: NORMAL SERV: (OWS) OILY WATER SEWER (P) PROCESSFLUID	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24 52.122 kg/cm2 @ -29 Deg C 38.56 kg/cm2 @ 345 Deg C	Class 300 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B,SMLS • ITCS A333-6,SMLS • CS A671-CC60CL. 22, EFW, DBLBTT STRT SM,100% X-RAY	• CSA105N • CS A234-WPB N, SMLS • ITCS A420-WPL6, SMLS • ITCSA420-WPL6W, WLD	• CS A105N, B16.5	• 304 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING,CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CSA216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SSBALL/STEM, METAL ST • API 623 TRIM12

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
										• API 600 TRIM12 • API 594 TRIM10
3CB4S02	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 24 52.122 kg/cm2 @ -29 Deg C 29.376 kg/cm2 @ 425 Deg C	Class 300 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS • CS A671-CC60 CL. 22, EFW, DBL BTT STRT SM, 100% X-RAY	• CS A105N • CS A234-WPB N, SMLS • ITCS A420-WPL6, SMLS • ITCS A420-WPL6W, WLD	• CS A105N, B16.5	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 600 TRIM12 • API 594 TRIM10
3CB9B55	DES: ASME B31.3-2014 CAT: NORMAL SERV: (CAT) CATALYST	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 12 52.122 kg/cm2 @ -29 Deg C 38.56 kg/cm2 @ 345 Deg C	Class 300 Raised Face		• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A234-WPBN, SMLS • ITCS A420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK W/O INNER RING, 316L SS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695	BODY: ========== • 316 SS A351-CF8M TRIM(S): ========== • 316 SS BALL/STEM, METAL ST, WC COATED BALL/ST
3CB9B56	DES: ASME B31.3-2014 CAT: NORMAL SERV: (CAT) CATALYST	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 12 52.122 kg/cm2 @ -29 Deg C 38.56 kg/cm2 @ 345 Deg C	Class 300 Raised Face		• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A234-WPBN, SMLS • ITCS A420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK W/O INNER RING, 316L SS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695	BODY: ========== • 316 SS A351-CF8M TRIM(S): ========== • 316 SS BALL/STEM, METAL ST, WC COATED BALL/ST
3CB9B57	DES: ASME B31.3-2014 CAT: NORMAL SERV: (CAT) CATALYST	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 12 52.122 kg/cm2 @ -29 Deg C 38.56 kg/cm2 @ 345 Deg C	Class 300 Raised Face		• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A234-WPBN, SMLS • ITCS A420-WPL6, SMLS	• CS A105N, B16.5	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695	BODY: ========== • CS A105N • CS A216-WCB • 316 SS A351-CF8M TRIM(S): ========== • API 602 TRIM16 • API 623 TRIM16

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
										• API 600 TRIM16 • API 594 TRIM12 • 316 SS BALL/STEM, METAL ST. WC COATED BALL/ST
3CB9B58	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (CAT) CATALYST (IA) INSTRUMENT AIR (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL300 NPS 0.5 - 12 52.122 kg/cm2 @ -29 Deg C 29.376 kg/cm2 @ 425 Deg C	Class 300 Raised Face		• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A234-WPB N, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, C S OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM16 • API 623 TRIM16 • API 594 TRIM12 • API 600 TRIM16
3CJ1S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 1.9 - CL300 NPS 0.5 - 24 52.734 kg/cm2 @ -29 Deg C 35.904 kg/cm2 @ 425 Deg C CALCULATED WALL ========== NPS 32 - 34 See PMC for P-T Limits	Class 300 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 1-1/4 CR-1/2 MO A335-P11, SMLS	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 • 1-1/4 CR-1/2 MO A234-WP11 CL. 1, SMLS	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T, B16.5 • 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T, B16.47A	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK, 316L SS INNER RING, 316L SS OUTER RING	• CR-MO-V A193-B16, W/ 2 HVY HEX NUTS, CR-MO A194-7, 2WSHRS, LOW ALLOY PCC-1-	BODY: ========== • 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T • 1-1/4 CR-1/2 MO A217-WC6 TRIM(S): ========== • API 602 TRIM8 • API 623 TRIM8 • API 600 TRIM8 • API 594 TRIM1
3CJ1S02	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (P) PROCESS FLUID (AV) VENT	B16.5/47 MG 1.9 - CL300 NPS 0.5 - 24 52.734 kg/cm2 @ -29 Deg C 12.954 kg/cm2 @ 550 Deg C CALCULATED WALL ========== NPS 32 - 54 See PMC for P-T Limits	Class 300 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 1-1/4 CR-1/2 MO A335-P11, SMLS • 1-1/4 CR-1/2 MO A691-1-1/4 CR CL 22, EFW, DBL BTT STRT SM, 100% X-RAY	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 • 1-1/4 CR-1/2 MO A234-WP11 CL. 1, SMLS • 1-1/4 CR-1/2 MO A234-WP11 CL. 1 -W. WLD. 100% X-RAY	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T, B16.5 • 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T, B16.47A	• 316L SS-TM, SPIRAL WOUND LOW STRESS, (1/8") THK, 316L SS INNER RING, 316L SS OUTER RING	• CR-MO-V A193-B16, W/ 2 HVY HEX NUTS, CR-MO A194-7, 2WSHRS, LOW ALLOY PCC-1-	BODY: ========== • 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T • 1-1/4 CR-1/2 MO A217-WC6 TRIM(S): ========== • API 602 TRIM8 • API 623 TRIM8 • API 600 TRIM8

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
										• API 594 TRIM1
3CJ2S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 1.9 - CL300 NPS 0.5 - 24 52.734 kg/cm2 @ -29 Deg C 35.904 kg/cm2 @ 425 Deg C	Class 300 Raised Face	3.0mm Nominal (2.4mm Minimum)	• 1-1/4 CR-1/2 MO A335-P11, SMLS	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 • 1-1/4 CR-1/2 MO A234-WP11 CL. 1, SMLS	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK,316L SS INNER RING, 316L SS OUTER RING	• CR-MO-V A193-B16, W/ 2 HVY HEX NUTS, CR-MO A194-7, 2WSHRS, LOW ALLOY PCC-4 1-	BODY: ========== • 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T • 1-1/4 CR-1/2 MO A217-WC6 TRIM(S): ========== • API 602 TRIM8 • API 623 TRIM8 • API 600 TRIM8 • API 594 TRIM1
3CJ3S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 1.9 - CL300 NPS 0.5 - 24 52.734 kg/cm2 @ -29 Deg C 35.904 kg/cm2 @ 425 Deg C	Class 300 Raised Face	4.5mm Nominal (3.6mm Minimum)	• 1-1/4 CR-1/2 MO A335-P11, SMLS	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 • 1-1/4 CR-1/2 MO A234-WP11 CL. 1, SMLS	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T, B16.5	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK,316L SS INNER RING, 316L SS OUTER RING	• CR-MO-V A193-B16, W/ 2 HVY HEX NUTS, CR-MO A194-7, 2WSHRS, LOW ALLOY PCC-4 1-	BODY: ========== • 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T • 1-1/4 CR-1/2 MO A217-WC6 TRIM(S): ========== • API 602 TRIM8 • 316 SS BALL/STEM, METAL ST, WC COATED BALL/ST • API 623 TRIM8 • API 600 TRIM8 • API 594 TRIM1 • MFR STD TRIM
3CL2S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 1.17 - CL300 NPS 0.5 - 24 52.734 kg/cm2 @ -29 Deg C 35.904 kg/cm2 @ 425 Deg C CALCULATED WALL ========== NPS 26 - 30 See PMC for P-T Limits	Class 300 Raised Face	3.0mm Nominal (2.4mm Minimum)	• 5 CR-1/2 MO A335-P5, SMLS	• 5 CR-1/2 MO A182-F5 • 5 CR-1/2 MO A234 -WP5 CL. 1, SMLS	• 5 CR-1/2 MO A182-F5 N&T, B16.5 • 5 CR-1/2 MO A182-F5 N&T, B16.47A	• 316L SS-FG, SPIRAL WOUND LOW STRESS, (1/8") THK,316L SS INNER RING, 316L SS OUTER RING	• CR-MO-V A193-B16, W/ 2 HVY HEX NUTS, CR-MO A194-7, 2WSHRS, LOW ALLOY PCC-4 1-	BODY: ========== • 5 CR-1/2 MO A182-F5 N&T • 5 CR-1/2 MO A217-C5 TRIM(S): ========== • API 602 TRIM8 • 316 SS BALL/STEM,

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
										METAL ST. WC COATED BALL/ST • API 623 TRIM8 • API 594 TRIM1 • API 600 TRIM8 • MFR STD TRIM
3CL3S02	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (P) PROCESS FLUID	B16.5/47 MG 1.17 - CL300 NPS 0.5 - 24 52.734 kg/cm2 @ -29 Deg C 21.828 kg/cm2 @ 500 Deg C	Class 300 Raised Face	4.5mm Nominal (3.6mm Minimum)	• 5 CR-1/2 MO A335-P5, SMLS	• 5 CR-1/2 MO A182-F5 • 5 CR-1/2 MO A234 -WP5 CL. 1, SMLS	• 5 CR-1/2 MO A182-F5 N&T, B16.5	• 316L SS-TM, SPIRAL WOUND LOW STRESS, (1/8") THK,316L SS INNER RING, 316L SS OUTER RING	• CR-MO-V A193-B16, W/ 2 HVY HEX NUTS, CR-MO A194-7, 2WSHRS, LOW ALLOY PCC-1-	BODY: ========== • 5 CR-1/2 MO A182-F5 N&T • 5 CR-1/2 MO A217-C5 TRIM(S): ========== • API 602 TRIM8 • API 623 TRIM8 • API 600 TRIM8 • API 594 TRIM1
3NU2B35	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AD) ACID DRAIN (SA) SULFURIC ACID	B16.5/47 MG 3.17 - CL300 NPS 0.5 - 6 42.228 kg/cm2 @ -29 Deg C 34.65 kg/cm2 @ 120 Deg C	Class 300 Raised Face	3.0mm Nominal (2.4mm Minimum)	• ALLOY 20 B729-N08020 ANN. SMLS • ALLOY 20 B464-N08020 ANN. WLD, 100%X-RAY	• ALLOY 20 B366 -WP20CB-S ANN., SMLS • ALLOY 20 B366 -WP20CB-WX ANN., WLD, 100% X-RAY	• ALLOY 20 B462-N08020 ANN. B16.5	• ALLOY20-PTFE, SPIRAL WOUND LOW STRESS, (1/8") THK, ALLO 20 INNER RING, C OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY S PCC-1-4, PTFE COATED	BODY: ========== • ALLOY 20 A351-CN7M TRIM(S): ========== • API 602 TRIM13 • API 594 TRIM13 • API 623 TRIM13
3SJ1S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 2.4 - CL300 NPS 0.5 - 24 50.592 kg/cm2 @ -29 Deg C 27.95 kg/cm2 @ 510 Deg C	Class 300 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 321 SS A312-TP321, SMLS • 321 SS A312-TP321, EFW, DBL BTT, STRT SM 100%X-RAY • 321 SS A358-321 CL. 1, EFW, DBL BTT, STRT SM, 100% X-RAY	• 321 SS A182-F321 • 321 SS A403 -WP321-S, SMLS • 321 SS A403 -WP321-WX, WLD, 100% X-RAY	• 321 SS A182-F321, B16.5	• 347 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 347 SS INNER RING, 347 SS OUTER RIN	• CR-MO-V A193-B16, W/ 2 HVY HEX NUTS, CR-MO A194-7, 2WSHRS, LOW ALLOY PCC-1-	BODY: ========== • 347 SS A182-F347 • 347 SS A351-CF8C TRIM(S): ========== • API 602 TRIM17 • API 623 TRIM17 • 347 SS TRIMW/ FHF
6CA2B41	DES: ASME B31.3-2014 CAT: NORMAL	B16.5/47 MG 1.3 - CL600 NPS 0.5 - 24	Class 600 Raised Face	3.0mm Nominal (2.4mm	• ITCS A333-6, SMLS	• ITCS A420-WPL6, SMLS	• ITCS A350-LF2 CL. 1, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK	• CR-1/5 MO A320-L7M, W/ 2 HVY HEX NUTS	BODY: ========== • ITCS A350-LF2 CL.

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	SERV: (H) HYDROGEN (P) PROCESS FLUID	97.92 kg/cm2 @ -45 Deg C 75.21 kg/cm2 @ 340 Deg C		Minimum)				316L SS INNER RING, 316L SS OUTER RING	CR-MO A194-7M,2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	1 • ITCSA352-LCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
6CB1S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (BDW) BLOWDOWN WATER (CH) CHEMICALS (P) PROCESS FLUID (PA) PLANT AIR (PN) PURGE NITROGEN (PW) PROCESS WATER	B16.5/47 MG 1.1 - CL600 NPS 0.5 - 24 104.142 kg/cm2 @ -29 Deg C 77.05 kg/cm2 @ 345 Deg C CALCULATED WALL ========== NPS 30 - 48 See PMC for P-T Limits	Class 600 Raised Face	1.5mm Nominal (1.2mm Minimum)	• CS A106-B,SMLS • ITCS A333-6,SMLS • CS A671-CC60CL. 22, EFW, DBLBTT STRT SM,100% X-RAY	• CS A105N • CS A234-WPB N, SMLS • ITCS A420-WPL6, SMLS • ITCSA420-WPL6W, WLD, 100%X-RAY	• CS A105N, B16.5 • CS A105N, B16.47A	• 304 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING,CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM8 • API 623 TRIM8 • API 600 TRIM8 • API 594 TRIM1
6CB2B41	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AV) VENT ATMOSPHERE (H) HYDROGEN (NG) NATURAL GAS (P) PROCESS FLUID (PN) PURGE NITROGEN (SPW) SOUR PROCESS (VF) FLARE (VFL) VENT FLARE LIQUID	B16.5/47 MG 1.1 - CL600 NPS 0.5 - 24 104.142 kg/cm2 @ -29 Deg C 77.05 kg/cm2 @ 345 Deg C	Class 600 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B,SMLS • ITCS A333-6,SMLS	• CS A234-WPBN, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
6CB2S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (H) HYDROGEN (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL600 NPS 0.5 - 24 104.142 kg/cm2 @ -29 Deg C 77.05 kg/cm2 @ 345 Deg C CALCULATED WALL ==========	Class 600 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B,SMLS • ITCS A333-6,SMLS • CS A671-CC60CL. 22, EFW, DBLBTT STRT SM,100% X-RAY	• CS A105N • CS A234-WPB N, SMLS • ITCS A420-WPL6, SMLS • ITCSA420-WPL6W, WLD,	• CS A105N, B16.5 • CS A105N, B16.47A	• 304 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING,CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	SERV: (H) HYDROGEN (P) PROCESS FLUID	97.92 kg/cm2 @ -45 Deg C 75.21 kg/cm2 @ 340 Deg C		Minimum)				316L SS INNER RING, 316L SS OUTER RING	CR-MO A194-7M, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	1 • ITCSA352-LCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
6CB1S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (BDW) BLOWDOWN WATER (CH) CHEMICALS (P) PROCESS FLUID (PA) PLANT AIR (PN) PURGE NITROGEN (PW) PROCESS WATER	B16.5/47 MG 1.1 - CL600 NPS 0.5 - 24 104.142 kg/cm2 @ -29 Deg C 77.05 kg/cm2 @ 345 Deg C CALCULATED WALL ========== NPS 30 - 48 See PMC for P-T Limits	Class 600 Raised Face	1.5mm Nominal (1.2mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS • CS A671-CC60 CL. 22, EFW, DBLBTT STRT SM, 100% X-RAY	• CS A105N • CS A234-WPB N, SMLS • ITCS A420-WPL6, SMLS • ITCSA420-WPL6W, WLD, 100%X-RAY	• CS A105N, B16.5 • CS A105N, B16.47A	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CSA216-WCB TRIM(S): ========== • API 602 TRIM8 • API 623 TRIM8 • API 600 TRIM8 • API 594 TRIM1
6CB2B41	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AV) VENT ATMOSPHERE (H) HYDROGEN (NG) NATURAL GAS (P) PROCESS FLUID (PN) PURGE NITROGEN (SPW) SOUR PROCESS (VF) FLARE (VFL) VENT FLARE LIQUID	B16.5/47 MG 1.1 - CL600 NPS 0.5 - 24 104.142 kg/cm2 @ -29 Deg C 77.05 kg/cm2 @ 345 Deg C	Class 600 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A234-WPBN, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CSA216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
6CB2S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (H) HYDROGEN (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL600 NPS 0.5 - 24 104.142 kg/cm2 @ -29 Deg C 77.05 kg/cm2 @ 345 Deg C CALCULATED WALL ==========	Class 600 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS • CS A671-CC60 CL. 22, EFW, DBLBTT STRT SM, 100% X-RAY	• CS A105N • CS A234-WPB N, SMLS • ITCS A420-WPL6, SMLS • ITCSA420-WPL6W, WLD,	• CS A105N, B16.5 • CS A105N, B16.47A	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CSA216-WCB TRIM(S): ========== • API 602 TRIM12

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
		NPS 30 - 48 See PMC for P-T Limits								• 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12 • MFR STD TRIM
6CB2S07	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (AV) VENT ATMOSPHERE (BDW) BLOWDOWN WATER (BFW) (HC) HIGH PRESSURE CONDENSATE (HS) HIGH PRESSURE STEAM (MC) MEDIUM CONDENSATE (MS) MEDIUM PRESSURE STEAM (LS) LOW PRESSURE STEAM	B16.5/47 MG 1.1 - CL600 NPS 0.5 - 24 104.142 kg/cm2 @ -29 Deg C 58.65 kg/cm2 @ 425 Deg C CALCULATED WALL NPS 30 - 36 See PMC for P-T Limits	Class 600 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS • CS A671-CC60 CL 22, EFW, DBL BTT STRT SM, 100% X-RAY	• CS A105N • CS A234-WPB N, SMLS • ITCS A420-WPL6, SMLS • ITCS A420-WPL6W, WLD, 100%X-RAY	• CS A105N, B16.5 • C A105N, SP-44 • S A105N, B16.47A	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: • CS A105N • CS A216-WCB TRIM(S): • API 602 TRIM5 • API 623 TRIM5 • API 600 TRIM5 • API 594 TRIM5 • MFR STD TRIM
6CB4B41	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID (SPW) SOUR PROCESS	B16.5/47 MG 1.1 - CL600 NPS 0.5 - 24 104.142 kg/cm2 @ -29 Deg C 77.05 kg/cm2 @ 345 Deg C	Class 600 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A234-WPBN, SMLS • ITCS A420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: • CS A105N • CS A216-WCB TRIM(S): • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
6CB4B43	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID (SPW) SOUR PROCESS	B16.5/47 MG 1.1 - CL600 NPS 0.5 - 24 104.142 kg/cm2 @ -29 Deg C 77.05 kg/cm2 @ 345 Deg C	Class 600 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A234-WPBN, SMLS • ITCS A420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: • CS A105N • CS A216-WCB TRIM(S): • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
										• API 600 TRIM12
6CB4B47	DES: ASME B31.3-2014 CAT: NORMAL SERV: (MEA) AMINE (OR DEA)	B16.5/47 MG 1.1 - CL600 NPS 0.5 - 24 104.142 kg/cm2 @ -29 Deg C 77.05 kg/cm2 @ 345 Deg C	Class 600 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B,SMLS • ITCS A333-6,SMLS	• CS A234-WPB N, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8")THK 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, CS A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
6CJ1S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 1.9 - CL600 NPS 0.5 - 24 105.468 kg/cm2 @ -29 Deg C 69.054 kg/cm2 @ 450 Deg C	Class 600 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 1-1/4 CR-1/2 MO A335-P11, SMLS	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 • 1-1/4 CR-1/2 MO A234-WP11 CL. 1, SMLS	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T, B16.5	• 316L SS-TM, SPIRAL WOUND, 3.2mm (1/8")THK 316L SS INNER RING, 316L SS OUTER RING	• CR-MO-V A193-B16, W/ 2 HVY HEX NUTS, CR-MO A194-7, 2WSHRS, LOW ALLOY PCC-1-	BODY: ========== • 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T • 1-1/4 CR-1/2 MO A217-WC6 TRIM(S): ========== • API 602 TRIM8 • API 623 TRIM8 • API 600 TRIM8 • API 594 TRIM1
6CJ1S07	DES: ASME B31.3-2014 CAT: NORMAL SERV: (HC) HIGH PRESSURE CONDENSATE (HHS) HIGH HIGH PRESSURE STEAM (HS) HIGH PRESSURE STEAM	B16.5/47 MG 1.9 - CL600 NPS 0.5 - 24 105.468 kg/cm2 @ -29 Deg C 69.054 kg/cm2 @ 450 Deg C CALCULATED WALL ========== NPS 26 - 48 See PMC for P-T Limits	Class 600 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 1-1/4 CR-1/2 MO A335-P11, SMLS	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 • 1-1/4 CR-1/2 MO A234-WP11 CL. 1, SMLS	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T, B16.5 • 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T, B16.47A	• 316L SS-TM, SPIRAL WOUND, 3.2mm (1/8")THK 316L SS INNER RING, 316L SS OUTER RING	• CR-MO-V A193-B16, W/ 2 HVY HEX NUTS, CR-MO A194-7, 2WSHRS, LOW ALLOY PCC-1-	BODY: ========== • 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T • 1-1/4 CR-1/2 MO A217-WC6 TRIM(S): ========== • API 602 TRIM5 • API 623 TRIM5 • API 594 TRIM5 • API 600 TRIM5
6CJ9B56	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE	B16.5/47 MG 1.9 - CL600 NPS 0.5 - 6	Class 600 Raised Face		• 1-1/4 CR-1/2 MO A335-P11, SMLS	• 1-1/4 CR-1/2 MO A234-WP11 CL. 1, SMLS	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T, B16.5	• 316L SS-TM, SPIRAL WOUND, 3.2mm (1/8")THK	• CR-MO-V A193-B16, W/ 2 HVY HEX NUTS, CR-MO	BODY: ========== • 316 SS A351-CF8M

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	SERV: (CAT) CATALYST	105.468 kg/cm2 @ -29 Deg C 16.85 kg/cm2 @ 580 Deg C						W/O INNER RING, 316L SS OUTER RING	A194-7, 2WSHRS, LOW ALLOY PCC-1-	TRIM(S): ========== • 316 SS BALL/STEM, METAL ST. WC COATED BALL/ST
6CL2S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 1.17 - CL600 NPS 0.5 - 16 105.468 kg/cm2 @ -29 Deg C 71.4 kg/cm2 @ 425 Deg C	Class 600 Raised Face	3.0mm Nominal (2.4mm Minimum)	• 5 CR-1/2 MO A335-P5, SMLS	• 5 CR-1/2 MO A182-F5 • 5 CR-1/2 MO A234 -WP5 CL. 1, SMLS	• 5 CR-1/2 MO A182-F5 N&T, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK 316L SS INNER RING, 316L SS OUTER RING	• CR-MO-V A193-B16, W/ 2 HVY HEX NUTS, CR-MO A194-7, 2WSHRS, LOW ALLOY PCC-1-	BODY: ========== • 5 CR-1/2 MO A182-F5 N&T • 5 CR-1/2 MO A217-C5 TRIM(S): ========== • API 602 TRIM8 • 316 SS BALL/STEM, METAL ST. WC COATED BALL/ST • API 623 TRIM8 • API 594 TRIM1 • API 600 TRIM8 • MFR STD TRIM
6NQ1S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 3.8 - CL600 NPS 0.5 - 12 105.468 kg/cm2 @ -29 Deg C 71.4 kg/cm2 @ 425 Deg C	Class 600 Raised Face	1.5mm Nominal (1.2mm Minimum)	• ALLOY 625 B444-N06625-1, ANN., SMLS	• ALLOY 625 B366 -WPNCMC-S ANN., SMLS	• ALLOY 625 B564-N06625 ANN., B16.5	• ALLOY625-FG, SPIRAL WOUND, 3.2mm (1/8") THK ALLOY 625 INNER RING, ALLOY 625 OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695	BODY: ========== • 5 CR-1/2 MO A182-F5 N&T • 5 CR-1/2 MO A217-C5 TRIM(S): ========== • API 602 TRIM8 • 316 SS BALL/STEM, METAL ST. WC COATED BALL/ST • API 623 TRIM8 • API 594 TRIM1 • API 600 TRIM8 • MFR STD TRIM
6SA1B05	DES: ASME B31.3-2014 CAT: NORMAL	B16.5/47 MG 2.1 - CL600 NPS 0.5 - 12	Class 600 Raised Face	1.5mm Nominal (1.2mm	• 304/304L SS A312-TP304/304L, SMLS	• 304/304L SS A403 -WP304/304L-S, SMLS	• 304/304L SS A182-F304/304L, B16.5	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK. 304	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H. 2	BODY: ========== • 316/316L SS

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	SERV: (DMW) DEMINERALIZED (LO) WATER LUBE OIL	101.286 kg/cm2 @ -29 Deg C 68.89 kg/cm2 @ 218 Deg C		Minimum)	• 304/304L SS A312-TP304/304L, EFW, DBL BTT, STRT SM,100% X-RAY • 304/304L SS A358-304/304L CL 1. EFW. DBL BTT. STRT SM. 100% X-RAY	• 304/304L SS A403 -WP304/304L-WX, WLD, 100% X-RAY		SS INNER RING, 304 SS OUTER RIN	WSHRS, LOW ALLOY G PCC-1-4, MECH GALV B695 CL.50	A182-F316/F316L • 316 SS A351-CF8M TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, PEEK ST • API 623 TRIM12 • API 594 TRIM10 • MFR STD TRIM
6SA1B41	DES: ASME B31.3-2014 CAT: NORMAL SERV: (FG) FUEL GAS	B16.5/47 MG 2.1 - CL600 NPS 0.5 - 16 101.286 kg/cm2 @ -29 Deg C 52.94 kg/cm2 @ 510 Deg C	Class 600 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 304/304L SS A312-TP304/304L, SMLS • 304/304L SS A312-TP304/304L, EFW, DBL BTT, STRT SM, 100% X-RAY • 304/304L SS A358-304/304L CL 1. EFW. DBL BTT. STRT SM. 100% X-RAY	• 304/304L SS A403 -WP304/304L-S, SMLS • 304/304L SS A403 -WP304/304L-WX, WLD, 100% X-	• 304/304L SS A182-F304/304L, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8")THK 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, COATED	BODY: ========== • 316/316L SS A182-F316/F316L • 316 SS A351-CF8M TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10
6SD1B11	DES: ASME B31.3-2014 CAT: NORMAL SERV: (AMD) AMINE DRAIN (MEA) AMINE (ORDEA)	B16.5/47 MG 2.2 - CL600 NPS 0.5 - 24 101.286 kg/cm2 @ -29 Deg C 55.86 kg/cm2 @ 510 Deg C	Class 600 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 316/316L SS A312-TP316/316L, SMLS • 316/316L SS A312-TP316/316L, EFW, DBL BTT, STRT SM,100% X-RAY • 316/316L SS A358-316/316L CL 1. EFW. DBL BTT. STRT SM. 100% X-RAY	• 316/316L SS A403 -WP316/316L-S, SMLS • 316/316L SS A403 -WP316/316L-WX, WLD, 100% X-RAY	• 316/316L SS A182-F316/F316L, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8")THK 316L SS INNER RING, 316L SS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • 316/316L SS A182-F316/F316L • 316 SS A351-CF8M TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10
6SD1B47	DES: ASME B31.3-2014 CAT: NORMAL SERV: (MEA) AMINE (OR DEA)	B16.5/47 MG 2.2 - CL600 NPS 0.5 - 16 101.286 kg/cm2 @ -29 Deg C 55.86 kg/cm2 @ 510 Deg C	Class 600 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 316/316L SS A312-TP316/316L, SMLS • 316/316L SS A312-TP316/316L, EFW, DBL BTT, STRT SM. 100%	• 316/316L SS A403 -WP316/316L-S, SMLS • 316/316L SS A403 -WP316/316L-WX, WLD, 100% X-	• 316/316L SS A182-F316/F316L, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8")THK 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, COATED	BODY: ========== • 316/316L SS A182-F316/F316L • 316 SS A351-CF8M TRIM(S):

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
					X-RAY • 316/316L SS A358-316/316L CL 1, EFW, DBL BTT, STRT SM, 100% X-RAY					========== • 316 SS BALL/STEM, METAL ST • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10
6SD1S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID (PW)	B16.5/47 MG 2.2 - CL600 NPS 0.5 - 24 101.286 kg/cm2 @ -29 Deg C 55.86 kg/cm2 @ 510 Deg C	Class 600 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 316/316L SS A312-TP316/316L, SMLS • 316/316L SS A312-TP316/316L, EFW, DBL BTT, STRT SM, 100% X-RAY • 316/316L SS A358-316/316L CL 1, EFW, DBL BTT, STRT SM, 100% X-RAY	• 316/316L SS A182-F316/F316L • 316/316L SS A403 -WP316/316L-S, SMLS • 316/316L SS A403 -WP316/316L-WX, WLD, 100% X-	• 316/316L SS A182-F316/F316L, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8")THK 316L SS INNER RING, 316L SS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • 316/316L SS A182-F316/F316L • 316 SS A351-CF8M TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10
9CB2B41	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL900 NPS 0.5 - 12 156.264 kg/cm2 @ -29 Deg C 115.61 kg/cm2 @ 345 Deg C CALCULATED WALL ========== NPS 14 - 16 See PMC for P-T Limits	Class 900 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A234-WPBN, SMLS • ITCS A420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8")THK 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
9CB2S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (H) HYDROGEN (P) PROCESS FLUID (PW)	B16.5/47 MG 1.1 - CL900 NPS 0.5 - 12 156.264 kg/cm2 @ -29 Deg C 115.61 kg/cm2 @ 345 Deg C CALCULATED WALL ========== NPS 14 - 20 See PMC for P-T Limits	Class 900 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS • CS A671-CC60 CL. 22, EFW, DBL BTT, STRT SM, 100% X-RAY	• CS A105N • CS A234-WPB N, SMLS • ITCS A420-WPL6, SMLS • ITCS A420-WPL6W, WLD, 100% X-RAY	• CS A105N, B16.5	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 600 TRIM12 • API 594 TRIM10

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
9CB2S02	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL900 NPS 0.5 - 12 156.264 kg/cm2 @ -29 Deg C 88.026 kg/cm2 @ 425 Deg C CALCULATED WALL ========== NPS 14 - 20 See PMC for P-T Limits	Class 900 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS • CS A671-CC60 CL. 22, EFW, DBL BTT STRT SM, 100% X-RAY	• CS A105N • CS A234-WPB N, SMLS • ITCS A420-WPL6, SMLS • ITCSA420-WPL6W, WLD. 100% X-RAY	• CS A105N, B16.5	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
9CB2S07	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (BFW) BOILER FEED WATER (HC) HIGH PRESSURE CONDENSA	B16.5/47 MG 1.1 - CL900 NPS 0.5 - 12 156.264 kg/cm2 @ -29 Deg C 88.026 kg/cm2 @ 425 Deg C CALCULATED WALL ========== See PMC for P-T Limits	Class 900 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A105N • CS A234-WPB N, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 304 SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK, 304 SS INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695 CL.50	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM5 • API 623 TRIM5 • API 594 TRIM5 • API 600 TRIM5
9CB4B41	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID (PN) PURGE	B16.5/47 MG 1.1 - CL900 NPS 0.5 - 12 156.264 kg/cm2 @ -29 Deg C 115.61 kg/cm2 @ 345 Deg C CALCULATED WALL ========== NPS 14 - 16 See PMC for P-T Limits	Class 900 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A234-WPBN, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
9CB4B43	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID (PW)	B16.5/47 MG 1.1 - CL900 NPS 0.5 - 12 156.264 kg/cm2 @ -29 Deg C 115.61 kg/cm2 @ 345 Deg C CALCULATED WALL ========== NPS 14 - 18 See PMC for P-T Limits	Class 900 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A234-WPBN, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
										• API 594 TRIM10 • API 600 TRIM12 • MFR STD TRIM
9CB4B44	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL900 NPS 0.5 - 12 156.264 kg/cm2 @ -29 Deg C 88.026 kg/cm2 @ 425 Deg C CALCULATED WALL ========== NPS 14 - 24 See PMC for P-T Limits	Class 900 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A234-WPBN, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12 • MFR STD TRIM
9CB4B47	DES: ASME B31.3-2014 CAT: NORMAL SERV: (MEA) AMINE (OR DEA)	B16.5/47 MG 1.1 - CL900 NPS 0.5 - 12 156.264 kg/cm2 @ -29 Deg C 115.61 kg/cm2 @ 345 Deg C CALCULATED WALL ========== NPS 14 - 16 See PMC for P-T Limits	Class 900 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A234-WPBN, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
9CB4B48	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (MEA) AMINE (OR DEA)	B16.5/47 MG 1.1 - CL900 NPS 0.5 - 12 156.264 kg/cm2 @ -29 Deg C 88.026 kg/cm2 @ 425 Deg C CALCULATED WALL ========== NPS 14 - 16 See PMC for P-T Limits	Class 900 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B, SMLS • ITCS A333-6, SMLS	• CS A234-WPBN, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8") THK 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
9CJ1S07	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE	B16.5/47 MG 1.9 - CL900 NPS 0.5 - 24	Class 900 Raised Face	1.5mm Nominal (1.2mm	• 1-1/4 CR-1/2 MO A335-P11, SMLS • 1-1/4 CR-1/2 MO	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 • 1-1/4 CR-1/2 MO	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T, B16.5	• 316L SS-TM, SPIRAL WOUND, 3.2mm (1/8") THK	• CR-MO-V A193-B16, W/ 2 HVY HEX NUTS, CR-MO	BODY: ========== • 1-1/4 CR-1/2 MO

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	SERV: (AV) VENT ATMOSPHERE (BFW) BOILER FEED WATER (HC) HIGH PRESSURE CONDENSATE (HS) HIGH PRESSURE STEAM (LC) LOW PRESSURE STEAM CONDENSATE (LS) LOW PRESSURE (HHS) STEAM HIGH HIGH STEAM	158.202 kg/cm2 @ -29 Deg C 78.744 kg/cm2 @ 500 Deg C CALCULATED WALL ========== NPS 30 - 54 See PMC for P-T Limits		Minimum)	A691-1-1/4 CR CL 22, EFW, DBL BTT STRT SM,100% X-RAY	A234-WP11 CL. 1, SMLS • 1-1/4 CR-1/2 MO A234-WP11 CL. 1 -W, WLD, 100% X-RAY	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T, B16.47A	316L SS INNER RING, 316L SS OUTER RING	A194-7, 2WSHRS, LOW ALLOY PCC-4 1-	A182-F11 CL. 2 N&T • 1-1/4 CR-1/2 MO A217-WC6 TRIM(S): ========== • API 602 TRIM5 • API 623 TRIM5 • API 594 TRIM5 • API 600 TRIM5
9SD1S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 2.2 - CL900 NPS 0.5 - 12 151.878 kg/cm2 @ -29 Deg C 83.82 kg/cm2 @ 510 Deg C CALCULATED WALL ========== NPS 14 - 24 See PMC for P-T Limits	Class 900 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 316/316L SS A312-TP316/316L, SMLS • 316/316L SS A312-TP316/316L, EFW, DBL BTT, STRT SM. 100% X-RAY • 316/316L SS A358-316/316L CL 1. EFW. DBL BTT. STRT SM. 100% X-RAY	• 316/316L SS A182-F316/F316L • 316/316L SS A403 -WP316/316L-S, SMLS • 316/316L SS A403 -WP316/316L-WX. WLD. 100% X-	• 316/316L SS A182-F316/F316L, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8")THK 316L SS INNER RING, 316L SS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695	BODY: ========== • 316/316L SS A182-F316/F316L • 316 SS A351-CF8M TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10
9SJ1S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 2.4 - CL900 NPS 0.5 - 12 151.878 kg/cm2 @ -29 Deg C 95.268 kg/cm2 @ 425 Deg C CALCULATED WALL ========== NPS 14 - 24 See PMC for P-T Limits	Class 900 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 321 SS A312-TP321,SMLS • 321 SS A312-TP321, EFW, DBL BTT, STRT SM 100%X-RAY • 321 SS A358-321 CL. 1. EFW. DBL BTT. STRT SM. 100% X-RAY	• 321 SS A182-F321 • 321 SS A403 -WP321-S, SMLS • 321 SS A403 -WP321-WX, WLD, 100% X-RAY	• 321 SS A182-F321, B16.5	• 347 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK. 347 SS INNER RING, 347 SS OUTER RIN	• CR-MO-V A193-B16, W/ 2 HVY HEX NUTS. CR-MO A194-7, 2WSHRS, LOW ALLOY PCC-4 1-	BODY: ========== • 347 SS A182-F347 • 347 SS A351-CF8C TRIM(S): ========== • API 602 TRIM17 • API 623 TRIM17 • 347 SS TRIMW/ FHF
15CB2B41	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID (VF) FLARE	B16.5/47 MG 1.1 - CL1500 NPS 0.5 - 6 260.406 kg/cm2 @ -29 Deg C 192.68 kg/cm2 @ 345 Deg C CALCULATED WALL	Class 1500 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B,SMLS • ITCS A333-6,SMLS	• CS A234-WPBN, SMLS • ITCS A420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8")THK 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ==========

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
		========== NPS 8 - 16 See PMC for P-T Limits								• API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
15CB2S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL1500 NPS 0.5 - 6 260.406 kg/cm2 @ -29 Deg C 192.68 kg/cm2 @ 345 Deg C CALCULATED WALL ========== NPS 8 - 20 See PMC for P-T Limits	Class 1500 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B,SMLS • ITCS A333-6,SMLS • CS A671-CC60CL. 22, EFW, DBLBTT STRT SM,100% X-RAY	• CS A105N • CS A234-WPB N, SMLS • ITCS A420-WPL6, SMLS • ITCSA420-WPL6W, WLD. 100% X-RAY	• CS A105N, B16.5	• 304 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK. 304 SS INNER RING,CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H. 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
15CB2S02 C	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL1500 NPS 0.5 - 6 260.406 kg/cm2 @ -29 Deg C 146.676 kg/cm2 @ 425 Deg C CALCULATED WALL ========== NPS 8 - 16 See PMC for P-T Limits	Class 1500 Raised Face	3.0mm Nominal (2.4mm Minimum)	• CS A106-B,SMLS • ITCS A333-6,SMLS	• CS A105N • CS A234-WPB N, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 304 SS-FG,SPIRAL WOUND, 3.2mm (1/8") THK. 304 SS INNER RING,CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H. 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • API 623 TRIM12 • API 594 TRIM10 • API 600 TRIM12
15CB4B42	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (H) HYDROGEN (P) PROCESS FLUID	B16.5/47 MG 1.1 - CL1500 NPS 1.5 - 6 260.406 kg/cm2 @ -29 Deg C 146.676 kg/cm2 @ 425 Deg C CALCULATED WALL ========== NPS 8 - 18 See PMC for P-T Limits	Class 1500 Raised Face	6.0mm Nominal (4.8mm Minimum)	• CS A106-B,SMLS • ITCS A333-6,SMLS	• CS A234-WPBN, SMLS • ITCSA420-WPL6, SMLS	• CS A105N, B16.5	• 316L SS-FG, SPIRAL WOUND, 3.2mm (1/8")THK 316L SS INNER RING, 316L SS OUTER RING	• CR-1/5 MO A193-B7M, W/ 2 HVY HEX NUTS, A194-2HM, 2 WSHRS, LOW ALLOY PCC-1-4, PTFE COATED	BODY: ========== • CS A105N • CS A216-WCB TRIM(S): ========== • API 602 TRIM12 • 316 SS BALL/STEM, METAL ST • API 623 TRIM12 • API 600 TRIM12 • API 594 TRIM10
15CJ1S07	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE	B16.5/47 MG 1.9 - CL1500 NPS 0.5 - 14	Class 1500 Raised Face	1.5mm Nominal (1.2mm	• 1-1/4 CR-1/2 MO A335-P11, SMLS	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 • 1-1/4 CR-1/2 MO	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T, B16.5	• 316L SS-TM, SPIRAL WOUND, 3.2mm (1/8")THK	• CR-MO-V A193-B16, W/ 2 HVY HEX NUTS, CR-MO	BODY: ========== • 1-1/4 CR-1/2 MO

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	SERV: (HC) HIGH PRESSURE CONDENSATE (HHS) HIGH HIGH PRESSURE STEAM (HS) HIGH PRESSURE STEAM	263.772 kg/cm2 @ -29 Deg C 131.172 kg/cm2 @ 500 Deg C CALCULATED WALL ========== NPS 16 - 24 See PMC for P-T Limits		Minimum)		A234-WP11 CL. 1, SMLS		316L SS INNER RING, 316L SS OUTER RING	A194-7, 2WSHRS, LOW ALLOY PCC-1	A182-F11 CL. 2 N&T • 1-1/4 CR-1/2 MO A217-WC6 TRIM(S): ========== • API 602 TRIM5 • API 623 TRIM5 • API 594 TRIM5 • API 600 TRIM5
15CJ2S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 1.9 - CL1500 NPS 0.5 - 14 263.772 kg/cm2 @ -29 Deg C 178.602 kg/cm2 @ 425 Deg C CALCULATED WALL ========== NPS 16 - 24 See PMC for P-T Limits	Class 1500 Raised Face	3.0mm Nominal (2.4mm Minimum)	• 1-1/4 CR-1/2 MO A335-P11, SMLS	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 • 1-1/4 CR-1/2 MO A234-WP11 CL. 1, SMLS	• 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T, B16.5	• 316L SS-TM, SPIRAL WOUND, 3.2mm (1/8")THK 316L SS INNER RING, 316L SS OUTER RING	• CR-MO-V A193-B16, W/ 2 HVY HEX NUTS, CR-MO A194-7, 2WSHRS, LOW ALLOY PCC-1	BODY: ========== • 1-1/4 CR-1/2 MO A182-F11 CL. 2 N&T • 1-1/4 CR-1/2 MO A217-WC6 TRIM(S): ========== • API 602 TRIM5 • API 623 TRIM5 • API 600 TRIM5 • API 594 TRIM5
15CK1S07	DES: ASME B31.3-2014 CAT: ELEVATED TEMPERATURE SERV: (HC) HIGH PRESSURE CONDENSATE (HS) HIGH PRESSURE STEAM	B16.5/47 MG 1.10 - CL1500 NPS 0.5 - 14 263.772 kg/cm2 @ -29 Deg C 79.764 kg/cm2 @ 550 Deg C CALCULATED WALL ========== NPS 16 - 24 See PMC for P-T Limits	Class 1500 Raised Face	1.5mm Nominal (1.2mm Minimum)	• 2-1/4 CR-1 MO A335-P22, SMLS	• 2-1/4 CR-1 MO A182-F22 CL. 3 • 2-1/4 CR-1 MO A234-WP22 CL. 1, SMLS	• 2-1/4 CR-1 MO A182-F22 CL. 3 N&T, B16.5	• 316L SS-TM, SPIRAL WOUND, 3.2mm (1/8")THK 316L SS INNER RING, 316L SS OUTER RING	• CR-MO-V A193-B16, W/ 2 HVY HEX NUTS, CR-MO A194-7, 2WSHRS, LOW ALLOY PCC-1	BODY: ========== • 2-1/4 CR-1 MO A182-F22 CL. 3 N&T • 2-1/4 CR-1 MO A217-WC9 TRIM(S): ========== • API 602 TRIM5 • API 623 TRIM5 • API 600 TRIM5 • API 594 TRIM5
1FE0A01	DES: ASME B31.3-2014 CAT: NORMAL	RTR 1FE0A01 MET NPS 4 - 36	Class 150 Flat Face	None	• RTR(EPOXY) D2996-RTRP-11FW, FILAMENT	• RTR (EPOXY)D5685 -RTRF-11F2E, FILAMENT WND	• RTR(EPOXY) D4024-RTR-113H, MFR STD, B16.5	• NON-ASBW/ NEOPRENE BINDER, FULL	• CS A307-B, W/ 1 HVY HEX NUT, CS A563-A, 2	BODY: ========== • SUPER DUPLEXSS

Class Revision	Design Code / Fluid Serv Cat / Service(s)	P-T Limits (Range: Min / Max)	Flange Class / Flange Facing	Corr Allow	Materials					
					Pipe	Fittings	Flanges	Gaskets	Bolts	Valves
	SERV: (BDW) BLOWDOWN WATER (CH) CHEMICALS (IW) INDUSTRIAL WATER (WELL WATER, PLANT (SS) CLEAN WATER SEWER (SW) SEA WATER (WW) WASTE WATER	10.34 kg/cm2 @ 38 Deg C 6.89 kg/cm2 @ 121 Deg C CALCULATED WALL ========== NPS 42 - 60 See PMC for P-T Limits					BOLT PATTERN • RTR (EPOXY) D4024-RTR-113H, MFR STD, B16.47A BOLT PATTERN	(1/8") THK	F436-1, MECH GALV B695 CL.55	A995-6A TRIM(S): ========== • 2507 SURED SS TRIM • MFR STD TRIM
3NQ1S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (H) HYDROGEN	B16.5/47 MG 3.8 - CL300 NPS 0.5 - 24 52.734 kg/cm2 @ -29 Deg C 35.904 kg/cm2 @ 425 Deg C	Class 300 Raised Face	1.5mm Nominal (1.2mm Minimum)	• ALLOY 625 B444-N06625-1, ANN., SMLS • ALLOY 625 B443-N06625-1, ANN., EFW, DBL BTT. STRT SM. 100% X-RAY	• ALLOY 625B366 -WPNCMC-S ANN., SMLS • ALLOY 625B366 -WPNCMC-WX ANN., WLD, 100%	• ALLOY 625 B564-N06625 ANN., B16.5	• ALLOY625-FG, SPIRAL WOUND, 3.2mm (1/8")THK ALLOY 625 INNER RING, ALLOY 625 OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695	BODY: ========== • ALLOY 625 B564-N06625 ANN. • ALLOY 625 A494-CW6MC TRIM(S): ========== • API 600 TRIM20A
1NM1S01	DES: ASME B31.3-2014 CAT: NORMAL SERV: (P) PROCESS FLUID	B16.5/47 MG 3.4 - CL150 NPS 0.5 - 24 16.218 kg/cm2 @ -29 Deg C 9.85 kg/cm2 @ 315 Deg C	Class 150 Raised Face	1.5mm Nominal (1.2mm Minimum)	• ALLOY 400 B165-N04400 ANN. SMLS • ALLOY 400 B725-N04400 ANN. EFW, DBL BTT. STRT SM. 100% X-RAY	• ALLOY 400 B564-N04400 ANN. • ALLOY 400B366 -WPNC-S ANN., SML • ALLOY 400 B366 WLD. 100% X-	• ALLOY 400 B564-N04400 ANN., B16.5 S	• ALLOY400-FG, SPIRAL WOUND, 3.2mm (1/8")THK ALLOY 400 INNER RING, CS OUTER RING	• CR-MO A193-B7, W/ 2 HVY HEX NUTS, CS A194-2H, 2 WSHRS, LOW ALLOY PCC-1-4, MECH GALV B695	BODY: ========== • ALLOY 400 B564-N04400 ANN. • ALLOY 400 A494-M35-1 TRIM(S): ========== • API 602 TRIM11 • API 600 TRIM11