

CLIENT



CONTRACTOR

IDOM

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NÚMERO DE CONTRATO: 3037737

- ☒ 1. APROBADO PARA DISEÑO.
☐ 2. APROBADO CON COMENTARIOS, PUEDE PROCEDER SUJETO A LA INCORPORACIÓN DE LOS CAMBIOS INDICADOS.
☐ 3. DEVUELTO Y REVISADO, NO PUEDE PROCEDER.
☐ 4. SOLO PARA INFORMACION.

FIRMA:

FECHA:

26/12/2023

PROJECT

Ingeniería Básica Proyecto Mejoras en Unidad de Destilación Reactiva U-107 Para Estabilidad y Cumplimiento de 10 PPM Azufre

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Editions Table

Revision	Date	Purpose of edition
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Annex I - Piping and valve specification sheets.

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1. Objetivo

El objetivo del presente documento es la definición de las clases de tubería y válvulas “Piping Class” a ser utilizadas por todas las partes involucradas en el proyecto “**Ingeniería Básica Proyecto Mejoras en Unidad de Destilación Reactiva U-107 Para Estabilidad y Cumplimiento de 10 PPM Azufre**”.

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2. Alcance

El alcance de este documento es seleccionar las especificaciones de materiales de tubería necesarias para el proyecto **“Ingeniería Básica Proyecto Mejoras en Unidad de Destilación Reactiva U-107 Para Estabilidad y Cumplimiento de 10 PPM Azufre”**, las cuales definen las características, propiedades y los requerimientos técnicos que deben cumplir los materiales (tubería, válvulas, accesorios, etc.). Para esta selección se tomó como referencia los documentos relacionados en el ítem 4 del presente documento.

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3. Códigos y Regulaciones

Todos los códigos y normas serán la última edición con las enmiendas, adiciones y códigos vigentes en la fecha de vigencia, a menos que se indique específicamente lo contrario. La aplicación de enmiendas posteriores, adiciones y casos de código publicados después de esa fecha está sujeta a un acuerdo entre el Contratante y el Contratista.

ASME / ANSI (American Society of Mechanical Engineers / American National Standard Institute)	
B16.1	Gray Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
B16.5	Steel Pipe Flanges, Flanged Valves and Fittings
B16.9	Factory-Made Wrought Steel Butt Welding Fittings
B16.10	Face-to –Face and End-to-End Dimensions of Valves
B16.11	Forged Steel Fittings, Socket-Welding and threaded
B16.20	Metallic Gaskets for Pipe Flanges - Ring-Joint, Spiral-wound
B16.21	Nonmetallic Flat Gaskets for Pipe Flanges
B16.25	Butt-welding Ends
B16.34	Valves – Flanged, Threaded and Welding End
B16.36	Orifice Flanges
B16.47	Large Diameter Steel Flanges Serie B – NPS 26 through NPS 60
B16.48	Line Blanks
B18.31.2	Continuous Thread Stud, Double-End Stud, And Flange Bolting Stud (Stud Bolt) (Inch Series)
B18.2.1	Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)
B18.2.2	Nuts for General Applications: Machine Screw Nuts; and Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
B31.3	Process Piping
B36.10M	Welded and Seamless Wrought Steel Pipe
API (American Petroleum Institute)	
5L	Line Pipe
6D	Pipeline Valves
6FA	Standard for Fire Test of Valves
598	Valve Inspection and Testing
594	Check Valves: Flanged, Lug, Wafer and Butt-welding
599	Metal Plug Valves - Flanged, Threaded, and Welding Ends
600	Steel Gate Valves Flanged and Butt Welding Ends
602	Gate, Globe, and Check Valves for Sizes DN 100 (NPS 4) and Smaller for the Petroleum and Natural Gas Industries
608	Metal Ball Valves—Flanged, Threaded, and Welding Ends
609	Butterfly Valves: Double-flanged, Lug- and Wafer-type, and Butt-welding Ends
607	Fire Test for Soft-Seated Quarter-Turn Valves

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623	Steel Globe Valves-Flanged and Butt-Welding Ends, Bolted Bonnets
MSS (Manufacturer's Standardization Society)	
SP-75	High-Strength, Wrought, Butt-Welding Fittings
SP-79	Socket-Welding Reducer Inserts
SP-83	Class 3000 and 6000 Pipe Unions, Socket Welding and Threaded (Carbon Steel, Alloy Steel, Stainless Steel and Nickel Alloys)
SP-95	Swaged Nipples and Bull Plugs
SP-97	Integrally Reinforced Forged Branch Outlet Fittings - Socket Welding, Threaded and Buttwelding Ends
ASTM (American Society for Testing and Materials)	
A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
A105	Standard Specification for Carbon Steel Forgings for Piping Applications
A106	Standard Specification for Seamless Carbon Steel pipe for High-Temperature Service
A182	Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
A193	Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications.
A194	Standard Specification for Carbon Steel, Alloy Steel, and Stainless Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
A216	Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
A217	Standard Specification for Steel Castings, Martensitic Stainless and Alloy, for Pressure-Containing Parts, Suitable for High-Temperature Service
A234	Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
A240	Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
A333	Standard Specification for Seamless and Welded Steel Pipe for Low-Temperature Service and Other Applications with Required Notch Toughness
A335	Standard Specification for Seamless Ferritic Alloy-Steel Pipe for High-Temperature Service
A387	Standard Specification for Pressure Vessel Plates, Alloy Steel, Chromium-Molybdenum
A395	Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures
A420	Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low-Temperature Service
A516	Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service
A672	Standard Specification for Electric-Fusion-Welded Steel Pipe for High-Pressure Service at Moderate Temperatures
D3261	Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
D3350	Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
F714	Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter

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NACE (National Association of Corrosion Engineers)	
NACE MR0103	Petroleum, petrochemical and natural gas industries — Metallic materials resistant to sulfide stress cracking in corrosive petroleum refining environments

Tabla 1. Códigos y Normas

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4. Abreviaciones

Para los propósitos de este documento, se aplican las siguientes nomenclaturas:

Nomenclatura	Descripción
API	American Petroleum Institute: Instituto Americano del Petróleo
ASME	American Society of Mechanical Engineers: Sociedad Americana de Ingenieros Mecánicos
ANSI	American National Standards Institute: Instituto Nacional Estadounidense de Estándares
ASTM	American Society of Testing Materials: Sociedad Americana de Ensayos de Materiales
BW	Buttwelding End: Extremos Biselados
GR	Grado
CS	Carbon Steel: Acero al carbono
ECP	ECOPETROL
EFW	Electric Fusion Welded (Soldado por Fusión Eléctrica)
FLG	Flanged: Bridado
ISO	International Organization for Standardization: Organización Internacional de Normalización.
MSS	Manufacturers Standardization Society: Sociedad de Estandarización de Fabricantes
MAWP	Máxima presión de trabajo permisible
NPS	Nominal Pipe Size: Diámetro Nominal del Tubo
NPT	National Pipe Thread: Rosca cónica
OD	Outside Diameter: Diámetro Externo
PE	Plain Ends: Extremo plano (del tubo)
RF	Raised Face: Cara Realzada (de la brida)
RT	Radiography Examination (Inspección Radiográfica)
SCH	Schedule (designación del espesor de pared del tubo)
SMLS	Seamless: Sin costura
STD	Standard (designación nominal del espesor de pared del tubo)
SW	Socket Weld: Soldadura de Encaje
THRD	Threaded: Extremo roscado
UT	Ultrasonic Examination (Inspección Ultrasónica)
WN	Welding Neck: Cuello soldado (para brida)

Tabla 2. Abreviaciones Aplicables

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Nomenclatura	Descripción
CWR	Cooling Water Return
CWS	Cooling Water Supply
FG	Fuel Gas
SV	Solvent
N	Nitrogen
LS	Low Pressure Steam
NF	Flare (General)
OD	Oily Drain
OWS	Oily Water Sewer
P	General Process
SB	Slops
AW	Sour Water
HG	Hydrogen
IL	Chemical Injection (Demulsifying, Dmds, Etc.)
BW	Boiler Feed Water
HC	High Pressure Condensate
HS	High Pressure Steam
PA	Plant Air
UW	Utility Water
VA	Vent to atmosphere
LC	Low Pressure Condensate
IA	Instrument Air
DW	Domestic Water (Potable)
MS	Medium Pressure Steam
FW	Fire Water

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Tabla 3. Abreviaciones – Fluidos

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5. Referencias

REF.	Código del Documento	Nombre del Documento
1	107-GE-PJ03-0407	Bases de Diseño
2	107-SP-PI02-0301	Criterios de Diseño – Tubería
 3	107-RP-PR08-0001	LINE LIST - FCC NAPHTHA HYDROTREATER (107) - STAGE I
 4	107-RP-PR08-0001	LINE LIST - FCC NAPHTHA HYDROTREATER (107) - STAGE II
 5	107-DS-PI07-0301	CARTILLA DE TIE-INS - STAGE I
 6	107-DS-PI07-0302	CARTILLA DE TIE-INS - STAGE II

Tabla 4. Documentos de Referencias

5.1. Referencias Reficar

REF.	Código del Documento	Nombre del Documento
1	000-SP-PI02-0200 Rev.2	PIPING MATERIAL CLASS INDEX

Tabla 5. Documentos de Referencias Reficar

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6. Unidades y Lenguaje

El idioma oficial del proyecto será el español.

A menos que se especifique lo contrario, las unidades que se utilizarán en este documento se harán de acuerdo con la información suministrada en la siguiente tabla:

Descripción	Unidad	Sistema de Medición
Diámetros nominales	Pulgadas (in)	Sistema Inglés
Longitudes	Milímetros (mm)	Sistema Internacional
Temperaturas	Fahrenheit (°F)	Sistema Inglés
Presiones	psi	Sistema Inglés

Tabla 6. Unidades de Medida

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7. Selección de Clases

A continuación, se indican las clases seleccionadas para la ejecución del proyecto.

Clase	ASME	Servicio	Rating ASME - Cara	Material Base	MAWP, Psig @ °F	Corrosion Allowance	Notas
12CS2S03	B 31.3	CWR, CWS	CL. 150, RF	Carbon Steel (A 53 B or API pipe)	150 @100°F	1/8"	2, 4, 5
1CB1S	B 31.3	FG, SV, NF	CL. 150, RF	Killed Carbon Steel	285 @100°F	1/16"	2, 4, 5
1CB1S01	B 31.3	N, PA, UW, VA	CL. 150, RF	Killed Carbon Steel	150 @100°F	1/16"	2, 4, 5
1CB1S02	B 31.3	LS, HC, LC	CL. 150, RF	Killed Carbon Steel	285 @100°F	1/16"	2, 4, 5
1CB2S	B 31.3	NF, OD, OWS, P, SB, FG	CL. 150, RF	Killed Carbon Steel	285 @100°F	1/8"	2, 4, 5
1CB2S53	B 31.3	AW, P	CL. 150, RF	Killed Carbon Steel	285 @100°F	1/8"	2, 5
1CB2S55	B 31.3	P, NF	CL. 150, RF	Killed Carbon Steel	285 @100°F	1/8"	2, 4
12PD1H01	B 31.3	P	CL. 150, RF	HDPE (High Density Polyethylene)	ATM @100°F	1/16"	2, 5, 7
3CB2S	B 31.3	CWR, HG, P, OWS	CL. 300, RF	Killed Carbon Steel	740 @100°F	1/8"	2, 4, 5
3CB2S53	B 31.3	AW, P	CL. 300, RF	Killed Carbon Steel	740 @100°F	1/8"	2, 5
3CB2S54	B 31.3	OWS	CL. 300, RF	Killed Carbon Steel	740 @100°F	1/8"	2, 5, 7
3CB2S55	B 31.3	AW, P	CL. 300, RF	Killed Carbon Steel	740 @100°F	1/8"	2, 4, 5
3CJ2S	B 31.3	IL, P, OD	CL. 300, RF	1-1/4 Cr - 1/2 Mo Alloy Steel	750 @100°F	1/8"	2, 4, 5
6CB2S02	B 31.3	HC, HS	CL. 600, RF	Killed Carbon Steel	1480 @100°F	1/8"	2, 4, 5
6CJ2S	B 31.3	HC, HS	CL. 600, RF	1-1/4 Cr - 1/2 Mo Alloy Steel	1500 @100°F	1/8"	2, 5, 7
12CS2S	B 31.3	OWS	CL. 150, RF	Carbon Steel (A 53 B or API pipe)	150 @100°F	1/8"	2, 4, 5, 8
12CS2S02	B 31.3	OWS	CL. 150, RF	Carbon Steel (A 53 B or API pipe)	150 @100°F	1/8"	2, 4, 5
1CG0T	B 31.3	IA	CL. 150, RF	Galvanized Carbon Steel (A 53 B)	150 @100°F	1/100"	2, 4, 5
1CG0T01	B 31.3	DW	CL. 150, RF	Galvanized Carbon Steel (A 53 B)	150 @100°F	1/100"	2, 4, 5
1CB2S02	B 31.3	HC, LS	CL. 150, RF	Killed Carbon Steel	285 @100°F	1/8"	2, 4
1CB2S54	B 31.3	AW	CL. 150, RF	Killed Carbon Steel	285 @100°F	1/8"	2, 4, 5
3CL2S	B 31.3	FG	CL. 300, RF	5 Cr - 1/2 Mo Alloy Steel	750 @100°F	1/8"	2, 5
3CB4S	B 31.3	P	CL. 300, RF	Killed Carbon Steel	740 @100°F	1/4"	2, 4
3CB4S04	B 31.3	IL, P	CL. 300, RF	Killed Carbon Steel	740 @100°F	1/4"	2, 4
3CB1S01	B 31.3	MS, BW	CL. 300, RF	Killed Carbon Steel	740 @100°F	1/16"	2, 4
3CB1S50	B 31.3	SB	CL. 300, RF	Killed Carbon Steel	740 @100°F	1/16"	2, 4

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Clase	ASME	Servicio	Rating ASME - Cara	Material Base	MAWP, Psig @ °F	Corrosion Allowance	Notas
12CG0T01	B 31.3	FW	200 lb CWP, RF	Galvanized Carbon Steel (A 53 B)	200 @100°F	1/100"	2, 5
12CS2S01	B 31.3	FW	200 lb CWP, RF	Carbon Steel (A 53 B or API pipe)	200 @100°F	1/8"	2, 5
12PD0H	B 31.3	FW	200 lb CWP, FF	HDPE (High Density Polyethylene)	200 @100°F	1/100"	2, 5

Tabla 7. Clases seleccionadas

Notas:

- Las clases relacionadas fueron tomadas de las especificaciones de tubería corporativas de Reficar y se seleccionan con base a la información de procesos según aplique, dando cumplimiento con los requerimientos técnicos y buscando la estandarización de las clases en el diseño propuesto según acuerdo entre LUMMUS TECHNOLOGY (LT) y ECOPETROL S.A.
- La columna MAWP hace referencia a la máxima presión de trabajo permisible contemplada por diseño (MAXIMUM ALLOWABLE WORKING PRESSURE) por código ASME B31.3 y se determina según el material y rating de las bridas (teniendo en cuenta la norma ASME B16.5 – 2020 Tabla II-2-1.1C) Pressure–Temperature Ratings for Group Materials, Psig.
- A continuación, en el anexo I, se incluye el PDF de las clases correspondiente a la extracción de la semilla Piping Material Class Specification – Reficar como última versión en PDF del documento en referencia.
- Las clases **1CB1S**, **1CB2S**, **1CB2S55**, **3CB2S**, **3CB2S55**, **3CJ2S**, **1CG0T**, **1CG0T01**, **6CB2S02**, **12CS2S02**, **12CS2S03**, **3CB4S**, **3CB4S04**, **1CB2S54**, **1CB1S02**, **3CB1S50**, **1CB2S02**, **3CB1S01**, **1CB1S01**, **12CS2S**, aplican al desarrollo de la etapa 1 de la Ingeniería Básica Proyecto Mejoras en Unidad de Destilación Reactiva U-107 Para Estabilidad y Cumplimiento de 10 PPM Azufre.
- Las clases **12CS2S03**, **1CB1S**, **1CB1S01**, **1CB1S02**, **1CB2S53**, **3CB2S53**, **6CB2S02**, **12CS2S02**, **1CB2S**, **1CG0T**, **1CG0T01**, **3CB2S**, **3CJ2S**, **1CB2S54**, **3CB2S55**, **12CS2S**, **3CL2S**, **12CS2S01 (FW)**, **12CG0T01 (FW)**, **12PD0H (FW)** aplican al desarrollo de la etapa 2 de la Ingeniería Básica Proyecto Mejoras en Unidad de Destilación Reactiva U-107 Para Estabilidad y Cumplimiento de 10 PPM Azufre.
- Las clases **12CS2S01**, **12CG0T01**, **12PD0H** son requeridas para el sistema contra incendio con el servicio Fire Water (FW) de la etapa II de la Ingeniería Básica Proyecto Mejoras en Unidad de Destilación Reactiva U-107 Para Estabilidad y Cumplimiento de 10 PPM Azufre.
- Las clases bajo esta Nota se han eliminado del alcance de la Etapa I y Etapa II del Piping Class de este proyecto.
- Las clases **12CS2S** y **12CS2S02** son requeridas para la red de aguas aceitosas / Oily Water Sewer (OWS) de la etapa II de la Ingeniería Básica Proyecto Mejoras en Unidad de Destilación Reactiva U-107 Para Estabilidad y Cumplimiento de 10 PPM Azufre.

PROJECT Ingeniería Básica Proyecto Mejoras en Unidad de Destilación Reactiva U-107 Para Estabilidad y Cumplimiento de 10 PPM Azufre		CONTRACTOR 	
CLIENT  Refinería de Cartagena S.A.S.	DOCUMENT EC 107-SP-PI02-0302	DOCUMENT ECP GRC-107-MET-ET-000001	DATE 26/12/2023
	DOCUMENT TITLE Piping Class		Rev. D1

Annex I - Piping and valve specification sheets.



PIPING MATERIAL CLASS INDEX

FOR THE

CARTAGENA REFINERY EXPANSION PROJECT

CB&I CONTRACT NO. 166000

Prepared By: Piping Engineering, CB&I, Houston

Document No: 000-SP-PI02-0200

Information Class: ☐ Confidential ☒ Business ☐ Public

Revision Number	Revision Date	Revision Description	Prepared By:	Checked By:	Approved By:
L	10 Oct 08	Issued For Design. Added More Technip Unit Specs	KP	SN	KAJ
M	24 Dec 08	Issued For Design. Added More Technip & Houston Unit Specs	KP	SN	KAJ
0	17 Jun 09	Issued For Design	KP	SN	KAJ
1	07 May 10	Issued For Construction	KP	SN	KAJ
2	23 Aug 12	Issued For Construction, Added new specs	SN	KAJ	GAD

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DOC NO. 166000-000-SP- -PI02-	PIPING MATERIAL CLASS	SERVICE	RATING-FACE TEMP-PRESS	BASIC MATERIAL	VALVE BODY TRIM	CORR. ALLOW. (INCH)	REV NO.
0001	1CA1S	GENERAL PROCESS IN LOW TEMP. SERVICE	CL 150, RF -50 TO 650F	LTCS	LTCS TRIM CN 12	0.063	---
0177	1CA2S	GENERAL PROCESS IN LOW TEMP. SERVICE	CL 150, RF -50 TO 650F	LTCS (PWHT)	LTCS TRIM CN 12	0.125	---
0002	1CB1B	LIQUID SULFUR (JACKETED)	CL 150, RF 0 TO 400F	KILLED CS (Core & Jacket)	CS PTFE SLEEVE	0.188(C) 0.063(J)	---
0007	1CB1B08 (UOP)	CATALYST LIFT LINE W / HYDROGEN	CL 150, RF 0 TO 550F	KILLED CS	----- -----	0.063	---
0003	1CB1B09 (UOP)	CATALYST	CL 150, RF 0 TO 800F	KILLED CS	----- -----	0.063	---
0025	1CB1B56	GASEOUS O ₂ SERVICE	CL 150, RF 0 TO 200F	KILLED CS	CS TRIM CN 11	0.063	---
0004	1CB1S	GENERAL PROCESS, FUEL GAS	CL 150, RF -20 TO 800F	KILLED CS	CS TRIM CN 8	0.063	---
0005	1CB1S02	BOILER FEED WATER, STEAM & CONDENSATE	CL 150, RF 0 TO 800F	KILLED CS	CS TRIM CN 8	0.063	---
0006	1CB1S08 (UOP)	NON ACID PROCESS	CL 150, RF 0 TO 650F	KILLED CS	CS TRIM CN 8	0.063	---
0190	1CB1S40	BOILER FEED WATER, STEAM & CONDENSATE, FULL VACUUM	CL 150, RF 0 TO 800F	KILLED CS	CS TRIM CN 8	0.063	---
0189	1CB1S50	BOILER FEED WATER, STEAM, CONDENSATE, & BLOW DOWN (ASME B31.1)	CL 150, RF 0 TO 800F	KILLED CS	CS TRIM CN 5	0.063	---
0176	1CB1S53	SOUR WATER, WET H ₂ S	CL 150, RF 0 TO 800F	KILLED CS (NACE)	CS TRIM CN 12	0.063	---
0179	1CB2B60	LIQUID SULFUR (PROCESS TRACED, NON – JACKETED)	CL 150, RF 0 TO 400F	KILLED CS	CS PTFE SLEEVE	0.125	---
0008	1CB2S	GENERAL PROCESS	CL 150, RF 0 TO 800F	KILLED CS	CS TRIM CN 8	0.125	---
0009	1CB2S01	CAUSTIC SODA (CONCENTRATION 0 -50%)	CL 150, RF 0 TO 200F	KILLED CS (PWHT)	CS TRIM CN 9	0.125	---
0010	1CB2S02	AMINE	CL 150, RF 0 TO 400F	KILLED CS (PWHT)	CS TRIM CN 12	0.125	---
0011	1CB2S03 (UOP)	HYDROCARBON AND TRACE HF ACID	CL 150, RF 0 TO 650F	KILLED CS (PWHT)	CS TRIM CN 9	0.125	---

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0012	1CB2S04	BOILER FEED WATER STEAM & CONDENSATE	CL 150, RF 0 TO 800F	KILLED CS	CS TRIM CN 8	0.125	----
0184	1CB2S05	GENERAL PROCESS (U/G)	CL 150, RF 0 TO 150F	KILLED CS (C & W)	CS TRIM CN 8	0.125	----
0249	1CB2S09 (UOP)	STORM WATER, HF ACID AREA (U/G)	CL 150, RF 0 TO 150F	KILLED CS (PWHT, C & W)	CS TRIM CN 9	0.125	----
0191	1CB2S40	GENERAL PROCESS, FULL VACUUM	CL 150, RF 0 TO 800F	KILLED CS	CS TRIM CN 8	0.125	----
0192	1CB2S41	SOUR WATER, WET H ₂ S, RICH AMINE, FULL VACUUM	CL 150, RF 0 TO 400F	KILLED CS (NACE, PWHT)	CS TRIM CN 12	0.125	----
0014	1CB2S53	SOUR WATER, WET H ₂ S	CL 150, RF 0 TO 800F	KILLED CS (NACE)	CS TRIM CN 12	0.125	----
0013	1CB2S54	SOUR WATER, WET H ₂ S, RICH AMINE	CL 150, RF -20 TO 400F	KILLED CS (NACE, PWHT)	CS TRIM CN 12	0.125	----
0016	1CB2S55	SOUR WATER, WET H ₂ S	CL 150, RF 0 TO 800F	KILLED CS (NACE, PWHT)	CS TRIM CN 12	0.125	----
0175	1CB2S61	SOUR WATER, WET H ₂ S, RICH AMINE (U/G)	CL 150, RF 0 TO 150F	KILLED CS (NACE, PWHT) (C & W)	CS TRIM CN 12	0.125	----
0015	1CB3S	AMINE	CL 150, RF 0 TO 400F	KILLED CS (PWHT)	CS TRIM CN 12	0.188	----
0018	1CB4S	H ₂ SO ₄ (93%-98%) <2FPS	CL 150, RF 0 TO 125F	KILLED CS	CS ALLOY 20	0.25	----
0017	1CB4S01	HYDROCARBON AND TRACE HF ACID	CL 150, RF 0 TO 650F	KILLED CS (PWHT)	CS TRIM CN 9	0.25	----
0193	1CB4S40	SOUR WATER, WET H ₂ S, FULL VACUUM	CL 150, RF 0 TO 800F	KILLED CS (NACE, PWHT)	CS TRIM CN 12	0.25	----
0019	1CB4S53	SOUR WATER, WET H ₂ S	CL 150, RF 0 TO 800F	KILLED CS (NACE)	CS TRIM CN 12	0.25	----
0180	1CB4S54	SOUR WATER, WET H ₂ S	CL 150, RF 0 TO 800F	KILLED CS (NACE, PWHT)	CS TRIM CN 12	0.25	----
0020	1CJ1S	GENERAL PROCESS	CL 150, RF -20 TO 1000F	1 1/4 CR-1/2 MO	1 1/4 CR-1/2 MO TRIM CN 8	0.063	----
0021	1CL2S	GENERAL PROCESS	CL 150, RF -20 TO 1000F	5 CR-1/2 MO (PWHT)	5 CR-1/2 MO TRIM CN 8	0.125	----
0022	1CM2S	GENERAL PROCESS	CL 150, RF -20 TO 1000F	9 CR-1 MO (PWHT)	9 CR-1 MO TRIM CN 8	0.125	----
0023	1NM0B56	OXYGEN SERVICE	CL 150, RF -20 TO 200F	ALLOY 400	ALLOY 400 TRIM CN 11	0	----

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0024	1NM1S09 (UOP)	GENERAL PROCESS	CL 150, RF -20 TO 600F	ALLOY 400	ALLOY 400 TRIM CN 11	0.063	----
0185	1NT0B	DILUTED H ₂ SO ₄ (1% - 20%)	CL 150, RF -20 TO 200F	ALLOY 20	ALLOY 20 TRIM CN 13	0	----
0026	1SA0B	LUBE / SEAL OIL	CL 150, RF -20 TO 400F	304/304L SS	CS TRIM CN 8	0	----
0244	1SA0B09	BREATHING AIR	CL 150, RF -20 TO 150F 150 PSIG MAX	304/304L SS	316/316L SS TRIM CN 12	0	----
0173	1SA0B56	GASEOUS O ₂ SERVICE	CL 150, RF -20 TO 200F	304/304L SS	316/316L SS TRIM CN 11	0	----
0028	1SA1B09 (UOP)	CATALYST ADDITION	CL 150, RF -20 TO 250F	304/304L SS	----- -----	0.063	----
0027	1SA0S	CORROSIVE PROCESS, DEMIN. WATER,	CL 150, RF -20 TO 800F	304/304L SS	316/316L SS TRIM CN 12	0	----
0029	1SA1S09 (UOP)	CORROSIVE PROCESS	CL 150, RF -50 TO 800F	304/304L SS	316/316L SS TRIM CN 12	0.063	----
0030	1SD0S	CORROSIVE PROCESS	CL 150, RF -20 TO 800F	316/316L SS	316/316L SS TRIM CN 12	0	----
0031	1SD1S09 (UOP)	CORROSIVE PROCESS	CL 150, RF -50 TO 800F	316/316L SS	316/316L SS TRIM CN 12	0.063	----
0032	1SE1S	GENERAL PROCESS	CL 150, RF -20 TO 900F	317/317L SS	317/317L SS HF SEAT	0.063	----
0194	1SE1S40	GENERAL PROCESS, FULL VACUUM	CL 150, RF -20 TO 900F	317/317L SS	317/317L SS HF SEAT	0.063	----
0034	3CA1S	GENERAL PROCESS IN LOW TEMP. SERVICE	CL 300, RF -50 TO 650F	LTCS	LTCS TRIM CN 12	0.063	----
0178	3CA2S	GENERAL PROCESS IN LOW TEMP. SERVICE	CL 300, RF -50 TO 650F	LTCS (PWHT)	LTCS TRIM CN 12	0.125	----
0035	3CB1B09 (UOP)	CATALYST WITHDRAWAL LINE	CL 300, RF 0 TO 800F	KILLED CS	----- -----	0.063	----
0174	3CB1B56	GASEOUS O ₂ SERVICE	CL 300, RF 0 TO 200F	KILLED CS	CS TRIM CN 11	0.063	----
0036	3CB1S	GENERAL PROCESS	CL 300, RF -20 TO 800F	KILLED CS	CS TRIM CN 8	0.063	----
0037	3CB1S01	BOILER FEED WATER, STEAM & CONDENSATE	CL 300, RF 0 TO 800F	KILLED CS	CS TRIM CN 8	0.063	----
0188	3CB1S02	GENERAL PROCESS (U/G)	CL 300, RF 0 TO 150F	KILLED CS (C & W)	----- -----	0.063	----

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0039	3CB1S08 (UOP)	NON ACID PROCESS	CL 300, RF 0 TO 650F	KILLED CS	CS TRIM CN 8	0.063	----
0040	3CB1S09 (UOP)	CATALYST LIFT LINE W / HYDROGEN	CL 300, RF 0 TO 550F	KILLED CS	----- -----	0.063	----
0041	3CB1S50	BOILER FEED WATER, STEAM, CONDENSATE, & BLOW DOWN (ASME B31.1)	CL 300, RF 0 TO 800F	KILLED CS	CS TRIM CN 5	0.063	----
0042	3CB2S	GENERAL PROCESS	CL 300, RF 0 TO 800F	KILLED CS	CS TRIM CN 8	0.125	----
0043	3CB2S01	CAUSTIC SODA (CONCENTRATION 0 -50%)	CL 300, RF 0 TO 200F	KILLED CS (PWHT)	CS TRIM CN 9	0.125	----
0044	3CB2S02	AMINE	CL 300, RF 0 TO 400F	KILLED CS (PWHT)	CS TRIM CN 12	0.125	----
0045	3CB2S03	HYDROFLUORIC ACID	CL 300, RF 0 TO 650F	KILLED CS (PWHT)	CS TRIM CN 9	0.125	----
0046	3CB2S04	HYDROCARBON AND TRACE HF ACID	CL 300, RF 0 TO 650F	KILLED CS (PWHT)	CS TRIM CN 9	0.125	----
0047	3CB2S05	BOILER FEED WATER, STEAM & CONDENSATE	CL 300, RF 0 TO 800F	KILLED CS	CS TRIM CN 8	0.125	----
0246	3CB2S09	HYDROFLUORIC ACID	CL 300, RF 0 TO 650F	KILLED CS (PWHT)	CS TRIM CN 9	0.125	----
0195	3CB2S40	GENERAL PROCESS, FULL VACUUM	CL 300, RF 0 TO 800F	KILLED CS	CS TRIM CN 8	0.125	----
0048	3CB2S53	SOUR WATER, WET H ₂ S	CL 300, RF 0 TO 800F	KILLED CS (NACE)	CS TRIM CN 12	0.125	----
0049	3CB2S54	SOUR WATER, WET H ₂ S, RICH AMINE	CL 300, RF -20 TO 400F	KILLED CS (NACE, PWHT)	CS TRIM CN 12	0.125	----
0038	3CB2S55	GENERAL PROCESS, SOUR WATER, WET H ₂ S	CL 300, RF 0 TO 800F	KILLED CS (NACE, PWHT)	CS TRIM CN 12	0.125	----
0050	3CB3S	AMINE	CL 300, RF -20 TO 400F	KILLED CS (PWHT)	CS TRIM CN 12	0.188	----
0051	3CB3S01	GENERAL PROCESS	CL 300, RF 0 TO 800F	KILLED CS	CS TRIM CN 8	0.188	----
0055	3CB4S	GENERAL PROCESS	CL 300, RF 0 TO 800F	KILLED CS	CS TRIM CN 8	0.25	----
0056	3CB4S01	AMINE	CL 300, RF 0 TO 400F	KILLED CS (PWHT)	CS TRIM CN 12	0.25	----
0052	3CB4S02	HYDROFLUORIC ACID	CL 300, RF 0 TO 650F	KILLED CS (PWHT)	CS TRIM CN 9	0.25	----

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0053	3CB4S03	HYDROCARBON AND TRACE HF ACID	CL 300, RF 0 TO 650F	KILLED CS (PWHT)	CS TRIM CN 9	0.25	----
0248	3CB4S04	GENERAL PROCESS	CL 300, RF 0 TO 800F	KILLED CS (PWHT)	CS TRIM CN 8	0.25	----
0054	3CB4S53	SOUR WATER, WET H ₂ S	CL 300, RF 0 TO 800F	KILLED CS (NACE)	CS TRIM CN 12	0.25	----
0033	3CB4S55	GENERAL PROCESS, SOUR WATER, WET H ₂ S	CL 300, RF 0 TO 800F	KILLED CS (NACE, PWHT)	CS TRIM CN 12	0.25	----
0182	3CB4S56	BRINE	CL 300, RF 0 TO 400F	KILLED CS (NACE, PWHT)	CS TRIM SUPER DUPLEX	0.25	----
0057	3CJ1B09 (UOP)	CATALYST LIFT LINE W / HYDROGEN	CL 300, RF -20 TO 1025F	1 1/4 CR-1/2 MO (PWHT)	1 1/4 CR-1/2 MO TRIM CN 8	0.063	----
0058	3CJ1S	GENERAL PROCESS	CL 300, RF -20 TO 1000F	1 1/4 CR-1/2 MO	1 1/4 CR-1/2 MO TRIM CN 8	0.063	----
0059	3CJ1S01	GENERAL PROCESS	CL 300, RF -20 TO 1100F	1 1/4 CR-1/2 MO	1 1/4 CR-1/2 MO TRIM CN 8	0.063	----
0060	3CJ1S08 (UOP)	PROCESS WITH HYDROGEN	CL 300, RF -20 TO 1100F	1 1/4 CR-1/2 MO (PWHT)	1 1/4 CR-1/2 MO TRIM CN 8	0.063	----
0061	3CJ1S09 (UOP)	PROCESS WITH HYDROGEN	CL 300, RF -20 TO 1000F	1 1/4 CR-1/2 MO (PWHT)	1 1/4 CR-1/2 MO TRIM CN 8	0.063	----
0062	3CJ2S	GENERAL PROCESS	CL 300, RF -20 TO 1000F	1 1/4 CR-1/2 MO	1 1/4 CR-1/2 MO TRIM CN 8	0.125	----
0197	3CJ2S08 (UOP)	PROCESS WITH HYDROGEN, SPENT CATALYST STRIPPER	CL 300, RF -20 TO 1100F	1 1/4 CR-1/2 MO (PWHT)	1 1/4 CR-1/2 MO TRIM CN 5	0.125	----
0063	3CJ2S09 (UOP)	PROCESS WITH HYDROGEN	CL 300, RF -20 TO 1000F	1 1/4 CR-1/2 MO (PWHT)	1 1/4 CR-1/2 MO TRIM CN 8	0.125	----
0066	3CJ4S09 (UOP)	PROCESS WITH HYDROGEN, WET H ₂ S	CL 300, RF -20 TO 800F	1 1/4 CR-1/2 MO (NACE, PWHT)	1 1/4 CR-1/2 MO TRIM CN 12	0.25	----
0071	3CK2S	PROCESS WITH HYDROGEN	CL 300, RF -20 TO 800F	2 1/4 CR-1 MO (PWHT)	2 1/4 CR-1 MO TRIM CN 8	0.125	----
0076	3CK2S01	GENERAL PROCESS	CL 300, RF -20 TO 800F	2 1/4 CR-1 MO	2 1/4 CR-1 MO TRIM CN 8	0.125	----
0064	3CL1S	GENERAL PROCESS	CL 300, RF -20 TO 1000F	5 CR-1/2 MO (PWHT)	5 CR-1/2 MO TRIM CN 8	0.063	----
0069	3CL2S	GENERAL PROCESS	CL 300, RF -20 TO 1000F	5 CR-1/2 MO (PWHT)	5 CR-1/2 MO TRIM CN 8	0.125	----
0198	3CL2S09 (UOP)	PROCESS WITH HYDROGEN	CL 300, RF -20 TO 1100F	5 CR-1/2 MO (PWHT)	5 CR-1/2 MO TRIM CN 8	0.125	----

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0070	3CM2S	GENERAL PROCESS	CL 300, RF -20 TO 1000F	9 CR-1 MO (PWHT)	9 CR-1 MO TRIM CN 8	0.125	----	
0153	3CM3S	GENERAL PROCESS	CL 300, RF -20 TO 800F	9 CR-1 MO (PWHT)	9 CR-1 MO TRIM CN 8	0.188	----	
0065	3NM2B (UOP)	HOT/WET HYDROFLUORIC ACID	CL 300, RF -20 TO 650F	ALLOY 400 (PWHT)	ALLOY 400 TRIM CN 9	0.125	----	
0067	3SA0B	LUBE / SEAL OIL	CL 300, RF -20 TO 400F	304/304L SS	CS TRIM CN 8	0	----	
0068	3SA0S	CORROSIVE PROCESS, DEMIN. WATER	CL 300, RF -20 TO 800F	304/304L SS	316/316L SS TRIM CN 12	0	----	
0077	3SA1S09 (UOP)	GENERAL PROCESS	CL 300, RF -50 TO 800F	304/304L SS	316/316L SS TRIM CN 12	0.063	----	
0199	3SC1S08 (UOP)	FLUE GAS LINE	CL 300, RF -20 TO 1500F	304H SS	316H SS 316H SS, FULL HF SEAT	0.063	----	
0072	3SC1S09 (UOP)	PROCESS W/HYDROGEN OR HOT AIR	CL 300, RF -20 TO 1250F	304H SS	316H SS 316H SS, FULL HF SEAT	0.063	----	
0073	3SD1S08	SUPERSEDED TO 3SF1S09						
0074	3SD1S09 (UOP)	CORROSIVE PROCESS	CL 300, RF -50 TO 800F	316/316L SS	316/316L SS TRIM CN 12	0.063	----	
0075	3SE1S	GENERAL PROCESS	CL 300, RF -20 TO 800F	317/317L SS	317/317L SS HF SEAT	0.063	----	
0196	3SE1S40	GENERAL PROCESS, FULL VACUUM	CL 300, RF -20 TO 800F	317/317L SS	317/317L SS HF SEAT	0.063	----	
0186	3SF1S09 (UOP)	PROCESS REGEN GAS	CL 300, RF -20 TO 1200F	316H SS	316H SS 316H SS, FULL HF SEAT	0.063	----	
0078	6CB1S	GENERAL PROCESS	CL 600, RF 0 TO 800F	KILLED CS	CS TRIM CN 8	0.063	----	
0079	6CB1S01	BOILER FEED WATER, STEAM & CONDENSATE	CL 600, RF 0 TO 800F	KILLED CS	CS TRIM CN 5	0.063	----	
0082	6CB1S50	BOILER FEED WATER, STEAM, CONDENSATE, & BLOW DOWN (ASME B31.1)	CL 600, RF 0 TO 800F	KILLED CS	CS TRIM CN 5	0.063	----	
0130	6CB1S54	SOUR WATER, WET H ₂ S, RICH AMINE	CL 600, RF 0 TO 400F	KILLED CS (NACE, PWHT)	CS TRIM CN 12	0.063	----	
0083	6CB2S	GENERAL PROCESS	CL 600, RF 0 TO 800F	KILLED CS	CS TRIM CN 8	0.125	----	

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0084	6CB2S01	AMINE	CL 600, RF 0 TO 400F	KILLED CS (PWHT)	CS TRIM CN 12	0.125	----
0085	6CB2S02	BOILER FEED WATER, STEAM & CONDENSATE	CL 600, RF 0 TO 800F	KILLED CS	CS TRIM CN 5	0.125	----
0086	6CB2S53	SOUR WATER, WET H ₂ S	CL 600, RF 0 TO 800F	KILLED CS (NACE)	CS TRIM CN 12	0.125	----
0087	6CB2S54	SOUR WATER, WET H ₂ S, RICH AMINE	CL 600, RF 0 TO 400F	KILLED CS (NACE, PWHT)	CS TRIM CN 12	0.125	----
0081	6CB2S55	SOUR WATER, WET H ₂ S	CL 600, RF 0 TO 800F	KILLED CS (NACE, PWHT)	CS TRIM CN 12	0.125	----
0088	6CB3S	AMINE	CL 600, RF 0 TO 400F	KILLED CS (PWHT)	CS TRIM CN 12	0.188	----
0091	6CB4S	GENERAL PROCESS	CL 600, RF 0 TO 800F	KILLED CS	CS TRIM CN 8	0.25	----
0090	6CB4S53	SOUR WATER, WET H ₂ S	CL 600, RF 0 TO 800F	KILLED CS (NACE)	CS TRIM CN 12	0.25	----
0089	6CB4S55	SOUR WATER, WET H ₂ S	CL 600, RF 0 TO 800F	KILLED CS (NACE, PWHT)	CS TRIM CN 12	0.25	----
0092	6CJ1B09 (UOP)	CATALYST LIFT LINE W / HYDROGEN	CL 600, RF -20 TO 1025F	1 1/4 CR-1/2 MO (PWHT)	----- -----	0.063	----
0093	6CJ1S	GENERAL PROCESS	CL 600, RF -20 TO 1000F	1 1/4 CR-1/2 MO	1 1/4 CR-1/2 MO TRIM CN 8	0.063	----
0094	6CJ1S09 (UOP)	PROCESS WITH HYDROGEN	CL 600, RF -20 TO 1000F	1 1/4 CR-1/2 MO (PWHT)	1 1/4 CR-1/2 MO TRIM CN 8	0.063	----
0095	6CJ2S	GENERAL PROCESS	CL 600, RF -20 TO 1000F	1 1/4 CR-1/2 MO	1 1/4 CR-1/2 MO TRIM CN 8	0.125	----
0096	6CJ2S09 (UOP)	PROCESS WITH HYDROGEN	CL 600, RF -20 TO 1000F	1 1/4 CR-1/2 MO (PWHT)	1 1/4 CR-1/2 MO TRIM CN 8	0.125	----
0097	6CJ3S09 (UOP)	PROCESS WITH HYDROGEN	CL 600, RF -20 TO 1000F	1 1/4 CR-1/2 MO (PWHT)	1 1/4 CR-1/2 MO TRIM CN 8	0.188	----
0098	6CJ4S09 (UOP)	PROCESS WITH HYDROGEN	CL 600, RF -20 TO 1000F	1 1/4 CR-1/2 MO (PWHT)	1 1/4 CR-1/2 MO TRIM CN 8	0.25	----
0187	6CK2S	GENERAL PROCESS	CL 600, RF -20 TO 800F 1245 psig @ 530F	2 1/4 CR-1 MO	2 1/4 CR-1 MO TRIM CN 8	0.125	----
0099	6CL2S	GENERAL PROCESS	CL 600, RF -20 TO 1000F	5 CR-1/2 MO (PWHT)	5 CR-1/2 MO TRIM CN 8	0.125	----
0100	6CM2S	GENERAL PROCESS	CL 600, RF -20 TO 1000F	9 CR-1 MO (PWHT)	9 CR-1 MO TRIM CN 8	0.125	----

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0101	6SA0B	LUBE / SEAL OIL	CL 600, RF -20 TO 400F	304/304L SS	CS TRIM CN 8	0	----
0102	6SA0S	CORROSIVE PROCESS, DEMIN. WATER	CL 600, RF -20 TO 800F	304/304L SS	316/316L SS TRIM CN 12	0	----
0080	6SA1S09 (UOP)	CORROSIVE PROCESS, HYDROGEN SERVICE	CL 600, RF -50 TO 800F	304/304L SS	316/316L SS TRIM CN 12	0.063	----
0146	6SD0S	GENERAL PROCESS	CL 600, RF -20 TO 800F	316/316L SS	316/316L SS TRIM CN 12	0	----
0103	6SE1S	GENERAL PROCESS	CL 600, RF -20 TO 800F	317/317L SS	317/317L SS HF SEAT	0.063	----
0104	6SF0S	GENERAL PROCESS	CL 600, RF -20 TO 1200F	316H SS	316H SS 316H SS, FULL HF SEAT	0	----
0105	6SM0S	GENERAL PROCESS	CL 600, RF -20 TO 1200F	347H SS	347H SS 347H SS, FULL HF SEAT	0	----
0108	9CB1S	DELETED					
0109	9CB1S01	GENERAL PROCESS	CL 900, RF 0 TO 800F	KILLED CS	CS TRIM CN 5	0.063	----
0128	9CB1S02	BOILER FEED WATER, STEAM	CL 900, RF 0 TO 800F 1260 psig @ 520F	KILLED CS	CS TRIM CN 5	0.063	----
0130	9CB1S50	BOILER FEED WATER, STEAM & BLOW DOWN (ASME B31.1)	CL 900, RF 0 TO 800F 1260 psig @ 520F	KILLED CS	CS TRIM CN 5	0.063	----
0111	9CB2S	GENERAL PROCESS	CL 900, RF 0 TO 800F	KILLED CS	CS TRIM CN 5	0.125	----
0112	9CB2S01	GENERAL PROCESS	CL 900, RF 0 TO 800F	KILLED CS (PWHT)	CS TRIM CN 5	0.125	----
0124	9CB2S55	SOUR WATER, WET H ₂ S	CL 900, RF 0 TO 800F	KILLED CS (NACE, PWHT)	CS TRIM CN 12	0.125	----
0110	9CB4S	GENERAL PROCESS	CL 900, RF 0 TO 800F	KILLED CS (PWHT)	CS TRIM CN 5	0.25	----
0113	9CJ1S	GENERAL PROCESS	CL 900, RF -20 TO 1000F	1 1/4 CR-1/2 MO	1 1/4 CR-1/2 MO TRIM CN 5	0.063	----
0114	9CJ1S01	BOILER FEED WATER, STEAM	CL 900, RF -20 TO 1000F	1 1/4 CR-1/2 MO	1 1/4 CR-1/2 MO TRIM CN 5	0.063	----
0123	9CJ1S02	GENERAL PROCESS	CL 900, RF -20 TO 1000F	1 1/4 CR-1/2 MO (PWHT)	1 1/4 CR-1/2 MO TRIM CN 5	0.063	----
0115	9CJ2S09 (UOP)	PROCESS WITH HYDROGEN	CL 900, RF -20 TO 1000F	1 1/4 CR-1/2 MO (PWHT)	1 1/4 CR-1/2 MO TRIM CN 5	0.125	----

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0116	9CJ3S09 (UOP)	PROCESS WITH HYDROGEN	CL 900, RF -20 TO 1000F	1 1/4 CR-1/2 MO (PWHT)	1 1/4 CR-1/2 MO TRIM CN 5	0.188	----
0117	9CJ4S09 (UOP)	PROCESS WITH HYDROGEN	CL 900, RF -20 TO 1000F	1 1/4 CR-1/2 MO (PWHT)	1 1/4 CR-1/2 MO TRIM CN 5	0.25	----
0107	9CK2S	PROCESS WITH HYDROGEN	CL 900, RF -20 TO 800F	2 1/4 CR-1 MO (PWHT)	2 1/4 CR-1 MO TRIM CN 5	0.125	----
0106	9CK2S01	GENERAL PROCESS	CL 900, RF -20 TO 800F	2 1/4 CR-1 MO	2 1/4 CR-1 MO TRIM CN 5	0.125	----
0118	9CM2S	GENERAL PROCESS	CL 900, RF -20 TO 1000F	9 CR-1 MO (PWHT)	9 CR-1 MO TRIM CN 5	0.125	----
0129	9CS2S80	CRUDE OIL SUPPLY LINE (U/G), (ASME B31.4)	CL 900, RF 0 TO 250F 1000 psig Max	CS (C & W)	CS TRIM CN 5	0.125	----
0119	9SJ1S09 (UOP)	PROCESS WITH HYDROGEN	CL 900, RF -20 TO 900F	321 SS	347 SS 347 SS, FULL HF SEAT	0.063	----
0120	9SL1S09 (UOP)	PROCESS WITH HYDROGEN	CL 900, RF -20 TO 900F	347 SS	347 SS 347 SS, FHS FULL HF SEAT	0.063	----
0121	15CB1S	GENERAL PROCESS	CL 1500, RF 0 TO 800F	KILLED CS	CS TRIM CN 5	0.063	----
0122	15CB1S01	BOILER FEED WATER, STEAM	CL 1500, RF 0 TO 800F	KILLED CS	CS TRIM CN 5	0.063	----
0125	15CB2S	GENERAL PROCESS	CL 1500, RF 0 TO 800F	KILLED CS	CS TRIM CN 5	0.125	----
0126	15CB2S01	AMINE	CL 1500, RF 0 TO 400F	KILLED CS (PWHT)	CS TRIM CN 12	0.125	----
0141	15CB2S54	GENERAL PROCESS, SOUR WATER, WET H ₂ S	CL 1500, RF 0 TO 800F	KILLED CS (NACE, PWHT)	CS TRIM CN 12	0.125	----
0127	15CB4S	GENERAL PROCESS	CL 1500, RF 0 TO 800F	KILLED CS	CS TRIM CN 5	0.25	----
0142	15CB4S55	GENERAL PROCESS, SOUR WATER, WET H ₂ S	CL 1500, RF 0 TO 800F	KILLED CS (NACE, PWHT)	CS TRIM CN 12	0.25	----
0132	15CJ1S	GENERAL PROCESS	CL 1500, RF -20 TO 1000F	1 1/4 CR-1/2 MO	1 1/4 CR-1/2 MO TRIM CN 5	0.063	----
0133	15CJ1S09 (UOP)	PROCESS WITH HYDROGEN	CL 1500, RF -20 TO 800F	1 1/4 CR-1/2 MO (PWHT)	1 1/4 CR-1/2 MO TRIM CN 5	0.063	----
0134	15CJ2S	GENERAL PROCESS	CL 1500, RF -20 TO 1000F	1 1/4 CR-1/2 MO	1 1/4 CR-1/2 MO TRIM CN 5	0.125	----

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0135	15CJ2S09 (UOP)	PROCESS WITH HYDROGEN	CL 1500, RF -20 TO 1000F	1 1/4 CR-1/2 MO (PWHT)	1 1/4 CR-1/2 MO TRIM CN 5	0.125	----
0136	15CJ4S09 (UOP)	PROCESS WITH HYDROGEN, WET H ₂ S	CL 1500, RF -20 TO 800F	1 1/4 CR-1/2 MO (NACE, PWHT)	1 1/4 CR-1/2 MO TRIM CN 12	0.25	----
0138	15CK1S09 (UOP)	PROCESS WITH HYDROGEN	CL 1500, RF -20 TO 800F	2 1/4 CR-1 MO (PWHT)	2 1/4 CR-1 MO TRIM CN 5	0.063	----
0137	15CK2S09 (UOP)	PROCESS WITH HYDROGEN	CL 1500, RF -20 TO 1100F	2 1/4 CR-1 MO (PWHT)	2 1/4 CR-1 MO TRIM CN 5	0.125	----
0140	15SE1S	GENERAL PROCESS	CL 1500, RF -20 TO 850F	317/317L SS	317/317L SS FULL HF SEAT	0.063	----
0139	15SL1S09 (UOP)	PROCESS WITH HYDROGEN	CL 1500, RF -20 TO 900F	347 SS	347 SS 347 SS, FULL HF SEAT	0.063	----
0147	25CB1S	GENERAL PROCESS	CL 2500, RF 0 TO 800F	KILLED CS	CS TRIM CN 5	0.063	----
0148	25CB2S	GENERAL PROCESS	CL 2500, RF 0 TO 800F	KILLED CS	CS TRIM CN 5	0.125	----
0150	25CJ1S09 (UOP)	PROCESS WITH HYDROGEN	CL 2500, RF -20 TO 800F	1 1/4 CR-1/2 MO (PWHT)	1 1/4 CR-1/2 MO TRIM CN 5	0.063	----
0151	25CK1S09 (UOP)	PROCESS WITH HYDROGEN	CL 2500, RF -20 TO 1100F	2 1/4 CR-1 MO (PWHT)	2 1/4 CR-1 MO TRIM CN 5	0.063	----
0152	25CK2S09 (UOP)	PROCESS WITH HYDROGEN	CL 2500, RF -20 TO 1100F	2 1/4 CR-1 MO (PWHT)	2 1/4 CR-1 MO TRIM CN 5	0.125	----
0149	25SE1S09 (UOP)	PROCESS WITH HYDROGEN	CL 2500, RF -20 TO 850F 2786 psig @ 850F	317/317L SS	317/317L SS FULL HF SEAT	0.063	----
0156	25SJ1S09 (UOP)	PROCESS WITH HYDROGEN	CL 2500, RF -20 TO 900F	321 SS	347 SS 347 SS, FULL HF SEAT	0.063	----
0157	1CB1S01	UTILITY WATER NITROGEN UTILITY AIR,	CL 150, RF 0 TO 366F 150 psig Max	CS	CS TRIM CN 8	0.063	----
0158	1CG0T	INSTRUMENT AIR	CL 150, RF 0 TO 200F 150 psig Max	GALV CS	CS TRIM CN 8	0	----
0159	1CG0T01	POTABLE WATER (A/G)	CL 150, RF 0 TO 200F 150 psig Max	GALV CS	CS TRIM CN 8	0	----
0155	1CG0T02	OIL MIST	CL 150, RF 0 TO 200F	GALV CS	----- -----	0	----

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0160	12CG0T01	FIRE WATER DRY SYSTEM (A/G)	CL 150, RF 0 TO 200F 200 psig Max	GALV CS	DI / BRONZE BUNA ST / BRONZE	0	----	
0161	12CS2S	OILY WATER SEWER (U/G)	CL 150, FF 0 TO 150F 150 psig Max	CS (C & W)	DI BUNA ST	0.125	----	
0162	12CS2S01	FIRE WATER (A/G)	CL 150, RF 0 TO 200F 200 psig Max	CS	DI / BRONZE BUNA SEAT / BRONZE	0.125	----	
0166	12CS2S02	OIL WASTE WATER (A/G)	CL 150, RF 0 TO 150F 150 psig Max	CS	DI BUNA SEAT	0.125	----	
0164	12CS2S03	FRESH COOLING WATER RAW WATER SERVICE (A/G)	CL 150, RF 0 TO 200F 150 psig Max	CS	DI BUNA SEAT	0.125	----	
0165	12CS2S04	FRESH COOLING WATER RAW WATER SERVICE (U/G)	CL 150, FF 0 TO 150F 150 psig Max	CS (C & W)	DI BUNA SEAT	0.125	----	
0167	12CS2S05	SLUDGE (A/G)	CL 150, FF 0 TO 150F 250 psig Max	CS	DI PTFE	0.125	----	
0172	12CS2S06	SLUDGE (U/G)	CL 150, FF 0 TO 150F 150 psig Max	CS (C & W)	DI PTFE	0.125	----	
0168	12FE0A	DELETED						
0143	12FE0A01	FIRE WATER (U/G) (TIE IN FOR EXISTING UNIT)	CL 150, RF 0 TO 150F 200 psig @ 150F	GRP	----- -----	0	----	
0163	12PD0H	FIRE WATER (U/G)	CL 150, FF 0 TO 100F 200 psig @ 73F	HDPE	DI BUNA SEAT	0	----	
0169	12PD0H01	STORM WATER (U/G)	CL 150, FF 0 TO 150F Atmospheric Pressure	HDPE	----- -----	0	----	
0131	12PD0H02	INDUSTRIAL RAW WATER (U/G)	CL 150, FF 0 TO 73F 160 psig Max	HDPE	----- -----	0	----	
0170	80PU0C	POTABLE WATER, CHLORINATED WATER (U/G)	FF 0 TO 150F 150 psig Max	CPVC	CPVC CPVC	0	----	
0181	80PU0C01	CHEMICALS (U/G)	FF 0 TO 120F 150 psig Max	CPVC	CPVC CPVC	0	----	

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0251	80PU0C02	CHLORINATED WATER, HYPOCHLORITE SOLUTION, (A/G)	FF 0 TO 150F 150 psig Max	CPVC	CPVC CPVC	0	----
0171	80PV0C	SANITARY SEWER (U/G)	FF 0 TO 140F 150 psig Max	PVC	PVC PVC	0	----
0154	80PV0C01	OILY WATER SEWER (U/G)	FF 0 TO 140F Atmospheric Pressure	PVC	----- -----	0	----
0252	50SA0L09	STEAM TRACING	TUBING -20 TO 500F 1000 PSIG	316 SS	----- -----	0	----
0144	50SD0L01	HYDRAULIC FLUID	TUBING -20 TO 400F 3000 PSIG	316/316L SS	----- -----	0	----
0250	50SD0L02	HYDRAULIC FLUID	TUBING -20 TO 400F 4000 PSIG	316/316L SS	----- -----	0	----
0145	50SD0L04	HYDRAULIC FLUID	TUBING -20 TO 400F 6000 PSIG	316/316L SS	----- -----	0	----

NOTES:

1. Determination of design condition limits for hydrogen service shall be in accordance with API 941, 7th edition, 2008 (Nelson's Curve), utilizing the Design Temperature. For Hydrogen service, no threaded connections allowed & minimum pipe size is ¾".
2. For Caustic and Sulfuric Acid services, all flanged joints, including bolted valve bonnets & caps, shall be fitted with indicating safety shields.

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		Piping Material Class: 1CB1S		
		Issue Date: 28-Feb-13	Revision 9	Prepared SN
			Checked KAJ	Approved GAD

Services	General Process (Note 558), Fuel Gas	Basic Material	Killed Carbon Steel
Pressure Rating:	CL 150, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0.063"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > ¾")
Flange Facing:	RF	Basic Construction:	1/2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class B Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS ½" Through NPS 48" (Full flange ratings per B16.5)

Temp F	-20 to 100	200	300	400	500	600	650	700	750	800
psig	285	260	230	200	170	140	125	110	95	80

For NPS 52" and Larger (Note 501, 548)

Temp F	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc
psig	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	½" – 2" 3" - 24" 26" - 26" 30" - 36" 42" – 48" 26" - 36" 42" – 48"	PE BE BE BE BE BE BE	XS STD STD STD XS STD XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10 CS, ASTM A106 GRADE B, SMLS, ASME B36.10 CS, ASTM A672 GRADE C65 CL12, EFW, STR SM, ASME B36.10 CS, ASTM A672 GRADE C65 CL12, EFW, STR SM, ASME B36.10 CS, ASTM A672 GRADE C65 CL12, EFW, STR SM, ASME B36.10 CS, ASTM A672 GRADE C65 CL22, EFW, STR SM, ASME B36.10 CS, ASTM A672 GRADE C65 CL22, EFW, STR SM, ASME B36.10	26 26, 1009 26, 1009	
NIPPLES	½" – 2" ½" – 2" ½" – 2"	PBE PBE TOE	XS 160 160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503 03	
CONC. SWAGES	⅜" – 2" ½" – 2" 3" – 4" (½" – 2")	TSE PBE BLE x PSE	160 XS STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	03	9
ECC. SWAGES	½" – 2" 3" – 4" (½" – 2")	PBE BLE x PSE	XS STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
FITTINGS	90 ELL ½" – 2" 45 ELL ½" – 2" TEE ½" – 2" TEE (RED) ½" – 2" 45 LATERAL ½" – 2" 45 LATERAL (RED) ½" – 2" PLUG ⅜" – 2" PLUG ½" – ½" COUPLING ½" – 2"	SW SW SW SW SW SW THRD PE SW	3000 LB 3000 LB 3000 LB 3000 LB 3000 LB 3000 LB 3000 LB 3000 LB	CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11, ROUND HEAD CS, ASTM A105, ASME B16.11, BARSTOCK, ROUND HEAD CS, ASTM A105, ASME B16.11	02 03 53	 9

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			Piping Material Class: 1CB1S		
			Issue Date: 28-Feb-13		Revision 9
			Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION			NOTES	REV
COUPLING	½" – 2"	THRD/SW	3000 LB	CS, ASTM A105, ASME B16.11			03	9
CAP	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11				
UNION	½" – 2"	SW	3000 LB	CS, ASTM A105, GROUND JOINT, MSS-SP-83			26	
CAP	½" – 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11			03	
SOCKOLET FLAT	½" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97				
SOCKOLET	½" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97				
45 SW LATROLET	½" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97				
SW ELBOLET	1 ½" – 1 ½"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97			26	
THREDOLET	½" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97			03	
WELDOLET	3" – 42"	WELD		CS, ASTM A105, MSS-SP-97				
90 ELL	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
90 ELL	26" – 26"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			26	
90 ELL	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
45 ELL	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
45 ELL	26" – 26"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			26	
45 ELL	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
45 BEND 12-D	8" – 8"	WELD		CS, ASTM A106 GRADE B, SMLS, PIPE BEND 45 Deg., 12-D Radius W / 6" Straight Length			26, 566	
TEE	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
TEE	26" – 26"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			26	
TEE	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
TEE (RED.)	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
TEE (RED.)	26" – 26"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			26	
TEE (RED.)	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
CAP	3" – 48"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
CAP	26" – 26"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9			26	
REDUCER (CC)	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
REDUCER (CC)	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
REDUCER (CC)	26" – 26"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			26	
REDUCER (CC)	42" x 32"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			26	
REDUCER (EC)	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
REDUCER (EC)	26" – 26"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			26	
REDUCER (EC)	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
VALVES				TAG NO.	SHORT CODE			
GATE	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	GWCS01	VG		
GATE	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GWCS10	VGS	08	
GATE	½" – 2"	SW	CL 800	CS Body W/ Alloy 400 TRIM (API # 9)	GWCS05	VG1	09, 26	
GATE	½" – 2"	THRD/SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	GWCY01	VG2	06, 03	
GATE	½" – 2"	THRD/SW	CL 800	CS Body W/ Alloy 400 TRIM (API # 9)	GWCY05	VG3	06, 03, 09, 26	
GATE	½" – 2"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Conventional Port	GACF03	VGF	15	
GATE	2" – 2"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Conventional Port	GBCF03	VGI	06, 15	
GATE	3" – 12"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GACF01	VG		
GATE	14" – 24"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, GO	GACF02	VG		
GATE	30" – 36"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, Series-A, GO	GACF22	VG		
GATE	42" – 48"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, Series-A, GO	GACF26	VG		
GATE	3" – 4"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GBCF01	VGI	06, 15	
GLOBE	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	LWCS01	VL		
GLOBE	3" – 10"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	LACF01	VL		
LIFT CHECK	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API # 8), Piston Type	CWCS01	VC	61	
LIFT CHECK	½" – 2"	SW	CL 800	CS Body W/ Alloy 400 TRIM (API # 9), Piston Type	CWCS05	VC1	09, 26, 61	
SWING CHECK	3" – 10"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VC	62	
SWING CHECK	12" – 24"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VCF	62	
DUAL PLT CHECK	12" – 24"	RF	CL 150	CS Body W/ 410 SS DISC, HF ST (API #8), DBL FLGD	CACF02	VC	63	
DUAL PLT CHECK	30" – 48"	RF	CL 150	CS Body W/ 410 SS DISC, HF ST (API #8), DBL FLGD, Series-A	CACF03	VC	63	
BUTTERFLY	3" – 24"	RF	CL 150	CS Body W/ Resilient Metal ST, HF ST, DBL FLGD, GO	FACF01	VX		9
BUTTERFLY	30" – 48"	RF	CL 150	CS Body W/ Resident Metal ST, HF ST, DBL FLGD, Series-A, GO	FACF02	VX		

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  Refinería de Cartagena S.A.	Piping Material Class Specification			Document No.: 000-SP-PI02-0004		
				Piping Material Class: 1CB1S		
				Issue Date: 28-Feb-13	Revision 9	
				Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION			NOTES	REV
BALL	¾" – 6"	RF	CL 150	CS Body W/ PTFE ST, Nickel Plated Floating Ball, RP, SP, Lever	BACF01	VB	09	
BALL	8" – 8"	RF	CL 150	CS Body W/ PTFE ST, Nickel Plated Floating Ball, RP, SP, GO	BACF02	VB	09	
BALL	10" – 24"	RF	CL 150	CS Body W/ PTFE ST, Nickel Plated Trunnion Ball, RP, LP, GO	BACF03	VB	09	
BALL	½" – 2"	SW	2000 WOG	CS Body W/ PTFE ST, 316 SS Floating Ball, FP, LP, Lever	BUCS01	VB1	09, 26	
BALL	3" – 6"	RF	CL 150	CS Body W/ RPTFE ST, 316 SS Floating Ball, FP, LP, Lever	BACF14	VB1	09, 26	
BALL	¾" – 2"	RF	CL 300	CS Body W/ RPTFE ST, 316 SS Floating Ball, FP, LP, Lever	BBCF01	VB2	09, 26	
FLANGES								
SOCKETWELD	½" – 2"	RF	CL 150	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5				
WELDNECK	6" – 6"	FF	CL 150	CS, ASTM A105, ASME B16.5				9
SLIP-ON-FLG(RED.)	1" – 14"	RF	CL 150	CS, ASTM A105, ASME B16.5			528, 533	
SLIP-ON-FLG(RED.)	3" x 2"	RF	CL 300	CS, ASTM A105, ASME B16.5			26	9
BLIND	½" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5				
WELDNECK	26" – 30"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES B			26	
WELDNECK	30" – 48"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A				
WELDNECK	32" – 32"	FF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A			26	
BLIND	26" – 30"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES B			26	
BLIND	30" – 48"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A				
SOCKETWELD	½" – 2"	RF	CL 300	CS, ASTM A105, ASME B16.5			12	
WELDNECK	3" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5			12	
BLIND	½" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5			12	
SOCKETWELD	½" – 2"	RF	CL 600	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 600	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 900	CS, ASTM A105, ASME B16.5				
SOCKETWELD	½" – 2"	RF	CL 1500	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 1500	CS, ASTM A105, ASME B16.5				
PR WN ORIFICE	1" – 24"	RF	CL 300	CS, ASTM A105 W/ ½" SOCKETWELD TAPS, ASME B16.36				
MISCELLANEOUS								
FIGURE 8 BLANK	½" – 12"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE BLANK	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE SPACER	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
FIGURE 8 BLANK	½" – 12"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48			26	
PADDLE BLANK	½" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48			26	
PADDLE SPACER	½" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48			26	
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDC01			553	
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/32" Dia. Hole @ 3/64" Center, TAG# YSDC02			554	
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 150	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSAS01			555	
FLANGE ISOLATION KIT	½" – 24"	RF	CL 150	ISOLATION GASKET, ASME B16.21, ASME B16.5, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.				
FLANGE ISOLATION KIT	30" – 42"	RF	CL 150	ISOLATION GASKET, ASME B16.21, ASME B16.47 SERIES A, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.				
GASKETS								
	½" – 24"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING				
	6" – 6"		CL 150	GASKET FULL, ASME B16.21, ASME B16.5, 1/16" THCK, GRAPHITE W/ 316 SS INSERT			14, 26	9
	26" – 30"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES B, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING			26	
	30" – 48"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING				

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  Refineria de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0004		
		Piping Material Class: 1CB1S		
		Issue Date: 28-Feb-13	Revision 9	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
	$\frac{1}{2}$ " – 24" $\frac{1}{2}$ " – 24" 3" – 24" $\frac{1}{2}$ " – 24"		CL 300 CL 600 CL 900 CL 1500	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
BOLTING STUD STUD STUD STUD STUD	ALL ALL ALL ALL ALL		CL 150 CL 300 CL 600 CL 900 CL 1500	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		

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90° BRANCH CONNECTION CHART (NOTE 1010)

BRANCH SIZE	48	T																			
	42	E	T																		
	36	P	E	T																	
	30	P	P	E	T																
	26	P	P	P	E	T															
	24	P	P	P	E	E	T														
	20	P	P	P	P	P	E	T													
	18	P	P	P	P	P	P	E	T												
	16	P	P	P	P	P	P	P	E	T											
	14	P	P	P	P	P	P	P	P	E	T										
	12	P	P	P	P	P	P	P	P	P	E	T									
	10	P	P	P	P	P	P	P	P	P	P	E	T								
	8	W	W	W	W	W	W	W	W	W	W	W	E	T							
	6	W	W	W	W	W	W	W	W	W	W	W	W	E	T						
	4	W	W	W	W	W	W	W	W	W	W	W	W	W	E	T					
	3	W	W	W	W	W	W	W	W	W	W	W	W	W	W	E	T				
	2	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	T			
	1½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	T		
	1	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T	
	¾	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T
	½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	E
	48	42	36	30	26	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
HEADER SIZE																					

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet

 	Piping Material Class Specification	Document No.: 000-SP-PI02-0004		
		Piping Material Class: 1CB1S		
		Issue Date: 28-Feb-13		Revision 9
		Prepared SN	Checked KAJ	Approved GAD

45° BRANCH CONNECTION CHART (NOTE 1010)

BRANCH SIZE	48	F																		
	42	P	F																	
	36	P	P	F																
	30	P	P	P	F															
	24	P	P	P	P	F														
	20	P	P	P	P	P	F													
	18	P	P	P	P	P	P	F												
	16	P	P	P	P	P	P	P	F											
	14	P	P	P	P	P	P	P	P	F										
	12	P	P	P	P	P	P	P	P	P	F									
	10	P	P	P	P	P	P	P	P	P	P	F								
	8	P	P	P	P	P	P	P	P	P	P	P	F							
	6	P	P	P	P	P	P	P	P	P	P	P	P	F						
	4	P	P	P	P	P	P	P	P	P	P	P	P	P	F					
	3	P	P	P	P	P	P	P	P	P	P	P	P	P	P	F				
	2	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H			
	1½	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	G	H		
	1	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	G	G	H	
	¾	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	G	G	H
	½	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	G	G	G
	48	42	36	30	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
HEADER SIZE																				

LEGEND:

F = Full Encirclement Reinforcement Pad (BW for 3" and larger)
P = 45° Branch Weld with Reinforcing Pad (Note 510)
L = 45° SW Latrolet (SW for 2" and smaller)

H = 45° Lateral (SW for 2" and smaller)
G = 45° Reducing Lateral (SW for 2" and smaller)

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0004		
		Piping Material Class: 1CB1S		
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		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
08. Full-port valves shall be used if indicated on the P&ID.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
12. These flanges shall be used only to match Class 300 flange connections at control valves and special equipment.
14. Full-face gaskets shall be used at flat-faced flanges.
15. These valves shall be used if mating to flanged nozzles.
26. To be used only if indicated on the P&ID.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
510. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Latrolet or Lateral depending on engineering requirements, availability and economics.
528. This component for use only in designs that require no clean-outs at changes in direction, as identified by P&ID (Typically downstream of inlet to sulfur pit).
533. Slip-On-Reducing-Flange shall be specified as 2 size items. The size combination is the same as Core Pipe Size to Jacket Pipe Size combination.
548. Pipe and pipe components thicker than 0.500" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
554. Use this strainer for Vapor / Gas Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
558. Services designated as "General Process" include "Hydrogen Service". Material Class selected for Hydrogen Service is based on the design condition limits in accordance with API 941 (Nelson Curve).
566. Pipe Bend shall be formed in accordance per ASME B 31.3.
617. For Instrument Connections only.
1009. The pipe used only in UOP Units.
1010. For pipe above 24 NPS in UOP specific Units, use A672 Grade B65 CL22 for Branch weld with Reinforcing pad & Full Encirclement pad.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0157		
		Piping Material Class: 1CB1S01		
		Issue Date: 28-Feb-13		Revision 6
		Prepared SN	Checked KAJ	Approved GAD

Services	Utility Water, Nitrogen, Utility Air	Basic Material	Carbon Steel
Pressure Rating:	CL 150, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0.063"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > ¾")
Flange Facing:	RF	Basic Construction:	1/2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class A Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS ½" Through NPS 48" (Not Full flange ratings per B16.5)

Temp F	0 to 100	200	300	366
psig	150	150	150	150

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	½" - 2" 3" - 24" 30" - 48"	PE BE BE	XS STD STD	CS, ASTM A53 GRADE B, SMLS, ASME B36.10 CS, ASTM A53 GRADE B, ERW, JE = 85%, ASME B36.10 CS, API 5L GRADE B, PSL1, SAWL, STR SM, JE = 95%, ASME B36.10		
NIPPLES	½" - 2" ½" - 2" ½" - 2"	PBE PBE TOE	XS 160 160	CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503 03	
CONC. SWAGES	¾" - 2" ½" - 2" 3" - 4" (½" - 2")	TSE PBE BLE x PSE	160 XS STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	03	6
ECC. SWAGES	½" - 2" ½" - 2" 3" - 4" (½" - 2")	TSE PBE BLE x PSE	160 XS STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	03 6	6
FITTINGS					02	
90 ELL	½" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
45 ELL	½" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
TEE	½" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
TEE (RED)	½" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
PLUG	½" - 2"	THRD		CS, ASTM A105, ASME B16.11, ROUND HEAD	03	
PLUG	½" - ½"	PE		CS, ASTM A105, ASME B16.11, BARSTOCK, ROUND HEAD	53	
COUPLING	½" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
COUPLING	½" - 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11	03	6
CAP	½" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
CAP	½" - 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11	03	
SOCKOLET	½" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97	03	
THREDOLET	½" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97		
WELDOLET	3" - 42"	WELD		CS, ASTM A105, MSS-SP-97		
90 ELL	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
45 ELL	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
TEE	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
TEE (RED.)	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		

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  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0157		
		Piping Material Class: 1CB1S01		
		Issue Date: 28-Feb-13	Revision 6	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION			NOTES	REV
CAP REDUCER (CC) REDUCER (EC)	3" – 48" 3" – 48" 3" – 48"	WELD WELD WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9 CS, ASTM A234 GRADE WPB-W, ASME B16.9 CS, ASTM A234 GRADE WPB-W, ASME B16.9				
VALVES					TAG NO.	SHORT CODE		
GATE	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	GWCS01	VG		
GATE	½" – 2"	THRD/SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	GWCY01	VG2	06, 03	
GATE	½" – 2"	THRD	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	GWCT01	VG2	06, 03, 26	
GATE	½" – 2"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Conventional Port	GACF03	VG2	15	
GATE	2" – 2"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Conventional Port	GBCF03	VGI	06, 15	
GATE	3" – 12"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GACF01	VG		
GATE	14" – 24"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, GO	GACF02	VG		
GLOBE	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	LWCS01	VL		
GLOBE	3" – 8"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	LACF01	VL		
LIFT CHECK	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8), Piston Type	CWCS01	VC	61	
SWING CHECK	3" – 6"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VC	62	
SWING CHECK	8" – 24"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VCF	62	
DUAL PLT CHECK	8" – 24"	RF	CL 150	CS Body W/ 410 SS DISC, HF ST (API #1), Wafer Style	CACW01	VC	63	
BUTTERFLY	6" – 24"	FF	CL 150	DI Body W/ Rubber Lined, D&T, Lug Style, G.O.	FUDL02	VX	09	
BALL	¾" – 6"	RF	CL 150	CS Body W/ PTFE ST, Nickel Plated Floating Ball, RP, SP, Lever	BACF01	VB	09	
BALL	8" – 8"	RF	CL 150	CS Body W/ PTFE ST, Nickel Plated Floating Ball, RP, SP, GO	BACF02	VB	09	
BALL	½" – 2"	SW	1000 WOG	CS Body W/ RPTFE ST, 316SS Floating Ball, RP, Lever	BUCS03	VBS	09, 26	6
BALL	½" – 2"	THRD/SW	1000 WOG	CS Body W/ RPTFE ST, 316SS Floating Ball, RP, Lever	BUCY03	VBC	09, 26	6
BALL	¾" – 6"	RF	CL 150	CS Body W/ RPTFE ST, 316SS Floating Ball, FP, LP, Lever	BUCF14	VBG	09, 26	6
FLANGES								
SOCKETWELD	½" – 2"	RF	CL 150	CS, ASTM A105, ASME B16.5			11	6
SOCKETWELD	½" – 2"	FF	CL 150	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5				
WELDNECK	30" – 48"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A			11	
WELDNECK	3" – 24"	FF	CL 150	CS, ASTM A105, ASME B16.5			11	
WELDNECK	30" – 48"	FF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A				
BLIND	½" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5				
BLIND	30" – 48"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A			12	
SOCKETWELD	½" – 2"	RF	CL 300	CS, ASTM A105, ASME B16.5			12	
WELDNECK	3" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5			12	
BLIND	½" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5				
SOCKETWELD	½" – 2"	RF	CL 600	CS, ASTM A105, ASME B16.5				6
SOCKETWELD	½" – 2"	RF	CL 1500	CS, ASTM A105, ASME B16.5				6
PR WN ORIFICE	1" – 24"	RF	CL 300	CS, ASTM A105 W/ ½" SOCKETWELD TAPS, ASME B16.36				
MISCELLANEOUS								
FIGURE 8 BLANK	½" – 12"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE BLANK	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE SPACER	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE BLANK	½" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				6
PADDLE SPACER	½" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				6
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDC01			553	
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/32" Dia. Hole @ 3/64" Center, TAG# YSDC02			554	
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 150	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSAS01			555	
FLANGE ISOLATION KIT	½" – 24"	RF	CL 150	ISOLATION GASKET, ASME B16.21, ASME B16.5, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.				6

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  Refineria de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0157		
		Piping Material Class: 1CB1S01		
		Issue Date: 28-Feb-13		Revision 6
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
GASKETS	1/2" – 24"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, CS OUTER RING, TP 304 SS INNER RING		6
	30" – 48"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, CS OUTER RING, TP 304 SS INNER RING		
	1/2" – 24"		CL 150	GASKET FULL, ASME B16.21, ASME B16.5, 1/16" THICK, GRAPHITE W/ 316 SS INSERT	14	6
	30" – 48"		CL 150	GASKET FULL, ASME B16.21, ASME B16.47 SERIES A, 1/16" THICK, GRAPHITE W/ 316 SS INSERT	14	
	1/2" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, CS OUTER RING, TP 304 SS INNER RING		6
	1/2" – 24"		CL 600	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, CS OUTER RING, TP 304 SS INNER RING		6
	1/2" – 2"		CL 1500	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, CS OUTER RING, TP 304 SS INNER RING		6
BOLTING	STUD	ALL	CL 150	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
	STUD	ALL	CL 300	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
	STUD	ALL	CL 600	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		6
	STUD	ALL	CL 1500	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		6

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0157		
		Piping Material Class: 1CB1S01		
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		Prepared SN	Checked KAJ	Approved GAD

90° BRANCH CONNECTION CHART

BRANCH SIZE	48	T																		
	42	E	T																	
	36	P	E	T																
	30	P	P	E	T															
	24	P	P	P	E	T														
	20	P	P	P	P	E	T													
	18	P	P	P	P	P	E	T												
	16	P	P	P	P	P	P	E	T											
	14	P	P	P	P	P	P	P	E	T										
	12	P	P	P	P	P	P	P	P	E	T									
	10	P	P	P	P	P	P	P	P	P	E	T								
	8	W	W	W	W	W	W	W	W	W	W	E	T							
	6	W	W	W	W	W	W	W	W	W	W	W	E	T						
	4	W	W	W	W	W	W	W	W	W	W	W	W	E	T					
	3	W	W	W	W	W	W	W	W	W	W	W	W	W	E	T				
	2	S	S	S	S	S	S	S	S	S	S	S	S	S	S	T				
	1½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	T			
	1	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T		
	¾	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T	
	½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	E	T
	48	42	36	30	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
HEADER SIZE																				

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet

	Piping Material Class Specification	Document No.: 000-SP-PI02-0157		
 Refinería de Cartagena S.A.		Piping Material Class: 1CB1S01		
		Issue Date: 28-Feb-13		Revision 6
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NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
11. Flat-face flanges shall be provided adjacent to flat-face equipment nozzles.
12. These flanges shall be used only to match Class 300 flange connections at control valves and special equipment.
14. Full-face gaskets shall be used at flat-faced flanges.
15. These valves shall be used if mating to flanged nozzles.
26. To be used only if indicated on the P&ID.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
554. Use this strainer for Vapor / Gas Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0005		
		Piping Material Class: 1CB1S02		
		Issue Date: 28-Feb-13	Revision 7	
		Prepared SN	Checked KAJ	Approved GAD

Services	Boiler Feed Water, Steam & Condensate	Basic Material	Killed Carbon Steel
Pressure Rating:	CL 150, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0.063"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > ¾")
Flange Facing:	RF	Basic Construction:	1/2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class B Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS ½" Through NPS 48" (Full flange ratings per B16.5)

Temp F	0 to 100	200	300	400	500	600	650	700	750	800
psig	285	260	230	200	170	140	125	110	95	80

For NPS 52" and Larger (Note 501, 504)

Temp F	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc
psig	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	½" – 2"	PE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10	26, 1034 26	7
	¾" – ¾"	PE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	2" – 2"	BE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	3" – 24"	BE	STD	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	30" – 36"	BE	STD	CS, ASTM A672 GRADE C65 CL12, EFW, STR SM, ASME B36.10		
	42" – 48"	BE	XS	CS, ASTM A672 GRADE C65 CL12, EFW, STR SM, ASME B36.10		
NIPPLES	½" – 2"	PBE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503 03	
	½" – 2"	PBE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
	½" – 2"	TOE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
CONC. SWAGES	½" – 2"	TSE	160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	03	
	½" – 2"	PBE	XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	3" – 4"	BLE x PSE	STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	26	
	(½" – 2")					
	2" – 2"	BLE x PSE	XS x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
(¾", 1 ½")				26		
2 ½" x 2"	BLE x PSE	STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95			
ECC. SWAGES	½" – 2"	PBE	XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	3" – 4" (½" – 2")	BLE x PSE	STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
FITTINGS					02	
	90 ELL	½" – 2"	SW	3000 LB		
	45 ELL	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11	
	TEE	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11	
	TEE (RED)	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11	
	PLUG	½" – 2"	THRD		CS, ASTM A105, ASME B16.11, ROUND HEAD	
	PLUG	½" - ½"	PE		CS, ASTM A105, ASME B16.11, BARSTOCK, ROUND HEAD	
	COUPLING	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11	
				03 53		

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		Piping Material Class: 1CB1S02		
		Issue Date: 28-Feb-13	Revision 7	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION			NOTES	REV
COUPLING	½" – 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11			03, 26	
CAP	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11				
45° LATERAL	½" – 2"	SW	3000 LB	CS, ASTM A105				
CAP	½" – 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11			03	
UNION	½" – 2"	SW	3000 LB	CS, ASTM A105, GROUND JOINT, MSS-SP-83			26	7
SOCKOLET FLAT	½" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97				
SOCKOLET	½" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97				7
SW ELBOLET	1½" – 1½"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97				
THREDOLET	½" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97			03	
WELDOLET FLAT	6" – 8"	WELD		CS, ASTM A105, MSS-SP-97			26	7
WELDOLET	3" – 42"	WELD		CS, ASTM A105, MSS-SP-97				
90 ELL	2" – 2"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9			26	
90 ELL	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
90 ELL SR.	18" – 18"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9			26	
90 ELL	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
90 ELL SR.	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 DESIGN W/ 1 D RADIUS			26	
45 ELL	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
45 ELL	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
TEE	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
TEE	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
TEE (RED.)	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
TEE (RED.)	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
CAP	3" – 48"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
REDUCER (CC)	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
REDUCER (CC)	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
REDUCER (EC)	4" x 2"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9			26	
REDUCER (EC)	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
REDUCER (EC)	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
VALVES					TAG NO.	SHORT CODE		
	GATE	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	GWCS01	VG	
	GATE	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GWCS10	VGS	08
	GATE	½" – 2"	THRD/SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	GWCY01	VG2	06, 03
	GATE	½" – 2"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Conventional Port	GACF03	VGf	15
	GATE	3" – 12"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GACF01	VG	
	GATE	14" – 24"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, GO	GACF02	VG	
	GATE	30" – 36"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, Series-A, GO	GACF22	VG	
	GATE	2" – 2"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Conventional Port	GBCF03	VGI	06, 15
	GATE	3" – 3"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GBCF01	VGI	06, 15
	GATE	30" – 36"	RF	CL 150	CS Body W/ 13 CR TRIM, Full HF ST (API #5), Full Port, Series-A, GO, Steam Service	GACF35	VG1	26, 1021
	GLOBE	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	LWCS01	VL	
	GLOBE	3" – 8"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	LACF01	VL	
	LIFT CHECK	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8), Piston Type	CWCS01	VC	61
	SWING CHECK	3" – 10"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VC	62
	SWING CHECK	12" – 24"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VCF	62
	DUAL PLT CHECK	12" – 24"	RF	CL 150	CS Body W/ 410 SS DISC, HF ST (API #8), DBL FLGD	CACF02	VC	63
	DUAL PLT CHECK	30" – 48"	RF	CL 150	CS Body W/ 410 SS DISC, HF ST (API #8), DBL FLGD, Series-A	CACF03	VC	63
	BUTTERFLY	3" – 8"	RF	CL 150	CS Body W/ Resilient Metal ST, HF ST, LUG STYLE, GO	FACL01	VX	
	BUTTERFLY	6" – 24"	RF	CL 150	CS Body W/ RPTFE ST, 316SS DISC, LUG STYLE, GO	FACL03	VX1	09, 26
	BUTTERFLY	10" – 24"	RF	CL 150	CS Body W/ Resilient Metal ST, HF ST, DBL FLGD, GO	FACF01	VX	
	BUTTERFLY	30" – 48"	RF	CL 150	CS Body W/ Resilient Metal ST, HF ST, DBL FLGD, Series-A, GO	FACF02	VX	
	BALL	1½" – 1½"	RF	CL 150	CS Body W/ RPTFE ST, 316SS Floating Ball, FP, LP, Lever	BACF14	VB	09, 26
	BALL	½" – 2"	THRD/SW	2000 WOG	CS Body W/ PEEK SEAT, 316 SS Floating Ball, RP, Lever	BUCY01	VB1	09, 26
	BALL	½" – 2"	THRD/SW	2000 WOG	CS Body W/ RPTFE ST, 316SS Floating Ball, FP, Lever	BUCYAA	VB2	09, 26
	BALL	½" – 2"	THRD/SW	1000 WOG	CS Body W/ RPTFE ST, 316SS Floating Ball, RP, Lever	BUCY03	VB3	09, 26

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  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0005		
		Piping Material Class: 1CB1S02		
		Issue Date: 28-Feb-13	Revision 7	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
FLANGES						
SOCKETWELD	1/2" – 2"	RF	CL 150	CS, ASTM A105, ASME B16.5	26	528
WELDNECK	2 1/2" – 2 1/2"	RF	CL 150	CS, ASTM A105, ASME B16.5		
WELDNECK	3" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5		
REDUCING	10" x 4"	RF	CL 150	CS, ASTM A105, ASME B16.5		
WELDNECK						
BLIND	1/2" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5	12	12
WELDNECK	30" – 48"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A		
BLIND	30" – 48"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A		
SOCKETWELD	1/2" – 2"	RF	CL 300	CS, ASTM A105, ASME B16.5		
WELDNECK	3" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5		
BLIND	1/2" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5		
SOCKETWELD	1/2" – 2"	RF	CL 600	CS, ASTM A105, ASME B16.5		
WELDNECK	3" – 24"	RF	CL 600	CS, ASTM A105, ASME B16.5		
SOCKETWELD	1/2" – 2"	RF	CL 1500	CS, ASTM A105, ASME B16.5		
WELDNECK	3" – 24"	FF	CL 150	CS, ASTM A105, ASME B16.5		
PR WN ORIFICE	1" – 24"	RF	CL 300	CS, ASTM A105 W/ 1/2" SOCKETWELD TAPS, ASME B16.36		
MISCELLANEOUS						
FIGURE 8 BLANK	1/2" – 12"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48	09	
PADDLE BLANK	1/2" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48		
PADDLE SPACER	1/2" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48		
PADDLE BLANK	1/2" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48		
PADDLE SPACER	1/2" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48	553	7
STEAM TRAP	1/2" – 1"	SW		Steam Trap Thermodynamic W/Strainer & Blow Down Valve, Universal SW Connector, TP 304 SS, 450 psig PMO, 720 psig PMA, TAG# ST-101		
Y-STRAINER	1/2" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDC01		
Y-STRAINER	1/2" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/32" Dia. Hole @ 3/64" Center, TAG# YSDC02		
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 150	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSAS01	554	
FLANGE	1/2" – 24"	RF	CL 150	ISOLATION GASKET, ASME B16.21, ASME B16.5, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.	555	
ISOLATION KIT						
GASKETS						
	1/2" – 24"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING	14	
	30" – 48"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
	1/2" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
	1/2" – 24"		CL 600	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
	1/2" – 2"		CL 1500	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
	3" – 24"		CL 150	GASKET FULL, ASME B16.21, ASME B16.5, 1/16" THICK, GRAPHITE W/ TP 316 SS INSERT		
BOLTING						
STUD	ALL		CL 150	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
STUD	ALL		CL 300	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
STUD	ALL		CL 600	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
STUD	ALL		CL 1500	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		

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90° BRANCH CONNECTION CHART

BRANCH SIZE	48	T																		
	42	E	T																	
	36	P	E	T																
	30	P	P	E	T															
	24	P	P	P	E	T														
	20	P	P	P	P	E	T													
	18	P	P	P	P	P	E	T												
	16	P	P	P	P	P	P	E	T											
	14	P	P	P	P	P	P	P	E	T										
	12	P	P	P	P	P	P	P	P	E	T									
	10	P	P	P	P	P	P	P	P	P	E	T								
	8	W	W	W	W	W	W	W	W	W	W	E	T							
	6	W	W	W	W	W	W	W	W	W	W	W	E	T						
	4	W	W	W	W	W	W	W	W	W	W	W	W	E	T					
	3	W	W	W	W	W	W	W	W	W	W	W	W	W	E	T				
	2	S	S	S	S	S	S	S	S	S	S	S	S	S	S	T				
	1½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	T			
	1	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T		
	¾	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T		
	½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	E	T	
	48	42	36	30	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
HEADER SIZE																				

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet

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NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
08. Full-port valves shall be used if indicated on the P&ID.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
12. These flanges shall be used only to match Class 300 flange connections at control valves and special equipment.
14. Full-face gaskets shall be used at flat-faced flanges.
15. These valves shall be used if mating to flanged nozzles.
26. To be used only if indicated on the P&ID.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
504. Pipe and pipe components thicker than 0.611" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
528. This component for use only in designs that require no clean-outs at changes in direction, as identified by P&ID (Typically downstream of inlet to sulfur pit).
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
554. Use this strainer for Vapor / Gas Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.
1021. Use this valve only at the battery limit for steam header isolation.
1034. This pipe to be used only for Injection / Sample Quills.

		Piping Material Class Specification	Document No.: 000-SP-PI02-0008		
			Piping Material Class: 1CB2S		
			Issue Date: 09-Jun-14		Revision 12
			Prepared SN	Checked KAJ	Approved GAD

Services	General Process	Basic Material	Killed Carbon Steel
Pressure Rating:	CL 150, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0.125"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > ¾")
Flange Facing:	RF	Basic Construction:	1/2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class B Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS ½" Through NPS 72" (Full flange ratings per B16.5), (Note 571)

Temp F	0 to 100	200	300	400	500	600	650	700	750	800
psig	285	260	230	200	170	140	125	110	95	80

For NPS 76" and Larger (Note 501, 504)

Temp F	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc
psig	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	½" – 1 ½"	PE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10	1058	
	2" – 2"	PE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	3" – 24"	BE	STD	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	30" – 42"	BE	XS	CS, ASTM A672 GRADE C65 CL12, EFW, STR SM, ASME B36.10		
	48" – 52"	BE	0.562"	CS, ASTM A672 GRADE C65 CL12, EFW, STR SM, ASME B36.10		
	56" – 56"	BE	0.625"	CS, ASTM A672 GRADE C65 CL32, EFW, STR SM, ASME B36.10		
	60" – 60"	BE	0.688"	CS, ASTM A672 GRADE C65 CL32, EFW, STR SM, ASME B36.10		
	72" – 72"	BE	0.750"	CS, ASTM A672 GRADE C65 CL32, EFW, STR SM, ASME B36.10		
	30" – 42"	BE	XS	CS, ASTM A672 GRADE C65 CL22, EFW, STR SM, ASME B36.10		
	48" – 48"	BE	0.562"	CS, ASTM A672 GRADE C65 CL22, EFW, STR SM, ASME B36.10		
					26, 1009	
NIPPLES	½" – 1 ½"	PBE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503	
	2" – 2"	PBE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
	½" – 2"	PBE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
	½" – ½"	TOE	XXS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
	¾" – 2"	TOE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
					03	
CONC. SWAGES	⅜" – 2"	TSE	XXS/160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	03	
	½" – 2"	TBE	XXS/160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	½" – 2"	PBE	160/XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	3" – 4"	BLE x PSE	STD x	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	(½" – 2")		(160/XS)			
ECC. SWAGES	½" – 2"	PBE	160/XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	3" – 4"	BLE x PSE	STD x	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	(½" – 2")		(160/XS)			
FITTINGS					02	
	90 ELL ½" – 1 ½"	SW	6000 LB	CS, ASTM A105, ASME B16.11		
	90 ELL 2" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
	45 ELL ½" – 1 ½"	SW	6000 LB	CS, ASTM A105, ASME B16.11		

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		Piping Material Class: 1CB2S		
		Issue Date: 09-Jun-14	Revision 12	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION	NOTES	REV
45 ELL	2" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
TEE	½" - 1 ½"	SW	6000 LB	CS, ASTM A105, ASME B16.11		
TEE	2" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
TEE (RED)	½" - 2"	SW	6000 LB	CS, ASTM A105, ASME B16.11		
45 LATERAL	½" - 1 ½"	SW	6000 LB	CS, ASTM A105, ASME B16.11		
45 LATERAL	2" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
45 LATERAL (RED)	½" - 2"	SW	6000 LB	CS, ASTM A105, ASME B16.11		
PLUG	½" - 2"	THRD		CS, ASTM A105, ASME B16.11, ROUND HEAD	03	
PLUG	½" - ½"	PE		CS, ASTM A105, ASME B16.11, BARSTOCK, ROUND HEAD	53	
COUPLING	½" - 1 ½"	SW	6000 LB	CS, ASTM A105, ASME B16.11		
COUPLING	2" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
COUPLING	½" - ½"	THRD	6000 LB	CS, ASTM A105, ASME B16.11	26	
COUPLING	¾" - 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11	26	
CAP	½" - 1 ½"	SW	6000 LB	CS, ASTM A105, ASME B16.11		
CAP	2" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
UNION	½" - 1 ½"	SW	6000 LB	CS, ASTM A105, GROUND JOINT, MSS-SP-83	26	
UNION	2" - 2"	SW	3000 LB	CS, ASTM A105, GROUND JOINT, MSS-SP-83	26	
CAP	½" - ½"	THRD	6000 LB	CS, ASTM A105, ASME B16.11	03	
CAP	¾" - 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11	03	
SOCKOLET FLAT	½" - 1 ½"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97		
SOCKOLET FLAT	2" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97		
SOCKOLET	½" - 1 ½"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97		
SOCKOLET	2" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97		
45 SW LATROLET	½" - 1 ½"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97		
45 SW LATROLET	2" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97		
SW ELBOLET	1 ½" - 1 ½"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97	26	
THREDOLET	½" - ½"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97	03	
THREDOLET	¾" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97	03	
WELDOLET	3" - 42"	WELD		CS, ASTM A105, MSS-SP-97		
WELDOLET FLAT	3" - 4"	WELD		CS, ASTM A105, MSS-SP-97	26	
90 ELBOLET	8" x 3", 30" x 12"	WELD		CS, ASTM A105, MSS-SP-97	26	
90 ELL	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9		
90 ELL	30" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
90 ELL	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS		
90 ELL	56" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS		
90 ELL SR.	3" - 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9	26	
45 ELL	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9		
45 ELL	30" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
45 ELL	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS		
45 ELL	56" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS		
TEE	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9		
TEE	30" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
TEE	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification for Non-STD Pipe Component	1015	
TEE	56" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, Specification for Non-STD Pipe Component	1015	
TEE (RED.)	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9		
TEE (RED.)	30" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
CAP	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9		
CAP	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification for Non-STD Pipe Component	1015	
CAP	56" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, Specification for Non-STD Pipe Component	1015	
REDUCER (CC)	2 ½" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9		
REDUCER (CC)	30" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
REDUCER (CC)	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification for Non-STD Pipe Component	1015	
REDUCER (CC)	56" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, Specification for Non-STD Pipe Component	1015	
REDUCER (EC)	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9		
REDUCER (EC)	30" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
REDUCER (EC)	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification for Non-STD Pipe Component	1015	
REDUCER (EC)	56" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, Specification for Non-STD Pipe Component	1015	

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			Piping Material Class: 1CB2S		
			Issue Date: 09-Jun-14		Revision 12
			Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION			NOTES	REV
VALVES					TAG NO.	SHORT CODE		
GATE	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	GWCS01	VG		
GATE	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8) , Full Port	GWCS10	VGS	08	
GATE	½" – 2"	THRD/SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	GWCY01	VG2	06, 03	
GATE	½" – 2"	THRD/SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GWCY16	VGB	06, 03, 08	
GATE	½" – 2"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Conventional Port	GACF03	VGf	15	
GATE	2" – 2"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Conventional Port	GBCF03	VGI	06, 15	
GATE	3" – 12"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GACF01	VG		
GATE	3" – 4"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GBCF01	VGI	06, 15	
GATE	14" – 24"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, GO	GACF02	VG		
GATE	30" – 36"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, Series-A, GO	GACF22	VG		
GATE	42" – 48"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, Series-A, GO	GACF26	VG		
GLOBE	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	LWCS01	VL		
GLOBE	½" – 2"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	LACF07	VLF	26	
GLOBE	3" – 8"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	LACF01	VL		
LIFT CHECK	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8), Piston Type	CWCS01	VC	61	
SWING CHECK	3" – 10"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VC	62	
SWING CHECK	12" – 24"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VCF	62	
DUAL PLT CHECK	12" – 24"	RF	CL 150	CS Body W/ 410 SS DISC, HF ST (API #8), DBL FLGD	CACF02	VC	63	
DUAL PLT CHECK	30" – 48"	RF	CL 150	CS Body W/ 410 SS DISC, HF ST (API #8), DBL FLGD, Series-A	CACF03	VC	63	
BUTTERFLY	3" – 8"	RF	CL 150	CS Body W/ Resilient Metal ST, HF ST, LUG STYLE, GO	FACL01	VX	09	
BUTTERFLY	10" – 24"	RF	CL 150	CS Body W/ Resilient Metal ST, HF ST, DBL FLGD, GO	FACF01	VX	09	
BUTTERFLY	30" – 48"	RF	CL 150	CS Body W/ Resilient Metal ST, HF ST, DBL FLGD, Series-A, GO	FACF02	VX	09	
BUTTERFLY	3" – 8"	RF	CL 150	CS Body W/ Resilient Metal ST, HF ST, DBL FLGD, GO	FACF01	VX1	09	
BALL	¾" – 6"	RF	CL 150	CS Body W/ PTFE ST, Nickel Plated Floating Ball, RP, SP, Lever	BACF01	VB	09	
BALL	8" – 8"	RF	CL 150	CS Body W/ PTFE ST, Nickel Plated Floating Ball, RP, SP, GO	BACF02	VB	09	
BALL	10" – 24"	RF	CL 150	CS Body W/ PTFE ST, Nickel Plated Trunnion Ball, RP, LP, GO	BACF03	VB	09	
BALL	¾" – 6"	RF	CL 150	CS Body W/ CR. CARBIDE CTD. ST, FLOATING BALL, RP, SP, LEVER	BACF07	VB1	09, 26, 1016	
BALL	10" – 24"	RF	CL 150	CS Body W/ CR. CARBIDE CTD. ST, TRUNNION BALL, RP, LP, GO	BACF26	VB1	09, 26, 1016	
BALL	¾" – 6"	RF	CL 150	CS Body W/ RPTFE ST, 316SS Floating Ball, FP, LP, Lever	BACF14	VB2	09	
FLANGES								
SOCKETWELD	½" – 2"	RF	CL 150	CS, ASTM A105, ASME B16.5				
WELDNECK	2 ½" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5				
BLIND	½" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5				
WELDNECK	30" – 60"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A				
BLIND	30" – 60"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A				
SLIP-ON-FLG(RED.)	3" x 2"	RF	CL 150	CS, ASTM A105, ASME B16.5			26	
REDUCING	24" x 16"	RF	CL 150	CS, ASTM A105, ASME B16.5			528	
WELDNECK								
SOCKETWELD	½" – 2"	FF	CL 150	CS, ASTM A105, ASME B16.5			11, 26	
WELDNECK	12" – 18"	FF	CL 150	CS, ASTM A105, ASME B16.5			11, 26	
SOCKETWELD	½" – 2"	RF	CL 300	CS, ASTM A105, ASME B16.5			12	
WELDNECK	3" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5			12	
BLIND	½" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5			12	
WELDNECK	30" – 48"	RF	CL 300	CS, ASTM A105, ASME B16.47 SERIES A			12	
SLIP-ON-FLG(RED.)	3" x 2"	RF	CL 300	CS, ASTM A105, ASME B16.5			26	
SOCKETWELD	½" – 2"	RF	CL 600	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 600	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 900	CS, ASTM A105, ASME B16.5				
SOCKETWELD	½" – 2"	RF	CL 1500	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 1500	CS, ASTM A105, ASME B16.5				

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  Refinería de Cartagena S.A.	Piping Material Class Specification		Document No.: 000-SP-PI02-0008		
			Piping Material Class: 1CB2S		
			Issue Date: 09-Jun-14	Revision 12	
			Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION	NOTES	REV
WELDNECK PR WN ORIFICE	½" – 3" 1" – 24"	RF RF	CL 2500 CL 300	CS, ASTM A105. ASME B16.5 CS, ASTM A105 W/ ½" SOCKETWELD TAPS, ASME B16.36		
MISCELLANEOUS						
FIGURE 8 BLANK	½" – 16"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48	26	
FIGURE 8 BLANK	½" – 16"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48		
PADDLE BLANK	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48	26	
PADDLE SPACER	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48		
PADDLE BLANK	½" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48	26	
PADDLE SPACER	½" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48	26	
PADDLE BLANK	½" – 24"	RF	CL 600	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48	26	
PADDLE SPACER	½" – 24"	RF	CL 600	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48	26	
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDC01	553	
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/32" Dia. Hole @ 3/64" Center, TAG# YSDC02	554	
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 150	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSAS01	555	
FLANGE ISOLATION KIT	½" – 24"	RF	CL 150	ISOLATION GASKET, ASME B16.21, ASME B16.5, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.		
FLANGE ISOLATION KIT	30" – 42"	RF	CL 150	ISOLATION GASKET, ASME B16.21, ASME B16.47 SERIES A, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.		
FLANGE ISOLATION KIT	2" – 24"	RF	CL 300	ISOLATION GASKET, ASME B16.21, ASME B16.5, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.		
GASKETS	½" – 24"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING	14, 26	
	30" – 60"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
	½" – 18"		CL 150	GASKET FULL, ASME B16.21, ASME B16.5, 1/16" THCK, GRAPHITE W/TP 316 SS INSERT		
	½" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
	30" – 48"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
	½" – 24"		CL 600	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
	3" – 24"		CL 900	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
	½" – 24"		CL 1500	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
	½" – 3"		CL 2500	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
BOLTING						
STUD	ALL		CL 150	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
STUD	ALL		CL 300	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
STUD	ALL		CL 600	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
STUD	ALL		CL 900	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
STUD	ALL		CL 1500	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
STUD	ALL		CL 2500	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		

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		Piping Material Class: 1CB2S		
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		Prepared SN	Checked KAJ	Approved GAD

90° BRANCH CONNECTION CHART (NOTE 1010)

BRANCH SIZE	72	T																						
	60	P	T																					
	56	P	P	T																				
	52	P	P	P	T																			
	48	P	P	P	P	T																		
	42	P	P	P	P	E	T																	
	36	P	P	P	P	P	E	T																
	30	X	P	P	P	P	P	E	T															
	24	X	P	P	P	P	P	P	E	T														
	20	X	P	P	P	P	P	P	P	E	T													
	18	X	P	P	P	P	P	P	P	P	E	T												
	16	X	P	P	P	P	P	P	P	P	P	E	T											
	14	X	P	P	P	P	P	P	P	P	P	P	E	T										
	12	X	P	P	P	P	P	P	P	P	P	P	P	E	T									
	10	X	P	P	P	P	P	P	P	P	P	P	P	P	E	T								
	8	X	W	W	W	W	W	W	W	W	W	W	W	W	W	E	T							
	6	X	W	W	W	W	W	W	W	W	W	W	W	W	W	W	E	T						
	4	X	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	E	T					
	3	X	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	E	T				
	2	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	T			
	1 ½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	T		
	1	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T	
	¾	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T	
	½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	E	T
		72	60	56	52	48	42	36	30	24	20	18	16	14	12	10	8	6	4	3	2	1 ½	1	¾
HEADER SIZE																								

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		Piping Material Class: 1CB2S		
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		Prepared SN	Checked KAJ	Approved GAD

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet
X = Do Not Used



Approved
GAD

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0008		
		Piping Material Class: 1CB2S		
		Issue Date: 09-Jun-14	Revision 12	
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
08. Full-port valves shall be used if indicated on the P&ID.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
12. These flanges shall be used only to match Class 300 flange connections at control valves and special equipment.
11. Flat-face flanges shall be provided adjacent to flat-face equipment nozzles.
14. Full-face gaskets shall be used at flat-faced flanges.
15. These valves shall be used if mating to flanged nozzles.
26. To be used only if indicated on the P&ID.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
504. Pipe and pipe components thicker than 0.611" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
510. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Latrolet or Lateral depending on engineering requirements, availability and economics.
528. This component for use only in designs that require no clean-outs at changes in direction, as identified by P&ID (Typically downstream of inlet to sulfur pit).
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
554. Use this strainer for Vapor / Gas Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
571. Occasional variations above the design conditions to a temperature Limit of 1000F is acceptable provided the code listed conditions are met.
1009. The pipe used only in UOP Units.
1010. For pipe above 24 NPS in UOP specific Units, use A672 Grade B65 CL22 for Branch weld with Reinforcing pad & Full Encirclement pad.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.
1015. Non-Standard Piping Component shall be in accordance with "Specification For Non-Standard Piping Component", refer to document number: 000-SP-PI02-0232.
1016. These valves are good for 800°F, with short term Temperature = 850°F.
1058. 48" pipe with wall thickness 0.562 and operating pressure of 50 psig, is good for temperature from -20F to 800F.

 	Piping Material Class Specification	Document No.: 000-SP-PI02-0014		
		Piping Material Class: 1CB2S53		
		Issue Date: 28-Feb-13	Revision 5	Prepared SN
			Checked KAJ	Approved GAD

Services	Sour Water, Wet H ₂ S	Basic Material	Killed Carbon Steel (NACE)
Pressure Rating:	CL 150, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0.125"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > ¾")
Flange Facing:	RF	Basic Construction:	1/2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class B Per Tech. Spec – NACE (Note 1000, 1013)	Design Code	ASME B31.3-2006

For NPS ½" Through NPS 48" (Full flange ratings per B16.5)

Temp F	0 to 100	200	300	400	500	600	650	700	750	800
psig	285	260	230	200	170	140	125	110	95	80

For NPS 52" and Larger (Note 501, 504)

Temp F	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc
psig	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	½" – 2" 3" – 24" 30" – 42" 48" – 52" 56" – 60" 64" – 72"	PE BE BE BE BE BE	XS STD XS 0.562" 0.625" 0.750"	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, NACE CS, ASTM A106 GRADE B, SMLS, ASME B36.10, NACE CS, ASTM A672 GRADE C65 CL12, EFW, STR SM, ASME B36.10, NACE CS, ASTM A672 GRADE C65 CL12, EFW, STR SM, ASME B36.10, NACE CS, ASTM A672 GRADE C65 CL32, EFW, STR SM, ASME B36.10, NACE CS, ASTM A672 GRADE C65 CL32, EFW, STR SM, ASME B36.10, NACE		
NIPPLES	½" – 2" ½" – 2" ½" – ½" ¾" – 2"	PBE PBE TOE TOE	XS 160 XXS 160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE	503 03 03	
CONC. SWAGES	½" – 2" ½" – 2" 3" – 4" (½" – 2")	TSE PBE BLE x PSE	XXS/160 XS STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95, NACE CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95, NACE CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95, NACE	03	
FITTINGS	90 ELL ½" – 2" 45 ELL ½" – 2" TEE ½" – 2" TEE (RED) ½" – 2" PLUG ½" – 2" PLUG ½" – ½" COUPLING ½" – 2" CAP ½" – 2" CAP ½" – ½" CAP ¾" – 2" SOCKOLET ½" – 2" THREDOLET ½" – ½" THREDOLET ¾" – 2"	SW SW SW SW THRD PE SW SW THRD THRD WELD WELD WELD	3000 LB 3000 LB 3000 LB 3000 LB 3000 LB 3000 LB 6000 LB 3000 LB 3000 LB 6000 LB 3000 LB	CS, ASTM A105, ASME B16.11, NACE CS, ASTM A105, ASME B16.11, NACE CS, ASTM A105, ASME B16.11, NACE CS, ASTM A105, ASME B16.11, NACE CS, ASTM A105, ASME B16.11, ROUND HEAD, NACE CS, ASTM A105, ASME B16.11, BARSTOCK, ROUND HEAD, NACE CS, ASTM A105, ASME B16.11, NACE CS, ASTM A105, ASME B16.11, NACE CS, ASTM A105, ASME B16.11, NACE CS, ASTM A105, MSS-SP-97, NACE CS, ASTM A105, MSS-SP-97, NACE CS, ASTM A105, MSS-SP-97, NACE	02 03 53 03 03 03 03	

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  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0014		
		Piping Material Class: 1CB2S53		
		Issue Date: 28-Feb-13	Revision 5	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION			NOTES	REV
WELDOLET	3" - 68"	WELD		CS, ASTM A105, MSS-SP-97, NACE				
90 ELL	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
90 ELL	30" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE				
90 ELL	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS, NACE				
90 ELL	56" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS, NACE				
45 ELL	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
45 ELL	30" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE				
45 ELL	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS, NACE				
45 ELL	56" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS, NACE				
TEE	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
TEE	30" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE				
TEE	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS, NACE			1015	
TEE	56" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, Specification for Non-STD Pipe Component, NACE			1015	
TEE (RED.)	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
TEE (RED.)	30" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE				
CAP	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
CAP	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification for Non-STD Pipe Component, NACE			1015	
CAP	56" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, Specification for Non-STD Pipe Component, NACE			1015	
REDUCER (CC)	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
REDUCER (CC)	30" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE				
REDUCER (CC)	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS, NACE			1015	
REDUCER (CC)	56" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, Specification for Non-STD Pipe Component, NACE			1015	
REDUCER (EC)	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
REDUCER (EC)	30" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE				
REDUCER (EC)	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS, NACE			1015	
REDUCER (EC)	56" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, Specification for Non-STD Pipe Component, NACE			1015	
VALVES				TAG NO.	SHORT CODE			
GATE	½" - 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	GWCS06	VG		
GATE	½" - 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, NACE	GWCS12	VGS	08	
GATE	½" - 2"	THRD/SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	GWCS06	VG2	06, 03	
GATE	½" - 2"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), Conventional Port, NACE	GACF13	VGF	15	
GATE	2" - 2"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12), Conventional Port, NACE	GBCF10	VGI	06, 15	
GATE	3" - 12"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, NACE	GACF14	VG		
GATE	3" - 4"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, NACE	GBCF11	VGI	06, 15	
GATE	14" - 24"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, GO, NACE	GACF15	VG		
GLOBE	½" - 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	LWCS06	VL		
GLOBE	3" - 8"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	LACF05	VL		
LIFT CHECK	½" - 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), Piston Type, NACE	CWCS06	VC	61	
SWING CHECK	3" - 10"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	CACF10	VC	62	
SWING CHECK	12" - 24"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	CACF10	VCF	62	
DUAL PLT CHECK	12" - 24"	RF	CL 150	CS Body W/ 316 SS DISC, HF ST (API #12), DBL FLGD, NACE	CACF11	VC	63	
FLANGES								
SOCKETWELD	½" - 2"	RF	CL 150	CS, ASTM A105, ASME B16.5, NACE				
WELDNECK	3" - 24"	RF	CL 150	CS, ASTM A105, ASME B16.5, NACE				
BLIND	½" - 24"	RF	CL 150	CS, ASTM A105, ASME B16.5, NACE				
WELDNECK	30" - 60"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A, NACE				
BLIND	30" - 60"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A, NACE				
SOCKETWELD	½" - 2"	RF	CL 300	CS, ASTM A105, ASME B16.5, NACE			12	
WELDNECK	3" - 24"	RF	CL 300	CS, ASTM A105, ASME B16.5, NACE			12	
BLIND	½" - 24"	RF	CL 300	CS, ASTM A105, ASME B16.5, NACE			12	
SOCKETWELD	½" - 2"	RF	CL 600	CS, ASTM A105, ASME B16.5, NACE				
PR WN ORIFICE	1" - 24"	RF	CL 300	CS, ASTM A105 W/ ½" SOCKETWELD TAPS, ASME B16.36, NACE				5

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	Piping Material Class Specification	Document No.: 000-SP-PI02-0014		
		Piping Material Class: 1CB2S53		
Issue Date: 28-Feb-13		Revision 5		
Prepared SN		Checked KAJ	Approved GAD	

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION	NOTES	REV
MISCELLANEOUS						
FIGURE 8 BLANK	1/2" – 12"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE		
PADDLE BLANK	1/2" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE		
PADDLE SPACER	1/2" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE		
Y-STRAINER	1/2" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDC03, NACE	553	
Y-STRAINER	1/2" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/32" Dia. Hole @ 3/64" Center, TAG# YSDC04, NACE	554	
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 150	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSAS04, NACE	555	
GASKETS	1/2" – 24" 30" – 60" 1/2" – 24" 1/2" – 2"		CL 150 CL 150 CL 300 CL 600	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE		5
BOLTING						
STUD	ALL		CL 150	ALLOY STEEL, ASTM A193 GRADE B7M, ASTM A 194 GRADE 2HM HEAVY HEX NUTS, NACE		
STUD	ALL		CL 300	ALLOY STEEL, ASTM A193 GRADE B7M, ASTM A 194 GRADE 2HM HEAVY HEX NUTS, NACE		
STUD	ALL		CL 600	ALLOY STEEL, ASTM A193 GRADE B7M, ASTM A 194 GRADE 2HM HEAVY HEX NUTS, NACE		5



Approved
GAD

	Piping Material Class Specification	Document No.: 000-SP-PI02-0014		
		Piping Material Class: 1CB2S53		
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 Refineria de Cartagena S.A.				

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
08. Full-port valves shall be used if indicated on the P&ID.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
12. These flanges shall be used only to match Class 300 flange connections at control valves and special equipment.
15. These valves shall be used if mating to flanged nozzles.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
504. Pipe and pipe components thicker than 0.611" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
554. Use this strainer for Vapor / Gas Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
1000. The requirements of NACE MR0103 shall be met where NACE is specified in the material description. All components shall be hardness tested.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.
1015. Non-Standard Piping Component shall be in accordance with "Specification For Non-Standard Piping Component", refer to document number: 000-SP-PI02-0232.

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0013		
		Piping Material Class: 1CB2S54		
		Issue Date: 28-Feb-13	Revision 11	Prepared SN
			Checked KAJ	Approved GAD

Services	Sour Water, Wet H ₂ S, & Rich Amine	Basic Material	Killed Carbon Steel (PWHT, NACE)
Pressure Rating:	CL 150, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0.125"
Material Group:	1.1	Stress Relief	ALL WELDS PER ASME B31.3
Flange Facing:	RF	Basic Construction:	1/2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class B Per Tech. Spec – NACE (Note 1000, 1013)	Design Code	ASME B31.3-2006

For NPS 1/2" Through NPS 72" (Full flange ratings per B16.5)

Temp F	-20 to 100	200	300	400
psig	285	260	230	200

For NPS 76" and Larger (Note 501, 548)

Temp F	CALC	CALC	CALC	CALC
psig	CALC	CALC	CALC	CALC

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	1/2" – 2"	PE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, NACE	541	
	3" – 24"	BE	STD	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, NACE	541	
	30" – 36"	BE	XS	CS, ASTM A672 GRADE C65 CL22, EFW, STR SM, ASME B36.10, NACE	541	
	42" – 42"	BE	XS	CS, ASTM A672 GRADE C65 CL22, EFW, STR SM, ASME B36.10, NACE		
	48" – 60"	BE	0.625"	CS, ASTM A672 GRADE C65 CL42, EFW, STR SM, ASME B36.10, NACE	541	
	64" – 72"	BE	0.750"	CS, ASTM A672 GRADE C65 CL42, EFW, STR SM, ASME B36.10, NACE		
NIPPLES	1/2" – 2"	PBE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE		
	1/2" – 2"	PBE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE	503	
	1/2" – 1/2"	TOE	XXS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE	03	
	3/4" – 2"	TOE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE	03	
CONC. SWAGES	3/8" – 2"	TSE	XXS/160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95, NACE		
	1/2" – 2"	PBE	XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95, NACE	03	11
	3" – 4"	BLE x PSE	STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95, NACE		
	(1/2" – 2")					
ECC. SWAGES	1/2" – 2"	PBE	XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95, NACE		
	3" – 4"	BLE x PSE	STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95, NACE		
FITTINGS	90 ELL	1/2" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11, NACE	02
	45 ELL	1/2" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11, NACE	
	TEE	1/2" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11, NACE	
	TEE (RED)	1/2" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11, NACE	
	45 LATERAL	1/2" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11, NACE	
	45 LATERAL (RED)	1/2" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11, NACE	
	PLUG	1/2" – 2"	THRD		CS, ASTM A105, ASME B16.11, ROUND HEAD, NACE	03
	PLUG	1/2" – 1/2"	PE		CS, ASTM A105, ASME B16.11, BARSTOCK, ROUND HEAD, NACE	53

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  Refineria de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0013		
		Piping Material Class: 1CB2S54		
		Issue Date: 28-Feb-13	Revision 11	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION	NOTES	REV
COUPLING	1/2" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11, NACE		
COUPLING	3/4" - 2"	THRD/SW	3000 LB	CS, ASTM A105, ASME B16.11, NACE	03	11
CAP	1/2" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11, NACE		
UNION	1/2" - 2"	SW	3000 LB	CS, ASTM A105, GROUND JOINT, MSS-SP-83, NACE	26	
CAP	1/2" - 1/2"	THRD	6000 LB	CS, ASTM A105, ASME B16.11, NACE	03	
CAP	3/4" - 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11, NACE	03	
SOCKOLET	1/2" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97, NACE		
SOCKOLET FLAT	1/2" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97, NACE		
SW ELBOLET	1 1/2" - 1 1/2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97, NACE		11
45 SW LATROLET	1/2" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97, NACE		
THREDOLET	1/2" - 1/2"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97, NACE	03	
THREDOLET	3/4" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97, NACE	03	
WELDOLET	3" - 68"	WELD		CS, ASTM A105, MSS-SP-97, NACE		
WELDOLET FLAT	3" - 3"	WELD		CS, ASTM A105, MSS-SP-97, NACE	26	
90 ELL	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE		
90 ELL SR	20" - 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE	26	11
90 ELL	30" - 42"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE, PWHT		
90 ELL	48" - 48"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9, NACE		
90 ELL	52" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS, NACE		
45 ELL	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE		
45 ELL	30" - 42"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE, PWHT		
45 ELL	48" - 48"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9, NACE		
45 ELL	52" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS, NACE		
TEE	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE		
TEE	30" - 42"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE, PWHT		
TEE	48" - 48"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9, NACE		
TEE	52" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, Specification for Non-STD Pipe Component, NACE	1015	
TEE (RED.)	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE		
TEE (RED.)	30" - 42"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE, PWHT		
TEE (RED.)	48" - 48"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9, NACE		
CAP	3" - 42"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE		11
CAP	48" - 48"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9, NACE		11
CAP	52" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, Specification for Non-STD Pipe Component, NACE	1015	
REDUCER (CC)	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE		
REDUCER (CC)	30" - 42"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE, PWHT		
REDUCER (CC)	48" - 48"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9, NACE		
REDUCER (CC)	52" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, Specification for Non-STD Pipe Component, NACE	1015	
REDUCER (EC)	3" - 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE		
REDUCER (EC)	30" - 42"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE, PWHT		
REDUCER (EC)	48" - 48"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9, NACE		
REDUCER (EC)	52" - 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, Specification for Non-STD Pipe Component, NACE	1015	
VALVES						
GATE	1/2" - 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	TAG NO. GWCS06	SHORT CODE VG
GATE	1/2" - 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, NACE	GWCS12	VGS
GATE	1/2" - 2"	SW	CL 800	CS Body W/ Alloy 400 TRIM (API #9), NACE	GWCS13	VG3
GATE	1/2" - 2"	THRD/SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	GWCS13	VG3
GATE	1/2" - 2"	THRD/SW	CL 800	CS Body W/ Alloy 400 TRIM (API #9), NACE	GWCY06	VG2
					GWCY10	VG4
GATE	1/2" - 2"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), Conventional Port, NACE	GACF13	VG4
GATE	1/2" - 2"	RF	CL 150	CS Body W/ Alloy 400 TRIM (API #9), Conventional Port, NACE	GACF13	VG4
GATE	2" - 2"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12), Conventional Port, NACE	GACF24	VG1
					GBCF10	VGI
GATE	2" - 2"	RF	CL 300	CS Body W/ Alloy 400 TRIM (API #9), Conventional Port, NACE	GBCF31	VG5
GATE	3" - 12"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, NACE	GBCF31	VG5
GATE	3" - 12"	RF	CL 150	CS Body W/ Alloy 400 TRIM (API #9), Full Port, NACE	GACF14	VG
GATE	3" - 4"	RF	CL 300	CS Body W/ Alloy 400 TRIM (API #9), Full Port, NACE	GACF25	VG1
					GBCF11	VGI

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  Refineria de Cartagena S.A.	Piping Material Class Specification			Document No.: 000-SP-PI02-0013		
				Piping Material Class: 1CB2S54		
				Issue Date: 28-Feb-13	Revision 11	
				Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION			NOTES	REV
GATE	14" – 24"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, GO, NACE	GACF15	VG		
GATE	30" – 36"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, SERIES A, GO, NACE	GACF23	VG		
GATE	42" – 48"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, SERIES A, GO, NACE	GACF27	VG		
GLOBE	½" – 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	LWCS06	VL		
GLOBE	3" – 8"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	LACF05	VL		
LIFT CHECK	½" – 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), Piston Type, NACE	CWCS06	VC	61	
SWING CHECK	3" – 10"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	CACF10	VC	62	
SWING CHECK	3" – 10"	RF	CL 150	CS Body W/ Alloy 400 TRIM (API #9), NACE	CACF18	VC1	09, 26, 62	
SWING CHECK	12" – 24"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	CACF10	VCF	62	
DUAL PLT CHECK	12" – 24"	RF	CL 150	CS Body W/ 316 SS DISC, HF ST (API #12), DBL FLGD, NACE	CACF11	VC	63	
DUAL PLT CHECK	30" – 48"	RF	CL 150	CS Body W/ 316 SS DISC, HF ST (API #12), DBL FLGD, SERIES A, NACE	CACF17	VC	63	
BUTTERFLY	3" – 8"	RF	CL 150	CS Body W/ SS Resilient Metal ST, HF ST, LUG STYPLE-DRILLED, GO, NACE	FACL02	VX	09	
BUTTERFLY	10" – 24"	RF	CL 150	CS Body W/ SS Resilient Metal ST, HF ST, DBL FLGD, GO, NACE	FACF04	VX	09	
BALL	¾" – 6"	RF	CL 150	CS Body W/ RPTFE ST, 316 SS Floating Ball, RP, SP, LEVER, NACE	BACF18	VB1	09	
BALL	8" – 8"	RF	CL 150	CS Body W/ RPTFE ST, 316 SS Floating Ball, RP, SP, GO, NACE	BACF19	VB1	09	
BALL	10" – 24"	RF	CL 150	CS Body W/ RPTFE ST, 316 SS Trunnion Ball, RP, LP, GO, NACE	BACF20	VB1	09	
BALL	¾" – 6"	RF	CL 150	CS Body W/ RPTFE ST, 316 SS Floating Ball, FP, LP, LEVER, NACE	BACF21	VB2	09	
BALL	8" – 8"	RF	CL 150	CS Body W/ RPTFE ST, 316 SS Floating Ball, FP, LP, GO, NACE	BACF27	VB2	09	
BALL	½" – 2"	THRD/SW	2000 WOG	CS Body W/ RPTFE ST, 316 SS Floating Ball, FP, LEVER, NACE	BUCYAB	VB3	09, 26	11
BALL	2" – 2"	RF	CL 300	CS Body W/ RPTFE ST, 316 SS Floating Ball, FP, LP, LEVER, NACE	BBCF17	VBI	09	
FLANGES							528	11
SOCKETWELD	½" – 2"	RF	CL 150	CS, ASTM A105, ASME B16.5, NACE				
WELDNECK	2 ½" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5, NACE				
REDUCING	14" x 8"	RF	CL 150	CS, ASTM A105, ASME B16.5, NACE				
WELDNECK								
BLIND	½" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5, NACE				
WELDNECK	30" – 60"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A, NACE				
BLIND	30" – 60"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A, NACE				
WELDNECK	30" – 60"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES B, NACE				
SLIP-ON-FLG(RED.)	3" x 2"	RF	CL 150	CS, ASTM A105, ASME B16.5, NACE				
SOCKETWELD	½" – 2"	RF	CL 300	CS, ASTM A105, ASME B16.5, NACE				
WELDNECK	3" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5, NACE				
BLIND	½" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5, NACE				
WELDNECK	30" – 48"	RF	CL 300	CS, ASTM A105, ASME B16.47 SERIES A, NACE				
SLIP-ON-FLG(RED.)	3" x 2"	RF	CL 300	CS, ASTM A105, ASME B16.5, NACE				
SOCKETWELD	½" – 2"	RF	CL 600	CS, ASTM A105, ASME B16.5, NACE			26	11
WELDNECK	3" – 24"	RF	CL 600	CS, ASTM A105, ASME B16.5, NACE			12	11
WELDNECK	3" – 24"	RF	CL 900	CS, ASTM A105, ASME B16.5, NACE			12	11
SOCKETWELD	½" – 2"	RF	CL 1500	CS, ASTM A105, ASME B16.5, NACE			12	11
WELDNECK	3" – 24"	RF	CL 1500	CS, ASTM A105, ASME B16.5, NACE			26	11
PR WN ORIFICE	1" – 24"	RF	CL 300	CS, ASTM A105 W/ ½" SOCKETWELD TAPS, ASME B16.36, NACE				
MISCELLANEOUS								
FIGURE 8 BLANK	½" – 12"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE				
PADDLE BLANK	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE				
PADDLE SPACER	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE				

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  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0013		
		Piping Material Class: 1CB2S54		
		Issue Date: 28-Feb-13	Revision 11	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION	NOTES	REV
FIGURE 8 BLANK	1/2" – 12"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE	12	
PADDLE BLANK	1/2" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE	12	
PADDLE SPACER	1/2" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE	12	
Y-STRAINER	1/2" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDC03, NACE	553	
Y-STRAINER	1/2" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/32" Dia. Hole @ 3/64" Center, TAG# YSDC04, NACE	554	
CONE STRAINER – TRUNCATED TYPE	2" – 24"	RF	CL 150	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSAS04, NACE	555	
FLANGE ISOLATION KIT	1/2" – 24"	RF	CL 150	ISOLATION GASKET, ASME B16.21, ASME B16.5, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.		
GASKETS	1/2" – 24"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE	26	
	30" – 60"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE		
	30" – 60"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES B, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE		
	1/2" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE		
	30" – 48"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE		
	1/2" – 24"		CL 600	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE		11
	3" – 24"		CL 900	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE		
	1/2" – 24"		CL 1500	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE		11
BOLTING	STUD	ALL	CL 150	ALLOY STEEL, ASTM A193 GRADE B7M, ASTM A 194 GRADE 2HM HEAVY HEX NUTS, NACE		
	STUD	ALL	CL 300	ALLOY STEEL, ASTM A193 GRADE B7M, ASTM A 194 GRADE 2HM HEAVY HEX NUTS, NACE		
	STUD	ALL	CL 600	ALLOY STEEL, ASTM A193 GRADE B7M, ASTM A 194 GRADE 2HM HEAVY HEX NUTS, NACE		
	STUD	ALL	CL 900	ALLOY STEEL, ASTM A193 GRADE B7M, ASTM A 194 GRADE 2HM HEAVY HEX NUTS, NACE		
	STUD	ALL	CL 1500	ALLOY STEEL, ASTM A193 GRADE B7M, ASTM A 194 GRADE 2HM HEAVY HEX NUTS, NACE		



Approved
GAD

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0013		
		Piping Material Class: 1CB2S54		
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		Prepared SN	Checked KAJ	Approved GAD

45° BRANCH CONNECTION CHART

BRANCH SIZE	48	F																		
	42	P	F																	
	36	P	P	F																
	30	P	P	P	F															
	24	P	P	P	P	F														
	20	P	P	P	P	P	F													
	18	P	P	P	P	P	P	F												
	16	P	P	P	P	P	P	P	F											
	14	P	P	P	P	P	P	P	P	F										
	12	P	P	P	P	P	P	P	P	P	F									
	10	P	P	P	P	P	P	P	P	P	P	F								
	8	P	P	P	P	P	P	P	P	P	P	P	F							
	6	P	P	P	P	P	P	P	P	P	P	P	P	F						
	4	P	P	P	P	P	P	P	P	P	P	P	P	P	F					
	3	P	P	P	P	P	P	P	P	P	P	P	P	P	P	F				
	2	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H			
	1½	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	G	H		
	1	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	G	G	H	
	¾	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	G	G	H	
	½	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	G	G	G	H
	48	42	36	30	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
HEADER SIZE																				

LEGEND:

F = Full Encirclement Reinforcement Pad (BW for 3" and larger)
P = 45° Branch Weld with Reinforcing Pad (Note 510)
L = 45° SW Latrolet (SW for 2" and smaller)

H = 45° Lateral (SW for 2" and smaller)
G = 45° Reducing Lateral (SW for 2" and smaller)

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NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
08. Full-port valves shall be used if indicated on the P&ID.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
12. These flanges shall be used only to match Class 300 flange connections at control valves and special equipment.
15. These valves shall be used if mating to flanged nozzles.
26. To be used only if indicated on the P&ID.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
504. Pipe and pipe components thicker than 0.611" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
528. This component for use only in designs that require no clean-outs at changes in direction, as identified by P&ID (Typically downstream of inlet to sulfur pit).
541. These pipe size / pipe schedule are good for full vacuum condition.
548. Pipe and pipe components thicker than 0.500" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
554. Use this strainer for Vapor / Gas Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
1000. The requirements of NACE MR0103 shall be met where NACE is specified in the material description. All components shall be hardness tested.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.
1015. Non-Standard Piping Component shall be in accordance with "Specification For Non-Standard Piping Component", refer to document number: 000-SP-PI02-0232.

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0016		
		Piping Material Class: 1CB2S55		
		Issue Date: 28-Feb-13	Revision 10	Prepared SN
			Checked KAJ	Approved GAD

Services	Sour Water, Wet H ₂ S	Basic Material	Killed Carbon Steel (NACE, PWHT)
Pressure Rating:	CL 150, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0.125"
Material Group:	1.1	Stress Relief	ALL WELDS PER ASME B31.3
Flange Facing:	RF	Basic Construction:	1/2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class B Per Tech. Spec – NACE (Note 1000, 1013)	Design Code	ASME B31.3-2006

For NPS 1/2" Through NPS 72" (Full flange ratings per B16.5), (Note 571)

Temp F	0 to 100	200	300	400	500	600	650	700	750	800
psig	285	260	230	200	170	140	125	110	95	80

For NPS 76" and Larger (Note 501, 504 and 571)

Temp F	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc
psig	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	1/2" – 2" 3" – 24" 30" – 42" 48" – 52" 56" – 60" 64" – 72"	PE BE BE BE BE BE	XS STD XS 0.562" 0.625" 0.750"	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, NACE CS, ASTM A106 GRADE B, SMLS, ASME B36.10, NACE CS, ASTM A672 GRADE C65 CL22, EFW, STR SM, ASME B36.10, NACE CS, ASTM A672 GRADE C65 CL22, EFW, STR SM, ASME B36.10, NACE CS, ASTM A672 GRADE C65 CL42, EFW, STR SM, ASME B36.10, NACE CS, ASTM A672 GRADE C65 CL42, EFW, STR SM, ASME B36.10, NACE		
NIPPLES	1/2" – 2" 1/2" – 2" 1/2" – 1/2" 3/4" – 2"	PBE PBE TOE TOE	XS 160 XXS 160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE	503 03 03	
CONC. SWAGES	1/2" – 2" 1/2" – 2" 3" – 4" (1/2" – 2")	TSE PBE BLE x PSE	XXS/160 XS STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95, NACE CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95, NACE CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95, NACE	03	
ECC. SWAGES	3" – 4" (1/2" – 2")	BLE x PSE	STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95, NACE		
FITTINGS	90 ELL 1/2" – 2" 45 ELL 1/2" – 2" TEE 1/2" – 2" TEE (RED) 1/2" – 2" PLUG 1/2" – 2" PLUG 1/2" – 1/2" COUPLING 1/2" – 2" CAP 1/2" – 2" CAP 1/2" – 1/2"	SW SW SW SW THRD PE SW SW THRD	3000 LB 3000 LB 3000 LB 3000 LB 3000 LB 3000 LB 6000 LB	CS, ASTM A105, ASME B16.11, NACE CS, ASTM A105, ASME B16.11, NACE CS, ASTM A105, ASME B16.11, NACE CS, ASTM A105, ASME B16.11, NACE CS, ASTM A105, ASME B16.11, ROUND HEAD, NACE CS, ASTM A105, ASME B16.11, BARSTOCK, ROUND HEAD, NACE CS, ASTM A105, ASME B16.11, NACE CS, ASTM A105, ASME B16.11, NACE CS, ASTM A105, ASME B16.11, NACE	02 03 53 03	

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			Piping Material Class: 1CB2S55		
			Issue Date: 28-Feb-13		Revision 10
			Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION			NOTES	REV
CAP	¾" – 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11, NACE			03	
SOCKOLET	½" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97, NACE				
SOCKOLET FLAT	½" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97, NACE				
THREDOLET	½" – ½"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97, NACE			03	
THREDOLET	¾" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97, NACE			03	
WELDOLET	3" – 68"	WELD		CS, ASTM A105, MSS-SP-97, NACE				
WELDOLET FLAT	3" – 3"	WELD		CS, ASTM A105, MSS-SP-97, NACE			26	
90 ELL	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
90 ELL	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE, PWHT				
90 ELL	52" – 52"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS, NACE, PWHT				
90 ELL	56" – 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS, NACE				
45 ELL	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
45 ELL	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE, PWHT				
45 ELL	52" – 52"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS, NACE, PWHT				
45 ELL	56" – 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS, NACE				
TEE	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
TEE	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE, PWHT				
TEE	52" – 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification for Non-STD Pipe Component, NACE, PWHT			1015	
TEE	56" – 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, Specification for Non-STD Pipe Component, NACE			1015	
TEE (RED.)	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
TEE (RED.)	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE, PWHT				
CAP	3" – 48"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
CAP	52" – 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification for Non-STD Pipe Component, NACE, PWHT			1015	
CAP	56" – 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, Specification for Non-STD Pipe Component, NACE			1015	
REDUCER (CC)	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
REDUCER (CC)	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE, PWHT				
REDUCER (CC)	52" – 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification for Non-STD Pipe Component, NACE, PWHT			1015	
REDUCER (CC)	56" – 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, Specification for Non-STD Pipe Component, NACE			1015	
REDUCER (EC)	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
REDUCER (EC)	30" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9, NACE, PWHT				
REDUCER (EC)	52" – 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification for Non-STD Pipe Component, NACE, PWHT			1015	
REDUCER (EC)	56" – 72"	WELD		LTCS, ASTM A420 GRADE WPL6-W, Specification for Non-STD Pipe Component, NACE			1015	
VALVES					TAG NO.	SHORT CODE		
GATE	½" – 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	GWCS06	VG		
GATE	½" – 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, NACE	GWCS12	VGS	08	
GATE	½" – 2"	THRD/SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	GWCY06	VG2	06, 03	
GATE	½" – 2"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), Conventional Port, NACE	GACF13	VGf	15	
GATE	2" – 2"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12), Conventional Port, NACE	GBCF10	VGI	06, 15	
GATE	3" – 12"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, NACE	GACF14	VG		
GATE	3" – 4"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, NACE	GBCF11	VGI	06, 15	
GATE	14" – 24"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, GO, NACE	GACF15	VG		
GATE	30" – 36"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, SERIES A, GO, NACE	GACF23	VG		
GATE	42" – 48"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, SERIES A, GO, NACE	GACF27	VG		
GLOBE	½" – 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	LWCS06	VL		
GLOBE	3" – 8"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	LACF05	VL		
LIFT CHECK	½" – 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), Piston Type, NACE	CWCS06	VC	61	
SWING CHECK	3" – 10"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	CACF10	VC	62	
SWING CHECK	12" – 24"	RF	CL 150	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	CACF10	VCF	62	
DUAL PLT CHECK	12" – 24"	RF	CL 150	CS Body W/ 316 SS DISC, HF ST (API #12), DBL FLGD, NACE	CACF11	VC	63	
DUAL PLT CHECK	30" – 48"	RF	CL 150	CS Body W/ 316 SS DISC, HF ST (API #12), DBL FLGD, SERIES A, NACE	CACF17	VC	63	
DUAL PLT CHECK	3" – 10"	RF	CL 150	CS Body W/ 316 SS DISC, HF ST (API #12), LUG STYLE BOLT THROUGH., NACE	CACL01	VCF	26, 63	

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  Refinería de Cartagena S.A.	Piping Material Class Specification		Document No.: 000-SP-PI02-0016		
			Piping Material Class: 1CB2S55		
			Issue Date: 28-Feb-13		Revision 10
			Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION			NOTES	REV
BUTTERFLY	6" – 24"	RF	CL 150	CS Body W/ SS Resilient Metal ST, HF ST, DBL FLGD, GO, NACE	FACF04	VX	09	10
BALL	¾" – 6"	RF	CL 150	CS Body W/ CR. CARBIDE CTD. ST, FLOATING BALL, RP, SP, LEVER, NACE	BACF11	VB1	09, 26, 1016	
BALL	8" – 8"	RF	CL 150	CS Body W/ CR. CARBIDE CTD. ST, FLOATING BALL, RP, SP, GO, NACE	BACF12	VB1	09, 26, 1016	
BALL	10" – 24"	RF	CL 150	CS Body W/ CR. CARBIDE CTD. ST, TRUNNION BALL, RP, LP, GO, NACE	BACF13	VB1	09, 26, 1016	
FLANGES								
SOCKETWELD	½" – 2"	RF	CL 150	CS, ASTM A105, ASME B16.5, NACE				
WELDNECK	3" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5, NACE				
BLIND	½" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5, NACE				
WELDNECK	30" – 60"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A, NACE				
BLIND	30" – 60"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A, NACE				
SOCKETWELD	½" – 2"	RF	CL 300	CS, ASTM A105, ASME B16.5, NACE			12	
WELDNECK	3" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5, NACE			12	
WELDNECK	30" – 48"	RF	CL 300	CS, ASTM A105, ASME B16.47 SERIES A, NACE			12	10
BLIND	½" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5, NACE			12	
PR WN ORIFICE	1" – 24"	RF	CL 300	CS, ASTM A105 W/ ½" SOCKETWELD TAPS, ASME B16.36, NACE				
MISCELLANEOUS								
FIGURE 8 BLANK	½" – 12"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE				
PADDLE BLANK	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE				
PADDLE SPACER	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE				
PADDLE BLANK	2" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE			12	10
PADDLE SPACER	2" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE			12	10
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDC03, NACE			553	
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/32" Dia. Hole @ 3/64" Center, TAG# YSDC04, NACE			554	
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 150	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSAS04, NACE			555	
GASKETS								
	½" – 24"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE				
	30" – 60"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE				
	½" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE				
	30" – 48"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE				10
BOLTING								
STUD	ALL		CL 150	ALLOY STEEL, ASTM A193 GRADE B7M, ASTM A 194 GRADE 2HM HEAVY HEX NUTS, NACE				
STUD	ALL		CL 300	ALLOY STEEL, ASTM A193 GRADE B7M, ASTM A 194 GRADE 2HM HEAVY HEX NUTS, NACE				



Approved
GAD

 	Piping Material Class Specification	Document No.: 000-SP-PI02-0016		
		Piping Material Class: 1CB2S55		
		Issue Date: 28-Feb-13	Revision 10	
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
08. Full-port valves shall be used if indicated on the P&ID.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
12. These flanges shall be used only to match Class 300 flange connections at control valves and special equipment.
15. These valves shall be used if mating to flanged nozzles.
26. To be used only if indicated on the P&ID.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
504. Pipe and pipe components thicker than 0.611" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
554. Use this strainer for Vapor / Gas Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
571. Occasional variations above the design conditions to a temperature Limit of 1000F is acceptable provided the code listed conditions are met.
1000. The requirements of NACE MR0103 shall be met where NACE is specified in the material description. All components shall be hardness tested.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.
1015. Non-Standard Piping Component shall be in accordance with "Specification For Non-Standard Piping Component", refer to document number: 000-SP-PI02-0232.
1016. These valves are good for 800°F, with short term Temperature = 850°F.

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0158		
		Piping Material Class: 1CG0T		
		Issue Date: 08-May-12	Revision 6	Prepared SN
			Checked KAJ	Approved GAD

Services	Instrument Air, Breathing Air	Basic Material	Galvanized Carbon Steel
Pressure Rating:	CL 150, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > ¾")
Flange Facing:	RF	Basic Construction:	1/2" - 2": THRD, 3" & UP: BW/FLGD
Examination:	Class A Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS ½" Through NPS 24" (Full flange ratings per B16.5)

Temp F	0 to 100	200
psig	150	150

For NPS 30" and Larger (Note 501, 504)

Temp F	Calc	Calc
psig	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	½" – 2" 3" – 24" ½" – 2"	TE BE TE	XS STD XS	GALV, T&C, ASTM A53 GRADE B, SMLS, ASME B36.10 CS, ASTM A53 GRADE B, ERW, EJ = 85%, ASME B36.10 GALV, T&C, ASTM A106 GRADE B, SMLS, ASME B36.10	60 1055	6
NIPPLES	½" – 2" ½" – 2"	TBE TBE	XS 160	GALV, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG GALV, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503	
CONC. SWAGES	½" x 3/8" ½" – 2" 3" – 4" (½" – 2")	TBE TBE BLE x TSE	XS XS STD x XS	GALV, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 GALV, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	26	
ECC. SWAGES	3" – 4" (½" – 2")	BLE x TSE	STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
FITTINGS					02	
90 ELL	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
45 ELL	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
TEE	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
TEE (RED)	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
PLUG	½" – 2"	THRD		GALV, ASTM A105, ASME B16.11, ROUND HEAD		
COUPLING	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
COUPLING (RED.)	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
CAP	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
UNION	½" – 2"	THRD	3000 LB	GALV, ASTM A105, GROUND JOINT, MSS-SP-83		
THREDOLET	½" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97		
WELDOLET	3" – 20"	WELD		CS, ASTM A105, MSS-SP-97		
90 ELL	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
45 ELL	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
TEE	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
TEE (RED.)	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		

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  Refinería de Cartagena S.A.	Piping Material Class Specification		Document No.: 000-SP-PI02-0158		
			Piping Material Class: 1CG0T		
			Issue Date: 08-May-12		Revision 6
			Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION			NOTES	REV
CAP REDUCER (CC) REDUCER (EC)	3" – 24" 3" – 24" 3" – 24"	WELD WELD WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9 CS, ASTM A234 GRADE WPB-W, ASME B16.9 CS, ASTM A234 GRADE WPB-W, ASME B16.9				
VALVES					TAG NO.	SHORT CODE		
GATE	½" – 2"	THRD	CL 200	Bronze Body W/ Bronze Trim	GUBT01	VG	646	6
GATE	½" – 2"	THRD	CL 800	316L SS Body W/ 316 SS TRIM, HF ST (API #12)	GWST01	VG1	1011, 26	
GATE	3" – 12"	RF	CL 150	CS, Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GACF01	VG		
GATE	14" – 24"	RF	CL 150	CS, Body W/ 13 CR TRIM, HF ST (API #8), Full Port, GO	GACF02	VG		
GLOBE	½" – 2"	THRD	CL 200	Bronze Body W/ Bronze TRIM	LUBT01	VL		
GLOBE	½" – 2"	THRD	CL 800	316L SS Body W/ 316 SS TRIM, HF ST (API #12)	LWST01	VL1	1011, 26	
GLOBE	3" – 8"	RF	CL 150	CS, Body W/ 13 CR TRIM, HF ST (API #8)	LACF01	VL		
SWING CHECK	½" – 2"	THRD	CL 200	Bronze Body W/ Bronze TRIM, Swing Type	CUBT01	VC	62	
LIFT CHECK	½" – 2"	THRD	CL 800	316L SS Body W/ 316 SS TRIM, HF ST (API #12), Piston Type	CWST01	VC1	26, 61, 1011	
SWING CHECK	3" – 10"	RF	CL 150	CS, Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VC	62	
SWING CHECK	12" – 24"	RF	CL 150	CS, Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VCF	62	
DUAL PLT CHECK	12" – 24"	RF	CL 150	CS, Body W/ 13 CR TRIM, HF ST (API #8), DBL FLGD	CACF02	VC	63	
BALL	½" – 2"	THRD	400 WOG	Bronze Body W/ Bronze TRIM, RP	BUBT01	VB	09	
FLANGES								
THREADED	½" – 2"	RF	CL 150	GALV, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5				
BLIND	½" – 24"	RF	CL 150	GALV, ASTM A105, ASME B16.5				
THREADED	½" – 2"	FF	CL 150	GALV, ASTM A105, ASME B16.5			11	6
THREADED	½" – 2"	RF	CL 300	GALV, ASTM A105, ASME B16.5			12	
WELDNECK	3" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5			12	
BLIND	½" – 24"	RF	CL 300	GALV, ASTM A105, ASME B16.5			12	
PR WN ORIFICE	3" – 24"	RF	CL 300	CS, ASTM A105 W/ ½" THREADED TAPS, ASME B16.36				
MISCELLANEOUS								
FIGURE 8 BLANK	½" – 12"	RF	CL 150	CS, ASTM A516 GRADE 70, GALVANIZED, ASME B16.48				
PADDLE BLANK	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, GALVANIZED, ASME B16.48				
PADDLE SPACER	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, GALVANIZED, ASME B16.48				
PADDLE BLANK	½" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, GALVANIZED, ASME B16.48				
PADDLE SPACER	½" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, GALVANIZED, ASME B16.48				
Y-STRAINER	½" – 2"	THRD	300 psig CWP	Bronze, ASTM B61 Body, TP 304SS Screen W / 1/32" Dia. Hole @ 3/64" Center, TAG# YSUB02			554	
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 150	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSAS01			555	
GASKETS								
	½" – 24"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING				
	½" – 2"		CL 150	GASKET FULL FACE, ASME B16.21, ASME B16.5, 1/16" THCK, GRAPHITE W/ 316 SS INSERT			14	6
	½" – 2"		CL 150	GASKET FULL FACE, ASME B16.21, ASME B16.5, 1/16" THCK, TEFLON (PTFE)			14, 1056	6
	½" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING				
BOLTING								
STUD	ALL		CL 150	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS				
STUD	ALL		CL 300	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS				

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0158		
		Piping Material Class: 1CG0T		
		Issue Date: 08-May-12		Revision 6
		Prepared SN	Checked KAJ	Approved GAD

90° BRANCH CONNECTION CHART

BRANCH SIZE	24	T															
	20	E	T														
	18	P	E	T													
	16	P	P	E	T												
	14	P	P	P	E	T											
	12	P	P	P	P	E	T										
	10	P	P	P	P	P	E	T									
	8	W	W	W	W	W	W	E	T								
	6	W	W	W	W	W	W	W	E	T							
	4	W	W	W	W	W	W	W	W	E	T						
	3	W	W	W	W	W	W	W	W	W	E	T					
	2	D	D	D	D	D	D	D	D	D	D	T					
	1½	D	D	D	D	D	D	D	D	D	D	E	T				
	1	D	D	D	D	D	D	D	D	D	D	E	E	T			
	¾	D	D	D	D	D	D	D	D	D	D	E	E	E	T		
	½	D	D	D	D	D	D	D	D	D	D	E	E	E	E	T	
		24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
HEADER SIZE																	

LEGEND:

E = Reducing Tee (BW for 3" and larger, THRD for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
D = Thredolet

T = Straight Tee (BW for 3" and larger, THRD for 2" and smaller)
W = Weldolet

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0158		
		Piping Material Class: 1CG0T		
		Issue Date: 08-May-12	Revision 6	
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
06. These valves shall be used only for vent, drain, and instrument connections.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
11. Flat-face flanges shall be provided adjacent to flat-face equipment nozzles.
12. These flanges shall be used only to match Class 300 flange connections at control valves and special equipment.
14. Full-face gaskets shall be used at flat-faced flanges.
15. These valves shall be used if mating to flanged nozzles.
26. To be used only if indicated on the P&ID.
60. Pipe spools shall be flanged, shop fabrication shall be maximized and all spools shall be hot-dip galvanized after fabrication.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
504. Pipe and pipe components thicker than 0.611" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
554. Use this strainer for Vapor / Gas Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
646. These valves shall be used for vent, drain, and instrument connections.
1011. These valves shall be used only for Units where Bronze material is not allowed (Eg. Sulfur Block).
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.
1055. These pipe shall be used for Breathing Air Service.
1056. These gaskets shall be used for Breathing Air Service.

  Refineria de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0159		
		Piping Material Class: 1CG0T01		
		Issue Date: 28-Feb-13		Revision 6
		Prepared SN	Checked KAJ	Approved GAD

Services	Potable Water A/G	Basic Material	Galvanized Carbon Steel
Pressure Rating:	CL 150, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > ¾")
Flange Facing:	RF	Basic Construction:	1/2" - 2": THRD, 3" & UP: BW/FLGD
Examination:	Class A Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS ½" Through NPS 24" (Full flange ratings per B16.5)

Temp F	0 to 100	200
psig	150	150

For NPS 30" and Larger (Note 501, 504)

Temp F	Calc	Calc
psig	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	½" – 2" 3" – 24"	TE BE	XS STD	GALV, T&C, ASTM A53 GRADE B, SMLS, ASME B36.10 CS, ASTM A53 GRADE B, ERW, EJ = 85%, ASME B36.10	60	
NIPPLES	½" – 2" ½" – 2"	TBE TBE	XS 160	GALV, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG GALV, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503	
CONC. SWAGES	½" – 2" 1 ¼" x ¾" 1 ½" x 1 ¼" 2" x 1 ¼" 3" – 4" (½" – 2")	TBE TBE TBE TBE BLE x TSE	XS XS XS XS STD x XS	GALV, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 GALV, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 GALV, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 GALV, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	26 26 26	
ECC. SWAGES	3" – 4" (½" – 2")	BLE x TSE	STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
FITTINGS					02	
90 ELL	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
45 ELL	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
TEE	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
TEE (RED)	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
PLUG	½" – 2"	THRD		GALV, ASTM A105, ASME B16.11, ROUND HEAD		
COUPLING	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
COUPLING (RED.)	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
CAP	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
UNION	½" – 2"	THRD	3000 LB	GALV, ASTM A105, GROUND JOINT, MSS-SP-83		
THREDOLET	½" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97		
WELDOLET	3" – 20"	WELD		CS, ASTM A105, MSS-SP-97		
90 ELL	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
45 ELL	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
TEE	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		

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  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0159		
		Piping Material Class: 1CG0T01		
		Issue Date: 28-Feb-13		Revision 6
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION			NOTES	REV
TEE (RED.) CAP REDUCER (CC) REDUCER (EC)	3" – 24" 3" – 24" 3" – 24" 3" – 24"	WELD WELD WELD WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 CS, ASTM A234 GRADE WPB-S, ASME B16.9 CS, ASTM A234 GRADE WPB-W, ASME B16.9 CS, ASTM A234 GRADE WPB-W, ASME B16.9				
VALVES					TAG NO.	SHORT CODE		
GATE	½" – 2"	THRD	CL 200	Bronze Body W/ Bronze TRIM	GUBT01	VG	06	
GATE	½" – 2"	THRD	CL 800	316L SS Body W/ 316 SS TRIM, HF ST (API #12)	GWST01	VG1	26, 1011	
GATE	3" – 12"	RF	CL 150	CS, Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GACF01	VG		
GATE	14" – 24"	RF	CL 150	CS, Body W/ 13 CR TRIM, HF ST (API #8), Full Port, GO	GACF02	VG		
GLOBE	½" – 2"	THRD	CL 200	Bronze Body W/ Bronze TRIM	LUBT01	VL		
GLOBE	½" – 2"	THRD	CL 800	316L SS Body W/ 316 SS TRIM, HF ST (API #12)	LWST01	VL1	26, 1011	
GLOBE	3" – 8"	RF	CL 150	CS, Body W/ 13 CR TRIM, HF ST (API #8)	LACF01	VL		
SWING CHECK	½" – 2"	THRD	CL 200	Bronze Body W/ Bronze TRIM, Swing Type	CUBT01	VC	62	
LIFT CHECK	½" – 2"	THRD	CL 800	316L SS Body W/ 316 SS TRIM, HF ST (API #12), Piston Type	CWST01	VC1	26, 61, 1011	
SWING CHECK	3" – 10"	RF	CL 150	CS, Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VC	62	
SWING CHECK	12" – 24"	RF	CL 150	CS, Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VCF	62	
DUAL PLT CHECK	12" – 24"	RF	CL 150	CS, Body W/ 13 CR TRIM, HF ST (API #8), DBL FLGD	CACF02	VC	63	
BALL	½" – 2"	THRD	400 WOG	Bronze Body W/ Bronze TRIM, RP	BUBT01	VB	09	
BUTTERFLY	2" – 4"	RF	200 CWP	DI Body W/ Buna Seat, Lug Style, Lever	FUDL01	VX	09	6
FLANGES								
THREADED	½" – 2"	RF	CL 150	GALV, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5				
BLIND	½" – 24"	RF	CL 150	GALV, ASTM A105, ASME B16.5				
THREADED	½" – 2"	RF	CL 300	GALV, ASTM A105, ASME B16.5			12	
WELDNECK	3" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5			12	
BLIND	½" – 24"	RF	CL 300	GALV, ASTM A105, ASME B16.5			12	
PR WN ORIFICE	3" – 24"	RF	CL 300	CS, ASTM A105 W/ ½" THREADED TAPS, ASME B16.36				
MISCELLANEOUS								
FIGURE 8 BLANK	½" – 12"	RF	CL 150	CS, ASTM A516 GRADE 70, GALVANIZED, ASME B16.48				
PADDLE BLANK	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, GALVANIZED, ASME B16.48				
PADDLE SPACER	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, GALVANIZED, ASME B16.48				
Y-STRAINER	½" – 2"	THRD	300 psig CWP	Bronze, ASTM B61 Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSUB01			553	
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 150	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSAS01			555	
FLANGE ISOLATION KIT	½" – 24"	RF	CL 150	ISOLATION GASKET, ASME B16.21, ASME B16.5, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.				6
GASKETS								
	½" – 24"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING				
	½" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING				
BOLTING								
STUD	ALL		CL 150	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS				
STUD	ALL		CL 300	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS				

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0159		
		Piping Material Class: 1CG0T01		
		Issue Date: 28-Feb-13		Revision 6
		Prepared SN	Checked KAJ	Approved GAD

90° BRANCH CONNECTION CHART

BRANCH SIZE	24	T															
	20	E	T														
	18	P	E	T													
	16	P	P	E	T												
	14	P	P	P	E	T											
	12	P	P	P	P	E	T										
	10	P	P	P	P	P	E	T									
	8	W	W	W	W	W	W	E	T								
	6	W	W	W	W	W	W	W	E	T							
	4	W	W	W	W	W	W	W	W	E	T						
	3	W	W	W	W	W	W	W	W	W	E	T					
	2	D	D	D	D	D	D	D	D	D	D	T					
	1½	D	D	D	D	D	D	D	D	D	D	E	T				
	1	D	D	D	D	D	D	D	D	D	D	E	E	T			
	¾	D	D	D	D	D	D	D	D	D	D	E	E	E	T		
	½	D	D	D	D	D	D	D	D	D	D	E	E	E	E	T	
		24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
HEADER SIZE																	

LEGEND:

E = Reducing Tee (BW for 3" and larger, THRD for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
D = Thredolet

T = Straight Tee (BW for 3" and larger, THRD for 2" and smaller)
W = Weldolet

	Piping Material Class Specification	Document No.: 000-SP-PI02-0159		
 Refinería de Cartagena S.A.		Piping Material Class: 1CG0T01		
		Issue Date: 28-Feb-13		Revision 6
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
06. These valves shall be used only for vent, drain, and instrument connections.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
12. These flanges shall be used only to match Class 300 flange connections at control valves and special equipment.
26. To be used only if indicated on the P&ID.
60. Pipe spools shall be flanged, shop fabrication shall be maximized and all spools shall be hot-dip galvanized after fabrication.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
504. Pipe and pipe components thicker than 0.611" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
1011. These valves shall be used only for Units where Bronze material is not allowed (Eg. Sulfur Block).
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.

	Piping Material Class Specification	Document No.: 000-SP-PI02-0155		
 Refinería de Cartagena S.A.		Piping Material Class: 1CG0T02		
		Issue Date: 30-Jun-11		Revision 3
		Prepared SN	Checked KAJ	Approved GAD

Services	Oil Mist	Basic Material	Galvanized Carbon Steel
Pressure Rating:	CL 150, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > ¾")
Flange Facing:	RF	Basic Construction:	1/2" - 2": THRD
Examination:	Class B Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS ½" Through NPS 2" (Full flange ratings per B16.5)

Temp F	0 to 100	200
psig	285	260

For NPS 3" and Larger (Note 501, 504)

Temp F	Calc	Calc
psig	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION		NOTES	REV
PIPE	½" – 2"	TE	XS	GALV, T&C, ASTM A53 GRADE B, SMLS, ASME B36.10			
NIPPLES	½" – 2" ½" – 2"	TBE TBE	XS 160	GALV, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG GALV, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		503	
CONC. SWAGES	½" – 2"	TBE	XS	GALV, ASTM A234 GRADE WPB, SMLS, MSS-SP-95			
FITTINGS						02	
90 ELL	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11			
45 ELL	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11			
TEE	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11			
TEE (RED)	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11			
COUPLING	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11			
COUPLING (RED.)	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11			
CAP	½" – 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11			
UNION	½" – 2"	THRD	3000 LB	GALV, ASTM A105, GROUND JOINT, MSS-SP-83			
VALVES					TAG NO.	SHORT CODE	
GATE	½" – 2"	THRD	CL 200	Bronze Body W/ Bronze Trim	GUBT01	VG	06 3
FLANGES							
THREADED	½" – 2"	RF	CL 150	GALV, ASTM A105, ASME B16.5			
BLIND	½" – 2"	RF	CL 150	GALV, ASTM A105, ASME B16.5			
THREADED	½" – 2"	RF	CL 300	GALV, ASTM A105, ASME B16.5		12	
BLIND	½" – 2"	RF	CL 300	GALV, ASTM A105, ASME B16.5		12	
MISCELLANEOUS							
FIGURE 8 BLANK	½" – 2"	RF	CL 150	CS, ASTM A516 GRADE 70, GALVANIZED, ASME B16.48			
PADDLE BLANK	½" – 2"	RF	CL 150	CS, ASTM A516 GRADE 70, GALVANIZED, ASME B16.48			
PADDLE SPACER	½" – 2"	RF	CL 150	CS, ASTM A516 GRADE 70, GALVANIZED, ASME B16.48			
Y-STRAINER	½" – 2"	THRD	300 psig CWP	Bronze, ASTM B61 Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSUB01		553	

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  Refineria de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0155		
		Piping Material Class: 1CG0T02		
		Issue Date: 30-Jun-11	Revision 3	Prepared SN
			Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
GASKETS	1/2" – 2"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		3
	1/2" – 2"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		3
BOLTING	STUD	ALL	CL 150	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
	STUD	ALL	CL 300	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		

	Piping Material Class Specification	Document No.: 000-SP-PI02-0155		
		Piping Material Class: 1CG0T02		
Issue Date: 30-Jun-11		Revision 3		
Prepared SN		Checked KAJ	Approved GAD	

90° BRANCH CONNECTION CHART

BRANCH SIZE	2	T				
	1½	E	T			
	1	E	E	T		
	¾	E	E	E	T	
	½	E	E	E	E	T
		2	1½	1	¾	½
HEADER SIZE						

LEGEND:

E = Reducing Tee (THRD for 2" and smaller)

T = Straight Tee (THRD for 2" and smaller)

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
06. These valves shall be used only for vent, drain, and instrument connections.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
12. These flanges shall be used only to match Class 300 flange connections at control valves and special equipment.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
504. Pipe and pipe components thicker than 0.611" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0037		
		Piping Material Class: 3CB1S01		
		Issue Date: 28-Feb-13	Revision 7	Prepared SN
			Checked KAJ	Approved GAD

Services	Boiler Feed Water, Steam & Condensate	Basic Material	Killed Carbon Steel
Pressure Rating:	CL 300, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0.063"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > ¾")
Flange Facing:	RF	Basic Construction:	1/2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class B Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS ½" Through NPS 30" (Full flange ratings per B16.5)

Temp F	0 to 100	200	300	400	500	600	650	700	750	800
psig	740	680	655	635	605	570	550	530	505	410

For NPS 36" and Larger (Note 501, 504)

Temp F	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc
psig	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	½" – 2"	PE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	3" – 12"	BE	STD	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	14" – 18"	BE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	20" – 20"	BE	40	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	24" – 24"	BE	40	LTCS, ASTM A333 GRADE 6, SMLS, ASME B36.10		
	30" – 30"	BE	0.750"	CS, ASTM A672 GRADE C65 CL32, EFW, STR SM, ASME B36.10		
	26" – 26"	BE	0.688"	CS, ASTM A672 GRADE C65 CL32, EFW, STR SM, ASME B36.10	26	
NIPPLES	½" – 2"	PBE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
	½" – 2"	PBE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503	
	½" – 2"	TOE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	03	
CONC. SWAGES	½" – 2"	TSE	160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	1" x ¾"	TLE x PSE	160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	½" – 2"	PBE	XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	03	
	3" – 4"	BLE x PSE	STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	03, 26	
	(½" – 2")					
ECC. SWAGES	½" – 2"	PBE	XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	3" – 4"	BLE x PSE	STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
FITTINGS	90 ELL	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11	02
	45 ELL	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11	
	TEE	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11	
	TEE (RED)	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11	
	PLUG	½" – 2"	THRD		CS, ASTM A105, ASME B16.11, ROUND HEAD	
	PLUG	½" - ½"	PE		CS, ASTM A105, ASME B16.11, BARSTOCK, ROUND HEAD	
	COUPLING	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11	03
	CAP	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11	53

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  Refinería de Cartagena S.A.	Piping Material Class Specification		Document No.: 000-SP-PI02-0037		
			Piping Material Class: 3CB1S01		
			Issue Date: 28-Feb-13		Revision 7
			Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION			NOTES	REV
CAP	½" – 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11			03	
SOCKOLET FLAT	½" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97				
SOCKOLET	½" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97				
SW ELBOLET	¾" – 1 ½"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97			26	
THREDOLET	½" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97			03	
WELDOLET	3" – 24"	WELD		CS, ASTM A105, MSS-SP-97				
90 ELL	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
90 ELL	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
90 ELL	30" – 30"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9				
90 ELL	26" – 26"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9			26	
90 ELL SR	8" – 8"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9			26	7
45 ELL	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
45 ELL	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
45 ELL	30" – 30"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9				
45 ELL	26" – 26"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9			26	
TEE	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
TEE	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
TEE	30" – 30"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9				
TEE (RED.)	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
TEE (RED.)	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
TEE (RED.)	30" – 30"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9				
CAP	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
CAP	24" – 30"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
REDUCER (CC)	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
REDUCER (CC)	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
REDUCER (CC)	30" – 30"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9				
REDUCER (EC)	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
REDUCER (EC)	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
REDUCER (EC)	30" – 30"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9				
VALVES				TAG NO.	SHORT CODE			
GATE	½" – 2"	SW THRD/SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	GWCS01	VG	06, 03	
GATE	½" – 2"		CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	GWCY01	VG2		
GATE	½" – 2"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Conventional Port	GBCF03	VGF	15	
GATE	½" – 2"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GBCF24	VGA	08	
GATE	3" – 12"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GBCF01	VG		
GATE	14" – 24"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, GO	GBCF02	VG		
GLOBE	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	LWCS01	VL		
GLOBE	3" – 8"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8)	LBCF01	VL		
LIFT CHECK	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8), Piston Type	CWCS01	VC	61	
SWING CHECK	3" – 10"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8)	CBCF01	VC	62	
SWING CHECK	12" – 24"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8)	CBCF01	VCF	62	
STOP CHECK	3" – 8"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8)	SBCF02	VS		7
DUAL PLT CHECK	12" – 24"	RF	CL 300	CS Body W/ 410 SS DISC, HF ST (API #8) DBL FLGD	CBCF02	VC	63	
DUAL PLT CHECK	30" – 30"	RF	CL 300	CS Body W/ 410 SS DISC, HF ST (API #8) DBL FLGD, SERIES A	CBCF03	VC	63	
BUTTERFLY	10" – 24"	RF	CL 300	CS Body W/ Resilient Metal ST, HF ST, DBL FLGD, GO	FBCF01	VX	09	
BUTTERFLY	30" – 30"	RF	CL 300	CS Body W/ Resilient Metal ST, HF ST, DBL FLGD, GO, SERIES A	FBCF02	VX	09	
BALL	½" – 4"	RF	CL 300	CS Body W/ RPTFE ST, 316 SS FLOATING BALL, FP, LP, LEVER	BBCF01	VB1	09, 26	7
FLANGES								
SOCKETWELD	½" – 2"	RF	CL 300	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5				
BLIND	½" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5				
WELDNECK	26" – 30"	RF	CL 300	CS, ASTM A105, ASME B16.47 SERIES A				
BLIND	30" – 30"	RF	CL 300	CS, ASTM A105, ASME B16.47 SERIES A				
WELDNECK	26" – 26"	RF	CL 300	CS, ASTM A105, ASME B16.47 SERIES B			26	
SOCKETWELD	½" – 2"	RF	CL 600	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 600	CS, ASTM A105, ASME B16.5				

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  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0037		
		Piping Material Class: 3CB1S01		
		Issue Date: 28-Feb-13	Revision 7	Prepared SN
			Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION	NOTES	REV
PR WN ORIFICE	1" – 24"	RF	CL 300	CS, ASTM A105 W/ 1/2" SOCKETWELD TAPS, ASME B16.36		
MISCELLANEOUS						
FIGURE 8 BLANK	1/2" – 12"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48	26	
FIGURE 8 BLANK	16" – 16"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48		
PADDLE BLANK	1/2" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48		
PADDLE SPACER	1/2" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48		
STEAM TRAP	1/2" – 1"	SW		Steam Trap Thermodynamic W/Strainer & Blow Down Valve, Universal SW Connector, TP 304 SS, 450 psig PMO, 720 psig PMA, TAG# ST-101	09	
Y-STRAINER	1/2" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDC01	553	
Y-STRAINER	1/2" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/32" Dia. Hole @ 3/64" Center, TAG# YSDC02	554	
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 300	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSBS01	555	
FLANGE	1/2" – 24"	RF	CL 300	ISOLATION GASKET, ASME B16.21, ASME B16.5, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.		
GASKETS						
	1/2" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP304 SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING	26	
	26" – 30"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP304 SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304SS INNER RING, CS OUTER RING		
	26" – 26"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES B, TP304 SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304SS INNER RING, CS OUTER RING		
	1/2" – 24"		CL 600	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
BOLTING						
STUD	ALL		CL 300	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
STUD	ALL		CL 600	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		

 	Piping Material Class Specification	Document No.: 000-SP-PI02-0037		
		Piping Material Class: 3CB1S01		
		Issue Date: 28-Feb-13		Revision 7
		Prepared SN	Checked KAJ	Approved GAD

90° BRANCH CONNECTION CHART

BRANCH SIZE	30	T																
	24	E	T															
	20	P	E	T														
	18	P	P	E	T													
	16	P	P	P	E	T												
	14	P	P	P	P	E	T											
	12	P	P	P	P	P	E	T										
	10	P	P	P	P	P	P	E	T									
	8	W	W	W	W	W	W	W	E	T								
	6	W	W	W	W	W	W	W	W	E	T							
	4	W	W	W	W	W	W	W	W	W	E	T						
	3	W	W	W	W	W	W	W	W	W	W	E	T					
	2	S	S	S	S	S	S	S	S	S	S	S	S	T				
	1½	S	S	S	S	S	S	S	S	S	S	S	S	E	T			
	1	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T		
	¾	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T	
	½	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	E	T
	30	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½	
HEADER SIZE																		

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet

 	Piping Material Class Specification	Document No.: 000-SP-PI02-0037		
		Piping Material Class: 3CB1S01		
		Issue Date: 28-Feb-13	Revision 7	
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
08. Full-port valves shall be used if indicated on the P&ID.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
15. These valves shall be used if mating to flanged nozzles.
26. To be used only if indicated on the P&ID.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
504. Pipe and pipe components thicker than 0.611" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
554. Use this strainer for Vapor / Gas Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0041		
		Piping Material Class: 3CB1S50		
		Issue Date: 28-Feb-13		Revision 4
		Prepared SN	Checked KAJ	Approved GAD

Services	Boiler Feed Water, Steam, Condensate, & Blow Down	Basic Material	Killed Carbon Steel
Pressure Rating:	CL 300, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0.063"
Material Group:	1.1	Stress Relief	ASME B31.1 (W.T. > ¾")
Flange Facing:	RF	Basic Construction:	1/2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class F Per Tech. Spec (Note 1013)	Design Code	ASME B31.1-2007

For NPS ½" Through NPS 24" (Full flange ratings per B16.5)

Temp F	0 to 100	200	300	400	500	600	650	700	750	800
psig	740	680	655	635	605	570	550	530	505	410

For NPS 30" and Larger (Note 501)

Temp F	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc
psig	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	½" – 2" 3" – 10" 12" – 24"	PE BE BE	XS STD 40	CS, ASME SA106 GRADE B, SMLS, ASME B36.10 CS, ASME SA106 GRADE B, SMLS, ASME B36.10 CS, ASME SA106 GRADE B, SMLS, ASME B36.10		
NIPPLES	½" – 2" ½" – 2" ½" – 2"	PBE PBE TOE	XS 160 160	CS, ASME SA106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASME SA106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASME SA106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503 03	
CONC. SWAGES	½" – 2" ½" – 2" 3" – 4" (½" – 2")	TSE PBE BLE x PSE	160 XS STD x XS	CS, ASME SA234 GRADE WPB, SMLS, MSS-SP-95 CS, ASME SA234 GRADE WPB, SMLS, MSS-SP-95 CS, ASME SA234 GRADE WPB, SMLS, MSS-SP-95	03	
FITTINGS					02	
90 ELL	½" – 2"	SW	3000 LB	CS, ASME SA105, ASME B16.11		
45 ELL	½" – 2"	SW	3000 LB	CS, ASME SA105, ASME B16.11		
TEE	½" – 2"	SW	3000 LB	CS, ASME SA105, ASME B16.11		
TEE (RED)	½" – 2"	SW	3000 LB	CS, ASME SA105, ASME B16.11		
PLUG	½" – 2"	THRD		CS, ASME SA105, ASME B16.11, ROUND HEAD	03	
PLUG	½" - ½"	PE		CS, ASME SA105, ASME B16.11, BARSTOCK, ROUND HEAD	53	
COUPLING	½" – 2"	SW	3000 LB	CS, ASME SA105, ASME B16.11		
CAP	½" – 2"	SW	3000 LB	CS, ASME SA105, ASME B16.11		
CAP	½" – 2"	THRD	3000 LB	CS, ASME SA105, ASME B16.11	03	
SOCKOLET FLAT	½" – 2"	WELD	3000 LB	CS, ASME SA105, MSS-SP-97		
SOCKOLET	½" – 2"	WELD	3000 LB	CS, ASME SA105, MSS-SP-97		
THREDOLET	½" – 2"	WELD	3000 LB	CS, ASME SA105, MSS-SP-97	03	
WELDOLET	3" – 20"	WELD		CS, ASME SA105, MSS-SP-97		
90 ELL	3" – 24"	WELD		CS, ASME SA234 GRADE WPB-S, ASME B16.9		
45 ELL	3" – 24"	WELD		CS, ASME SA234 GRADE WPB-S, ASME B16.9		
TEE	3" – 24"	WELD		CS, ASME SA234 GRADE WPB-S, ASME B16.9		
TEE (RED.)	3" – 24"	WELD		CS, ASME SA234 GRADE WPB-S, ASME B16.9		

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  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0041		
		Piping Material Class: 3CB1S50		
		Issue Date: 28-Feb-13	Revision 4	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION			NOTES	REV
CAP REDUCER (CC) REDUCER (EC)	3" – 24" 3" – 24" 3" – 24"	WELD WELD WELD		CS, ASME SA234 GRADE WPB-S, ASME B16.9 CS, ASME SA234 GRADE WPB-S, ASME B16.9 CS, ASME SA234 GRADE WPB-S, ASME B16.9				
VALVES					TAG NO.	SHORT CODE		
GATE	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	GWCS08	VG	06, 03 15	
GATE	½" – 2"	THRD/SW	CL 800	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	GWCY08	VG2		
GATE	½" – 2"	RF	CL 300	CS Body W/ 13 CR TRIM, Full HF ST (API #5), Conventional Port	GBCF21	VGf		
GATE	3"– 12"	RF	CL 300	CS Body W/ 13 CR TRIM, Full HF ST (API #5), Full Port	GBCF19	VG		
GATE	14" – 24"	RF	CL 300	CS Body W/ 13 CR TRIM, Full HF ST (API #5), Full Port, GO	GBCF20	VG		
GLOBE	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	LWCS08	VL		
GLOBE	3" – 8"	RF	CL 300	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	LBCF08	VL		
LIFT CHECK	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, Full HF ST (API #5), Piston Type	CWCS08	VC	61	
SWING CHECK	3" – 24"	RF	CL 300	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	CBCF14	VC	62	
STOP CHECK	3" – 8"	RF	CL 300	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	SBCF01	VS		4
FLANGES								
SOCKETWELD	½" – 2"	RF	CL 300	CS, ASME SA105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 300	CS, ASME SA105, ASME B16.5				
BLIND	½" – 24"	RF	CL 300	CS, ASME SA105, ASME B16.5				
PR WN ORIFICE	1" – 24"	RF	CL 300	CS, ASME SA105 W/ ½" SOCKETWELD TAPS, ASME B16.36				
MISCELLANEOUS								
FIGURE 8 BLANK	½" – 12"	RF	CL 300	CS, ASME SA516 GRADE 70, NORMALIZED, ASME B16.48			09	
PADDLE BLANK	½" – 24"	RF	CL 300	CS, ASME SA516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE SPACER	½" – 24"	RF	CL 300	CS, ASME SA516 GRADE 70, NORMALIZED, ASME B16.48				
STEAM TRAP	½" – 1"	SW		Steam Trap Thermodynamic W/Strainer & Blow Down Valve, Universal SW Connector, TP 304 SS, 450 psig PMO, 720 psig PMA, TAG# ST-101				
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASME SA216 GRADE WCB Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDC05			553	
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASME SA216 GRADE WCB Body, TP 304SS Screen W / 1/32" Dia. Hole @ 3/64" Center, TAG# YSDC06			554	
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 300	SS, ASME SA240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSBS02			555	
GASKETS	½" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING				4
BOLTING								
STUD	ALL		CL 300	ALLOY STEEL, ASME SA193 GRADE B7, ASME SA194 GRADE 2H HEAVY HEX NUTS				

  Refineria de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0041		
		Piping Material Class: 3CB1S50		
		Issue Date: 28-Feb-13		Revision 4
		Prepared SN	Checked KAJ	Approved GAD

90° BRANCH CONNECTION CHART

BRANCH SIZE	24	T															
	20	E	T														
	18	P	E	T													
	16	P	P	E	T												
	14	P	P	P	E	T											
	12	P	P	P	P	E	T										
	10	P	P	P	P	P	E	T									
	8	W	W	W	W	W	W	E	T								
	6	W	W	W	W	W	W	W	E	T							
	4	W	W	W	W	W	W	W	W	E	T						
	3	W	W	W	W	W	W	W	W	W	E	T					
	2	S	S	S	S	S	S	S	S	S	S	T					
	1½	S	S	S	S	S	S	S	S	S	S	E	T				
	1	S	S	S	S	S	S	S	S	S	S	E	E	T			
	¾	S	S	S	S	S	S	S	S	S	S	S	E	E	T		
	½	S	S	S	S	S	S	S	S	S	S	S	E	E	E	T	
		24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
HEADER SIZE																	

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet

  Refineria de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0041		
		Piping Material Class: 3CB1S50		
		Issue Date: 28-Feb-13	Revision 4	
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
15. These valves shall be used if mating to flanged nozzles.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
554. Use this strainer for Vapor / Gas Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0042		
		Piping Material Class: 3CB2S		
		Issue Date: 28-Feb-13		Revision 7
		Prepared SN	Checked KAJ	Approved GAD

Services	General Process	Basic Material	Killed Carbon Steel
Pressure Rating:	CL 300, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0.125"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > ¾")
Flange Facing:	RF	Basic Construction:	1/2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class B Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS ½" Through NPS 36" (Full flange ratings per B16.5)

Temp F	0 to 100	200	300	400	500	600	650	700	750	800
psig	740	680	655	635	605	570	550	530	505	410

For NPS 42" and Larger (Note 501, 504)

Temp F	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc
psig	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	½" - 1 ½"	PE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10	26, 1001, 1054	7
	2" - 2"	PE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	3" - 16"	BE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	18" - 20"	BE	40	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	24" - 24"	BE	40	LTCS, ASTM A333 GRADE 6, SMLS, ASME B36.10		
	30" - 30"	BE	0.812"	CS, ASTM A672 GRADE C65 CL 42, EFW, STR SM, ASME B36.10		
	36" - 36"	BE	0.938"	CS, ASTM A672 GRADE C65 CL 42, EFW, STR SM, ASME B36.10		
	4" - 8"	BE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, C&W		
NIPPLES	½" - 1 ½"	PBE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503 03 03	
	2" - 2"	PBE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
	½" - 2"	PBE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
	½" - 1"	TOE	XXS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
	1 ½" - 2"	TOE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
CONC. SWAGES	¾" - 2"	TSE	XXS/160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	03	7
	½" - 2"	PBE	160/XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	3" - 4"	BLE x PSE	XS x	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	(½" - 2")		(160/XS)			
ECC. SWAGES	½" - 2"	PBE	160/XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	3" - 4"	BLE x PSE	XS x	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
FITTINGS	½" - 1 ½"	SW	6000 LB	CS, ASTM A105, ASME B16.11	02	
	2" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
	45 ELL ½" - 1 ½"	SW	6000 LB	CS, ASTM A105, ASME B16.11		
	45 ELL 2" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
	TEE ½" - 1 ½"	SW	6000 LB	CS, ASTM A105, ASME B16.11		

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  Refineria de Cartagena S.A.	Piping Material Class Specification		Document No.: 000-SP-PI02-0042		
			Piping Material Class: 3CB2S		
			Issue Date: 28-Feb-13		Revision 7
			Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION			NOTES	REV
TEE	2" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11			03	
TEE (RED)	½" - 2"	SW	6000 LB	CS, ASTM A105, ASME B16.11				
45 LATERAL	½" - 1 ½"	SW	6000 LB	CS, ASTM A105, ASME B16.11			53	
45 LATERAL	2" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11				
PLUG	½" - 2"	THRD		CS, ASTM A105, ASME B16.11, ROUND HEAD			03	
PLUG	½" - ½"	PE		CS, ASTM A105, ASME B16.11, BARSTOCK, ROUND HEAD				
COUPLING	½" - 1 ½"	SW	6000 LB	CS, ASTM A105, ASME B16.11			03	
COUPLING	2" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11				
COUPLING	½" - 1"	THRD	6000 LB	CS, ASTM A105, ASME B16.11			03	
COUPLING	1 ½" - 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11				
CAP	½" - 1 ½"	SW	6000 LB	CS, ASTM A105, ASME B16.11			26	
CAP	2" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11				
UNION	½" - 1 ½"	SW	6000 LB	CS, ASTM A105, GROUND JOINT, MSS-SP-83			26	
UNION	2" - 2"	SW	3000 LB	CS, ASTM A105, GROUND JOINT, MSS-SP-83				
CAP	½" - 1"	THRD	6000 LB	CS, ASTM A105, ASME B16.11			03	
CAP	1 ½" - 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11				
SOCKOLET FLAT	½" - 1 ½"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97			03	
SOCKOLET FLAT	2" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97				
SOCKOLET	½" - 1 ½"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97			26	
SOCKOLET	2" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97				
SW ELBOLET	¾" - 1 ½"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97			03	
THREDOLET	½" - 1"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97				
THREDOLET	1 ½" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97			03	
WELDOLET	3" - 30"	WELD		CS, ASTM A105, MSS-SP-97				
90 ELL	3" - 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9			26	7
90 ELL	24" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
90 ELL	30" - 36"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9			26	
90 ELL SR	10" - 10"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
45 ELL	3" - 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9			26	
45 ELL	24" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
45 ELL	30" - 36"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9			26	
TEE	3" - 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
TEE	24" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9			26	
TEE	30" - 36"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9				
TEE (RED.)	3" - 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9			26	
TEE (RED.)	24" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
TEE (RED.)	30" - 36"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9			26	
CAP	3" - 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
CAP	24" - 36"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9			26	
REDUCER (CC)	3" - 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
REDUCER (CC)	24" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9			26	
REDUCER (CC)	30" - 36"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9				
REDUCER (CC)	34" x 30"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9			26	
REDUCER (EC)	3" - 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
REDUCER (EC)	24" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9			26	
REDUCER (EC)	30" - 36"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9				
VALVES					TAG NO.	SHORT CODE		
GATE	½" - 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	GWCS01	VG	08	
GATE	½" - 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GWCS10	VGS		
GATE	½" - 2"	THRD/SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	GWCY01	VG2	06, 03	
GATE	½" - 2"	THRD/SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GWCYAA	VG3		
GATE	½" - 2"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Conventional Port	GBCF03	VG1	15	7
GATE	½" - 2"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GBCF24	VG1		
GATE	3" - 12"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GBCF01	VG	15, 08	
GATE	14" - 24"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, G.O.	GBCF02	VG		
GATE	3" - 12"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), W/ Location "G" THRD Tapping, Full Port	GBCF35	VG1	26	

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		Piping Material Class Specification	Document No.: 000-SP-PI02-0042		
			Piping Material Class: 3CB2S		
			Issue Date: 28-Feb-13		Revision 7
			Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION			NOTES	REV
GATE	14" – 24"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), W/ Location "G" THRD Tapping, Full Port, G.O.	GBCF36	VG1	26	
GLOBE	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	LWCS01	VL		
GLOBE	3" – 8"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8)	LBCF01	VL		
LIFT CHECK	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8), Piston Type	CWCS01	VC	61	
SWING CHECK	3" – 10"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8)	CBCF01	VC	62	
SWING CHECK	12" – 24"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8)	CBCF01	VCF	62	
DUAL PLT CHECK	12" – 24"	RF	CL 300	CS Body W/ 410 SS DISC, HF ST (API #8) DBL FLGD	CBCF02	VC	63	
BUTTERFLY	2" – 8"	RF	CL 300	CS Body W/ Resilient Metal ST, HF ST, Lug Type, G.O.	FBCL01	VX	09	
BUTTERFLY	10" – 24"	RF	CL 300	CS Body W/ Resilient Metal ST, HF ST, DBL FLGD, G.O.	FBCF01	VX	09	
BALL	¾" – 4"	RF	CL 300	CS Body W/ CR. CARBIDE CTD. ST, FLOATING BALL, RP, SP, LEVER	BBCF02	VB1	09, 26	
BALL	6" – 8"	RF	CL 300	CS Body W/ CR. CARBIDE CTD. ST, FLOATING BALL, RP, SP, GO	BBCF03	VB1	09, 26	
BALL	10" – 12"	RF	CL 300	CS Body W/ CR. CARBIDE CTD. ST, TRUNNION BALL, RP, LP, GO	BBCF04	VB1	09, 26	
BALL	¾" – 4"	RF	CL 300	CS Body W/ RPTFE ST, 316SS FLOATING BALL, FP, LP, LEVER	BBCF01	VB2	09, 26	
BALL	½" – 2"	THRD/SW	2000 WOG	CS Body W/ RPTFE ST, 316SS FLOATING BALL, FP, LEVER	BUCYAA	VB3	09, 26	7
FLANGES								
SOCKETWELD	½" – 2"	RF	CL 300	CS, ASTM A105, ASME B16.5			26	
WELDNECK	3" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5				
BLIND	½" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5				
WELDNECK	30" – 36"	RF	CL 300	CS, ASTM A105, ASME B16.47 SERIES A				
WELDNECK	34" – 34"	RF	CL 300	CS, ASTM A105, ASME B16.47 SERIES A				
BLIND	30" – 36"	RF	CL 300	CS, ASTM A105, ASME B16.47 SERIES A				
SOCKETWELD	½" – 2"	RF	CL 600	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 600	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 900	CS, ASTM A105, ASME B16.5				
SOCKETWELD	½" – 2"	RF	CL 1500	CS, ASTM A105, ASME B16.5				
WELDNECK	2" – 12"	RF	CL 2500	CS, ASTM A105, ASME B16.5				
PR WN ORIFICE	1" – 24"	RF	CL 300	CS, ASTM A105 W/ ½" SOCKETWELD TAPS, ASME B16.36				
MISCELLANEOUS								
FIGURE 8 BLANK	½" – 12"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48			26	
PADDLE BLANK	½" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE SPACER	½" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE BLANK	3" – 24"	RF	CL 600	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE SPACER	3" – 24"	RF	CL 600	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				26
PADDLE BLANK	8" – 8"	RF	CL 900	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				26
PADDLE SPACER	8" – 8"	RF	CL 900	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				26
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDC01			553	
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/32" Dia. Hole @ 3/64" Center, TAG# YSDC02			554	
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 300	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSBS01			555	
FLANGE ISOLATION KIT	½" – 24"	RF	CL 300	ISOLATION GASKET, ASME B16.21, ASME B16.5, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.				
GASKETS								
	½" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING			26	
	30" – 36"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING				
	34" – 34"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING				

  Refineria de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0042		
		Piping Material Class: 3CB2S		
		Issue Date: 28-Feb-13	Revision 7	Prepared SN
			Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION	NOTES	REV
	1/2" – 24" 3" – 24" 1/2" – 2" 2" – 12"		CL 600 CL 900 CL 1500 CL 2500	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
BOLTING STUD STUD STUD STUD STUD	ALL ALL ALL ALL ALL		CL 300 CL 600 CL 900 CL 1500 CL 2500	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		

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90° BRANCH CONNECTION CHART

BRANCH SIZE	36	T																
	30	E	T															
	24	P	E	T														
	20	P	P	E	T													
	18	P	P	P	E	T												
	16	P	P	P	P	E	T											
	14	P	P	P	P	P	E	T										
	12	P	P	P	P	P	P	E	T									
	10	P	P	P	P	P	P	P	E	T								
	8	W	W	W	W	W	W	W	W	E	T							
	6	W	W	W	W	W	W	W	W	W	E	T						
	4	W	W	W	W	W	W	W	W	W	W	E	T					
	3	W	W	W	W	W	W	W	W	W	W	W	E	T				
	2	S	S	S	S	S	S	S	S	S	S	S	S	S	T			
	1½	S	S	S	S	S	S	S	S	S	S	S	S	S	E	T		
	1	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T	
	¾	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T
	½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	E
	36	30	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
HEADER SIZE																		

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet

  Refineria de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0042		
		Piping Material Class: 3CB2S		
		Issue Date: 28-Feb-13	Revision 7	
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
08. Full-port valves shall be used if indicated on the P&ID.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
15. These valves shall be used if mating to flanged nozzles.
26. To be used only if indicated on the P&ID.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
504. Pipe and pipe components thicker than 0.611" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
554. Use this strainer for Vapor / Gas Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
1001. Underground piping shall be externally coated for corrosion protection in accordance with technical standard 166000-000-SP-MU10-0022.
1054. These U/G pipe shall be limited to 160F maximum.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.



Approved
GAD

  Refineria de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0048		
		Piping Material Class: 3CB2S53		
		Issue Date: 28-Feb-13	Revision 4	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION			NOTES	REV
CAP	1" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11, NACE			03	03
CAP	½" – 1"	THRD	6000 LB	CS, ASTM A105, ASME B16.11, NACE				
CAP	1 ½" – 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11, NACE			03	03
SOCKOLET	½" - ¾"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97, NACE				
SOCKOLET	1" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97, NACE			03	03
THREDOLET	½" – 1"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97, NACE				
THREDOLET	1 ½" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97, NACE			03	03
WELDOLET	3" – 20"	WELD		CS, ASTM A105, MSS-SP-97, NACE				
90 ELL	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE			03	03
90 ELL	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9, NACE				
45 ELL	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE			03	03
45 ELL	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9, NACE				
TEE	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE			03	03
TEE	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9, NACE				
TEE (RED.)	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE			03	03
TEE (RED.)	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9, NACE				
CAP	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE			03	03
CAP	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9, NACE				
REDUCER (CC)	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE			03	03
REDUCER (CC)	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9, NACE				
REDUCER (EC)	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE			03	03
REDUCER (EC)	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9, NACE				
VALVES					TAG NO.	SHORT CODE		
GATE	½" – 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12) , NACE	GWCS06	VG	06, 03	15
GATE	½" – 2"	THRD/SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12) , NACE	GWCY06	VG2		
GATE	½" – 2"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12), Conventional Port, NACE	GBCF10	VGf		
GATE	3"– 12"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, NACE	GBCF11	VG	61	62
GATE	14" – 24"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, GO, NACE	GBCF12	VG		
GLOBE	½" – 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12) , NACE	LWCS06	VL		
GLOBE	3" – 8"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12) , NACE	LBCF04	VL	62	63
LIFT CHECK	½" – 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), Piston Type, NACE	CWCS06	VC		
SWING CHECK	3" – 10"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12) , NACE	CBCF09	VC		
SWING CHECK	12" – 24"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12) , NACE	CBCF09	VCF	63	
DUAL PLT CHECK	12" – 24"	RF	CL 300	CS Body W/ 316 SS DISC, HF ST (API #12), DBL FLGD, NACE	CBCF10	VC		
FLANGES								
SOCKETWELD	½" – 2"	RF	CL 300	CS, ASTM A105, ASME B16.5, NACE			553	
WELDNECK	3" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5, NACE				
BLIND	½" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5, NACE				
PR WN ORIFICE	1" – 24"	RF	CL 300	CS, ASTM A105 W/ ½" SOCKETWELD TAPS, ASME B16.36, NACE				
MISCELLANEOUS								
FIGURE 8 BLANK	½" – 12"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE			554	
PADDLE BLANK	½" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE				
PADDLE SPACER	½" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE				
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDC03, NACE			555	
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/32" Dia. Hole @ 3/64" Center, TAG# YSDC04, NACE				
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 300	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSBS08, NACE			555	
GASKETS								
	½" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE				4

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 	Piping Material Class Specification	Document No.: 000-SP-PI02-0048		
		Piping Material Class: 3CB2S53		
		Issue Date: 28-Feb-13	Revision 4	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION	NOTES	REV
BOLTING STUD	ALL		CL 300	ALLOY STEEL, ASTM A193 GRADE B7M, ASTM A 194 GRADE 2HM HEAVY HEX NUTS, NACE		

 	Piping Material Class Specification	Document No.: 000-SP-PI02-0048		
		Piping Material Class: 3CB2S53		
		Issue Date: 28-Feb-13		Revision 4
		Prepared SN	Checked KAJ	Approved GAD

90° BRANCH CONNECTION CHART

BRANCH SIZE	24	T															
	20	E	T														
	18	P	E	T													
	16	P	P	E	T												
	14	P	P	P	E	T											
	12	P	P	P	P	E	T										
	10	P	P	P	P	P	E	T									
	8	W	W	W	W	W	W	E	T								
	6	W	W	W	W	W	W	W	E	T							
	4	W	W	W	W	W	W	W	W	E	T						
	3	W	W	W	W	W	W	W	W	W	E	T					
	2	S	S	S	S	S	S	S	S	S	S	T					
	1½	S	S	S	S	S	S	S	S	S	S	E	T				
	1	S	S	S	S	S	S	S	S	S	S	E	E	T			
	¾	S	S	S	S	S	S	S	S	S	S	S	E	E	T		
	½	S	S	S	S	S	S	S	S	S	S	S	E	E	E	T	
		24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
HEADER SIZE																	

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet

 	Piping Material Class Specification	Document No.: 000-SP-PI02-0048		
		Piping Material Class: 3CB2S53		
		Issue Date: 28-Feb-13	Revision 4	
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
15. These valves shall be used if mating to flanged nozzles.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
504. Pipe and pipe components thicker than 0.611" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
554. Use this strainer for Vapor / Gas Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
1000. The requirements of NACE MR0103 shall be met where NACE is specified in the material description. All components shall be hardness tested.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0038		
		Piping Material Class: 3CB2S55		
		Issue Date: 28-Feb-13		Revision 7
		Prepared SN	Checked KAJ	Approved GAD

Services	Sour Water, Wet H ₂ S, General Process (Note 558)	Basic Material	Killed Carbon Steel (PWHT, NACE)
Pressure Rating:	CL 300, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0.125"
Material Group:	1.1	Stress Relief	ALL WELDS PER ASME B31.3
Flange Facing:	RF	Basic Construction:	1/2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class B Per Tech. Spec – NACE (Note 1000, 1013)	Design Code	ASME B31.3-2006

For NPS 1/2" Through NPS 24" (Full flange ratings per B16.5), (Note 571)

Temp F	0 to 100	200	300	400	500	600	650	700	750	800
psig	740	680	655	635	605	570	550	530	505	410

For NPS 30" and Larger (Note 501, 504 and 571)

Temp F	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc
psig	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	1/2" – 3/4"	PE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, NACE		
	1" – 2"	PE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, NACE		
	3" – 16"	BE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, NACE		
	18" – 20"	BE	40	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, NACE		
	24" – 24"	BE	40	LTCS, ASTM A333 GRADE 6, SMLS, ASME B36.10, NACE		
NIPPLES	1/2" – 3/4"	PBE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE		
	1" – 2"	PBE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE		
	1/2" – 2"	PBE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE	503	
	1/2" – 1"	TOE	XXS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE	03	
	1 1/2" – 2"	TOE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG, NACE	03	
CONC. SWAGES	1/2" – 2"	TSE	XXS/160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95, NACE	03	
	1/2" – 2"	PBE	160/XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95, NACE		
	3" – 4"	BLE x PSE	XS x	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95, NACE		
	(1/2" – 2")		(160/XS)			
FITTINGS	90 ELL 1/2" – 3/4"	SW	6000 LB	CS, ASTM A105, ASME B16.11, NACE	02	
	90 ELL 1" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11, NACE		
	45 ELL 1/2" – 3/4"	SW	6000 LB	CS, ASTM A105, ASME B16.11, NACE		
	45 ELL 1" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11, NACE		
	TEE 1/2" – 3/4"	SW	6000 LB	CS, ASTM A105, ASME B16.11, NACE		
	TEE 1" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11, NACE		
	TEE (RED) 1/2" – 3/4"	SW	6000 LB	CS, ASTM A105, ASME B16.11, NACE		
	TEE (RED) 1" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11, NACE		
	PLUG 1/2" – 2"	THRD		CS, ASTM A105, ASME B16.11, ROUND HEAD, NACE	03	
	PLUG 1/2" – 1/2"	PE		CS, ASTM A105, ASME B16.11, BARSTOCK, ROUND HEAD, NACE	53	
	COUPLING 1/2" – 3/4"	SW	6000 LB	CS, ASTM A105, ASME B16.11, NACE		
	COUPLING 1" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11, NACE		

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Piping Material Class Specification

Document No.:
000-SP-PI02-0038

Piping Material Class:
3CB2S55

Issue Date:
28-Feb-13

Revision
7

Prepared
SN

Checked
KAJ

Approved
GAD

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION			NOTES	REV
CAP	1/2" – 3/4"	SW	6000 LB	CS, ASTM A105, ASME B16.11, NACE			03 03	
CAP	1" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11, NACE				
CAP	1/2" – 1"	THRD	6000 LB	CS, ASTM A105, ASME B16.11, NACE				
CAP	1 1/2" – 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11, NACE				
SOCKOLET	1/2" – 3/4"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97, NACE			26 26 03 03	7 7
SOCKOLET	1" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97, NACE				
SOCKOLET FLAT	1/2" – 3/4"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97, NACE				
SOCKOLET FLAT	1" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97, NACE				
THREDOLET	1/2" – 1"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97, NACE			03	
THREDOLET	1 1/2" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97, NACE			03	
WELDOLET	3" – 20"	WELD		CS, ASTM A105, MSS-SP-97, NACE				
90 ELL	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
90 ELL	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9, NACE				
45 ELL	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
45 ELL	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9, NACE				
TEE	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
TEE	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9, NACE				
TEE (RED.)	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
TEE (RED.)	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9, NACE				
CAP	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
CAP	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9, NACE				
REDUCER (CC)	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
REDUCER (CC)	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9, NACE				
REDUCER (EC)	3" – 20"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9, NACE				
REDUCER (EC)	24" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9, NACE				
VALVES					TAG NO.	SHORT CODE		
GATE	1/2" – 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	GWCS06	VG	06, 03 15	
GATE	1/2" – 2"	THRD/SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	GWCY06	VG2		
GATE	1/2" – 2"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12), Conventional Port, NACE	GBCF10	VGf		
GATE	3" – 12"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, NACE	GBCF11	VG		
GATE	14" – 24"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12), Full Port, GO, NACE	GBCF12	VG		
GLOBE	1/2" – 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	LWCS06	VL		
GLOBE	3" – 8"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	LBCF04	VL		
LIFT CHECK	1/2" – 2"	SW	CL 800	CS Body W/ 316 SS TRIM, HF ST (API #12), Piston Type, NACE	CWCS06	VC	61	
SWING CHECK	3" – 10"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	CBCF09	VC	62	
SWING CHECK	12" – 24"	RF	CL 300	CS Body W/ 316 SS TRIM, HF ST (API #12), NACE	CBCF09	VCF	62	
DUAL PLT CHECK	12" – 24"	RF	CL 300	CS Body W/ 316 SS DISC, HF ST (API #12), DBL FLGD, NACE	CBCF10	VC	63	
BALL	3/4" – 4"	RF	CL 300	CS Body W/ CR. CARBIDE CTD. ST, FLOATING BALL, RP, SP, LEVER, NACE	BBCF07	VB1	09, 26	
BALL	6" – 8"	RF	CL 300	CS Body W/ CR. CARBIDE CTD. ST, FLOATING BALL, RP, SP, GO, NACE	BBCF08	VB1	09, 26	
BALL	10" – 24"	RF	CL 300	CS Body W/ CR. CARBIDE CTD. ST, TRUNNION BALL, RP, LP, GO, NACE	BBCF09	VB1	09, 26	
FLANGES								
SOCKETWELD	1/2" – 2"	RF	CL 300	CS, ASTM A105, ASME B16.5, NACE				
WELDNECK	3" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5, NACE				
BLIND	1/2" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5, NACE				
SOCKETWELD	1/2" – 2"	RF	CL 600	CS, ASTM A105, ASME B16.5, NACE				
WELDNECK	3" – 24"	RF	CL 600	CS, ASTM A105, ASME B16.5, NACE				
PR WN ORIFICE	1" – 24"	RF	CL 300	CS, ASTM A105 W/ 1/2" SOCKETWELD TAPS, ASME B16.36, NACE				
MISCELLANEOUS								
FIGURE 8 BLANK	1/2" – 12"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE				
PADDLE BLANK	1/2" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE				
PADDLE SPACER	1/2" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE				

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  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0038		
		Piping Material Class: 3CB2S55		
		Issue Date: 28-Feb-13	Revision 7	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH./RAT	MATERIAL DESCRIPTION	NOTES	REV
PADDLE BLANK	3" – 24"	RF	CL 600	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE		7
PADDLE SPACER	3" – 24"	RF	CL 600	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, NACE		7
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDC03, NACE	553	
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/32" Dia. Hole @ 3/64" Center, TAG# YSDC04, NACE	554	
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 300	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSBS08, NACE	555	
GASKETS	½" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE		7
	½" – 24"		CL 600	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING, NACE		7
BOLTING	STUD	ALL	CL 300	ALLOY STEEL, ASTM A193 GRADE B7M, ASTM A 194 GRADE 2HM HEAVY HEX NUTS, NACE		
	STUD	ALL	CL 600	ALLOY STEEL, ASTM A193 GRADE B7M, ASTM A 194 GRADE 2HM HEAVY HEX NUTS, NACE		

 	Piping Material Class Specification	Document No.: 000-SP-PI02-0038		
		Piping Material Class: 3CB2S55		
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		Prepared SN	Checked KAJ	Approved GAD

90° BRANCH CONNECTION CHART

BRANCH SIZE	24	T															
	20	E	T														
	18	P	E	T													
	16	P	P	E	T												
	14	P	P	P	E	T											
	12	P	P	P	P	E	T										
	10	P	P	P	P	P	E	T									
	8	W	W	W	W	W	W	E	T								
	6	W	W	W	W	W	W	W	E	T							
	4	W	W	W	W	W	W	W	W	E	T						
	3	W	W	W	W	W	W	W	W	W	E	T					
	2	S	S	S	S	S	S	S	S	S	S	T					
	1½	S	S	S	S	S	S	S	S	S	S	E	T				
	1	S	S	S	S	S	S	S	S	S	S	E	E	T			
	¾	S	S	S	S	S	S	S	S	S	S	S	E	E	T		
	½	S	S	S	S	S	S	S	S	S	S	S	E	E	E	T	
		24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
HEADER SIZE																	

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet

 	Piping Material Class Specification	Document No.: 000-SP-PI02-0038		
		Piping Material Class: 3CB2S55		
		Issue Date: 28-Feb-13	Revision 7	
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
15. These valves shall be used if mating to flanged nozzles.
26. To be used only if indicated on the P&ID.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
504. Pipe and pipe components thicker than 0.611" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
554. Use this strainer for Vapor / Gas Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
558. Services designated as "General Process" include "Hydrogen Service". Material Class selected for Hydrogen Service is based on the design condition limits in accordance with API 941 (Nelson Curve).
571. Occasional variations above the design conditions to a temperature Limit of 1000F is acceptable provided the code listed conditions are met.
1000. The requirements of NACE MR0103 shall be met where NACE is specified in the material description. All components shall be hardness tested.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0055		
		Piping Material Class: 3CB4S		
		Issue Date: 28-Feb-13		Revision 5
		Prepared SN	Checked KAJ	Approved GAD

Services	General Process	Basic Material	Killed Carbon Steel
Pressure Rating:	CL 300, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0.25"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > ¾")
Flange Facing:	RF	Basic Construction:	¾" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class B Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS ¾" Through NPS 24" (Full flange ratings per B16.5)

Temp F	0 to 100	200	300	400	500	600	650	700	750	800
psig	740	680	655	635	605	570	550	530	505	410

For NPS 30" and Larger (Note 501, 504)

Temp F	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc
psig	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	¾" - 1 ½"	PE	XXS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	2" - 2"	PE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	3" - 3"	BE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	4" - 4"	BE	120	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	6" - 8"	BE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	10" - 10"	BE	80	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	12" - 14"	BE	60	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	16" - 24"	BE	60	LTCS, ASTM A333 GRADE 6, SMLS, ASME B36.10		
NIPPLES	½" - ½"	PBE	80S	SS, ASTM A312 GRADE TP 304/304L, SMLS, ASME B36.19, 3" (75mm) & 6" (150mm) LONG	503	
	¾" - 1 ½"	PBE	XXS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503	
	2" - 2"	PBE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503	
	½" - 1"	TOE	160	SS, ASTM A312 GRADE TP 304/304L, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	03	5
	2" - 2"	TOE	XXS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	03	
CONC. SWAGES	¾" - 2"	PBE	XXS/160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	3" - 4"	BLE x PSE	(160/120) x	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	(¾" - 2")		(XXS/160)			
FITTINGS					02	
90 ELL	¾" - 1 ½"	SW	9000 LB	CS, ASTM A105, ASME B16.11		
90 ELL	2" - 2"	SW	6000 LB	CS, ASTM A105, ASME B16.11		
45 ELL	¾" - 1 ½"	SW	9000 LB	CS, ASTM A105, ASME B16.11		
45 ELL	2" - 2"	SW	6000 LB	CS, ASTM A105, ASME B16.11		
TEE	¾" - 1 ½"	SW	9000 LB	CS, ASTM A105, ASME B16.11		
TEE	2" - 2"	SW	6000 LB	CS, ASTM A105, ASME B16.11		
TEE (RED)	¾" - 2"	SW	9000 LB	CS, ASTM A105, ASME B16.11		
PLUG	¾" - 2"	THRD		CS, ASTM A105, ASME B16.11, ROUND HEAD	03	
PLUG	½" - ½"	PE		CS, ASTM A105, ASME B16.11, BARSTOCK, ROUND HEAD	53	
COUPLING	¾" - 1 ½"	SW	9000 LB	CS, ASTM A105, ASME B16.11		
COUPLING	2" - 2"	SW	6000 LB	CS, ASTM A105, ASME B16.11		
CAP	¾" - 1 ½"	SW	9000 LB	CS, ASTM A105, ASME B16.11		

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 	Piping Material Class Specification	Document No.: 000-SP-PI02-0055		
		Piping Material Class: 3CB4S		
		Issue Date: 28-Feb-13	Revision 5	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION			NOTES	REV
CAP	2" - 2"	SW	6000 LB	CS, ASTM A105, ASME B16.11			03	
CAP	2" - 2"	THRD	6000 LB	CS, ASTM A105, ASME B16.11				
SOCKOLET	¾" - 1 ½"	WELD	9000 LB	CS, ASTM A105, MSS-SP-97			26	
SOCKOLET	2" - 2"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97				
SW ELBOLET	(3" - 24")	WELD	9000 LB	CS, ASTM A105, MSS-SP-97			03	
	(1 ½" - 1 ½")							
THREDOLET	2" - 2"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97				
WELDOLET	3" - 20"	WELD		CS, ASTM A105, MSS-SP-97				
90 ELL	3" - 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
90 ELL	16" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
45 ELL	3" - 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
45 ELL	16" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
TEE	3" - 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
TEE	16" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
TEE (RED.)	3" - 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
TEE (RED.)	16" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
CAP	3" - 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
CAP	16" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
REDUCER (CC)	3" - 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
REDUCER (CC)	16" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
REDUCER (EC)	3" - 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
REDUCER (EC)	16" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
VALVES					TAG NO.	SHORT CODE		
GATE	1" - 2"	SW	CL 1500	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	GFCS01	VG	06, 03	
GATE	1" - 2"	THRD/SW	CL 1500	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	GFCY01	VG2		
GATE	½" - ¾"	THRD/SW	CL 800	316L SS Body W/ 316 SS TRIM, HF ST (API #12)	GWSY01	VG3	520	06, 15
GATE	2" - 2"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GBCF01	VGA		
GATE	3" - 12"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GBCF01	VG	61	
GATE	14" - 24"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, GO	GBCF02	VG		
GLOBE	1" - 2"	SW	CL 1500	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	LFCS01	VL	62	
GLOBE	3" - 8"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8)	LBCF01	VL		
LIFT CHECK	1" - 2"	SW	CL 1500	CS Body W/ 13 CR TRIM, Full HF ST (API #5), Piston Type	CFCS01	VC	61	
SWING CHECK	3" - 24"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8)	CBCF01	VC	62	
FLANGES								
SOCKETWELD	¾" - 2"	RF	CL 300	CS, ASTM A105, ASME B16.5				
WELDNECK	3" - 24"	RF	CL 300	CS, ASTM A105, ASME B16.5				
BLIND	¾" - 24"	RF	CL 300	CS, ASTM A105, ASME B16.5				
SOCKETWELD	¾" - 2"	RF	CL 600	CS, ASTM A105, ASME B16.5				
WELDNECK	3" - 24"	RF	CL 600	CS, ASTM A105, ASME B16.5				
PR WN ORIFICE	1" - 24"	RF	CL 300	CS, ASTM A105 W/ ½" SOCKETWELD TAPS, ASME B16.36				
MISCELLANEOUS								
FIGURE 8 BLANK	¾" - 12"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, HC Service			539	
PADDLE BLANK	¾" - 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, HC Service			539	
PADDLE SPACER	¾" - 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, HC Service			539	5
PADDLE BLANK	3" - 24"	RF	CL 600	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, HC Service			539	
PADDLE SPACER	3" - 24"	RF	CL 600	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, HC Service			539	5
CONE STRAINER - TRUNCATED TYPE	3" - 24"	RF	CL 300	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSBS01			555	
GASKETS								
	¾" - 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING				5
	¾" - 24"		CL 600	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING				5

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 	Piping Material Class Specification	Document No.: 000-SP-PI02-0055		
		Piping Material Class: 3CB4S		
		Issue Date: 28-Feb-13	Revision 5	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION	NOTES	REV
BOLTING STUD STUD	ALL ALL		CL 300 CL 600	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		

  Refineria de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0055		
		Piping Material Class: 3CB4S		
		Issue Date: 28-Feb-13		Revision 5
		Prepared SN	Checked KAJ	Approved GAD

90° BRANCH CONNECTION CHART

BRANCH SIZE	24	T															
	20	E	T														
	18	P	E	T													
	16	P	P	E	T												
	14	P	P	P	E	T											
	12	P	P	P	P	E	T										
	10	P	P	P	P	P	E	T									
	8	W	W	W	W	W	W	E	T								
	6	W	W	W	W	W	W	W	E	T							
	4	W	W	W	W	W	W	W	W	E	T						
	3	W	W	W	W	W	W	W	W	W	E	T					
	2	S	S	S	S	S	S	S	S	S	S	T					
	1½	S	S	S	S	S	S	S	S	S	S	E	T				
	1	S	S	S	S	S	S	S	S	S	S	E	E	T			
	¾	S	S	S	S	S	S	S	S	S	S	S	E	E	T		
		24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	
HEADER SIZE																	

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet

  Refineria de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0055		
		Piping Material Class: 3CB4S		
		Issue Date: 28-Feb-13	Revision 5	
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
26. To be used only if indicated on the P&ID.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
504. Pipe and pipe components thicker than 0.611" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
520. These valves shall be used only for instrument connections.
539. HC Service means high corrosive service. Figure 8 Blank, Paddle Blank, & Paddle Spacer in HC Service shall be with a thickness equal to B16.48 thickness plus 1/8" (3mm).
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.



Approved
GAD

		Piping Material Class Specification	Document No.: 000-SP-PI02-0248		
			Piping Material Class: 3CB4S04		
			Issue Date: 28-Feb-13	Revision 1	
			Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION			NOTES	REV
CAP	¾" – 1 ½"	SW	9000 LB	CS, ASTM A105, ASME B16.11			03	
CAP	2" – 2"	SW	6000 LB	CS, ASTM A105, ASME B16.11				
CAP	2" – 2"	THRD	6000 LB	CS, ASTM A105, ASME B16.11				
SOCKOLET	¾" – 1 ½"	WELD	9000 LB	CS, ASTM A105, MSS-SP-97			26	
SOCKOLET	2" – 2"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97				
SW ELBOLET	(3" – 24")	WELD	9000 LB	CS, ASTM A105, MSS-SP-97				
THREDOLET	(1 ½" – 1 ½")						03	
THREDOLET	2" – 2"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97				
WELDOLET	3" – 20"	WELD		CS, ASTM A105, MSS-SP-97				
90 ELL	3" – 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
90 ELL	16" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
45 ELL	3" – 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
45 ELL	16" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
TEE	3" – 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
TEE	16" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
TEE (RED.)	3" – 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
TEE (RED.)	16" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
CAP	3" – 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
CAP	16" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
REDUCER (CC)	3" – 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
REDUCER (CC)	16" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
REDUCER (EC)	3" – 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
REDUCER (EC)	16" – 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
VALVES					TAG NO.	SHORT CODE		
GATE	1" – 2"	SW	CL 1500	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	GFC001	VG	06, 03	520
GATE	1" – 2"	THRD/SW	CL 1500	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	GFCY01	VG2		
GATE	½" – ¾"	THRD/SW	CL 800	316L SS Body W/ 316 SS TRIM, HF ST (API #12)	GWSY01	VG3		
GATE	2" – 2"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GBCF01	VGA	06, 15	
GATE	3" – 12"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GBCF01	VG		
GATE	14" – 24"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, GO	GBCF02	VG		
GLOBE	1" – 2"	SW	CL 1500	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	LFCS01	VL		
GLOBE	3" – 8"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8)	LBCF01	VL		
LIFT CHECK	1" – 2"	SW	CL 1500	CS Body W/ 13 CR TRIM, Full HF ST (API #5), Piston Type	CFCS01	VC		
SWING CHECK	3" – 24"	RF	CL 300	CS Body W/ 13 CR TRIM, HF ST (API #8)	CBCF01	VC	61	
							62	
FLANGES								
SOCKETWELD	½" – ½"	RF	CL 300	SS, ASTM A182 GRADE F304/304L, ASME B16.5				1
SOCKETWELD	¾" – 2"	RF	CL 300	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5				
BLIND	¾" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5				
SOCKETWELD	¾" – 2"	RF	CL 600	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 600	CS, ASTM A105, ASME B16.5				
PR WN ORIFICE	1" – 24"	RF	CL 300	CS, ASTM A105 W/ ½" SOCKETWELD TAPS, ASME B16.36				
MISCELLANEOUS								
FIGURE 8 BLANK	¾" – 12"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, HC Service			539	
PADDLE BLANK	¾" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, HC Service			539	
PADDLE SPACER	¾" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, HC Service			539	
PADDLE BLANK	3" – 24"	RF	CL 600	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, HC Service			539	
PADDLE SPACER	3" – 24"	RF	CL 600	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48, HC Service			539	
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 300	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSBS01			555	
GASKETS								
	½" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING				1

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  Refineria de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0248		
		Piping Material Class: 3CB4S04		
		Issue Date: 28-Feb-13	Revision 1	Prepared SN
			Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION	NOTES	REV
	3/4" – 24"		CL 600	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
BOLTING STUD STUD	ALL ALL		CL 300 CL 600	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		

 	Piping Material Class Specification	Document No.: 000-SP-PI02-0248		
		Piping Material Class: 3CB4S04		
		Issue Date: 28-Feb-13		Revision 1
		Prepared SN	Checked KAJ	Approved GAD

90° BRANCH CONNECTION CHART

BRANCH SIZE	24	T														
	20	E	T													
	18	P	E	T												
	16	P	P	E	T											
	14	P	P	P	E	T										
	12	P	P	P	P	E	T									
	10	P	P	P	P	P	E	T								
	8	W	W	W	W	W	W	E	T							
	6	W	W	W	W	W	W	W	E	T						
	4	W	W	W	W	W	W	W	W	E	T					
	3	W	W	W	W	W	W	W	W	W	E	T				
	2	S	S	S	S	S	S	S	S	S	S	S	T			
	1½	S	S	S	S	S	S	S	S	S	S	S	E	T		
	1	S	S	S	S	S	S	S	S	S	S	S	E	E	T	
	¾	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T
	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	
HEADER SIZE																

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet

  Refineria de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0248		
		Piping Material Class: 3CB4S04		
		Issue Date: 28-Feb-13		Revision 1
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

- 02. All butt-welded component thicknesses shall match the pipe thickness.
- 03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
- 06. These valves shall be used only for vent, drain, and instrument connections.
- 09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
- 26. To be used only if indicated on the P&ID.
- 53. This item shall be used for orifice flange tap connections only.
- 61. These check valves shall be installed in a horizontal position with cover up.
- 62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
- 501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
- 502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
- 503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
- 504. Pipe and pipe components thicker than 0.611" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
- 520. These valves shall be used only for instrument connections.
- 539. HC Service means high corrosive service. Figure 8 Blank, Paddle Blank, & Paddle Spacer in HC Service shall be with a thickness equal to B16.48 thickness plus 1/8" (3mm).
- 555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
- 1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0062		
		Piping Material Class: 3CJ2S		
		Issue Date: 28-Feb-13	Revision 3	Prepared SN
			Checked KAJ	Approved GAD

Services	General Process	Basic Material	1 ¼ CR- 1/2 MO
Pressure Rating:	CL 300, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0.125"
Material Group:	1.9	Stress Relief	ASME B31.3 (W.T. > ½")
Flange Facing:	RF	Basic Construction:	1/2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class B Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS ½" Through NPS 24" (Full flange ratings per B16.5)

Temp F	-20 to 100	200	300	400	500	600	650	700	750	800	850	900	950	1000
psig	750	750	720	695	665	605	590	570	530	510	485	450	320	215

For NPS 30" and Larger (Note 501)

Temp F	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc
psig	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	½" – ¾" 1" - 2" 3" - 16" 18" - 24"	PE PE BE BE	160 XS XS 40	1 ¼ CR – ½ MO, ASTM A335 GRADE P11, SMLS, ASME B36.10 1 ¼ CR – ½ MO, ASTM A335 GRADE P11, SMLS, ASME B36.10 1 ¼ CR – ½ MO, ASTM A335 GRADE P11, SMLS, ASME B36.10 1 ¼ CR – ½ MO, ASTM A335 GRADE P11, SMLS, ASME B36.10		
NIPPLES	½" – ¾" 1" – 2" ½" – 2" ½" – 1" 1 ½" – 2"	PBE PBE PBE TOE TOE	160 XS 160 XXS 160	1 ¼ CR – ½ MO, ASTM A335 GRADE P11, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG 1 ¼ CR – ½ MO, ASTM A335 GRADE P11, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG 1 ¼ CR – ½ MO, ASTM A335 GRADE P11, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG 1 ¼ CR – ½ MO, ASTM A335 GRADE P11, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG 1 ¼ CR – ½ MO, ASTM A335 GRADE P11, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503 03 03	
CONC. SWAGES	½" – 2" ½" – 2" 3" – 4" (½" – 2")	TSE PBE BLE x PSE	XXS/160 160/XS XS x (160/XS)	1 ¼ CR – ½ MO, ASTM A234 GRADE WP11 CL1, SMLS, MSS-SP-95 1 ¼ CR – ½ MO, ASTM A234 GRADE WP11 CL1, SMLS, MSS-SP-95 1 ¼ CR – ½ MO, ASTM A234 GRADE WP11 CL1, SMLS, MSS-SP-95	03	
FITTINGS	90 ELL ½" – ¾" 90 ELL 1" - 2" 45 ELL ½" – ¾" 45 ELL 1" - 2" TEE ½" – ¾" TEE 1" - 2" TEE (RED) ½" – ¾" TEE (RED) 1" - 2" 45 LATERAL ½" – ¾" 45 LATERAL 1" - 2"	SW SW SW SW SW SW SW SW SW SW	6000 LB 3000 LB 6000 LB 3000 LB 6000 LB 3000 LB 6000 LB 3000 LB 6000 LB 3000 LB	1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11 1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11 1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11 1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11 1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11 1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11 1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11 1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11 1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11 1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11	02	3 3

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	Piping Material Class Specification		Document No.: 000-SP-PI02-0062		
			Piping Material Class: 3CJ2S		
			Issue Date: 28-Feb-13		Revision 3
			Prepared SN	Checked KAJ	Approved GAD
					

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION			NOTES	REV
PLUG	½" – 2"	THRD		1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11, ROUND HEAD			03	
PLUG	½" – ½"	PE		1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11, BARSTOCK, ROUND HEAD			53	
COUPLING	½" – ¾"	SW	6000 LB	1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11				
COUPLING	1" – 2"	SW	3000 LB	1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11				
CAP	½" – ¾"	SW	6000 LB	1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11				
CAP	1" – 2"	SW	3000 LB	1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11				
CAP	½" – 1"	THRD	6000 LB	1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11			03	
CAP	1 ½" – 2"	THRD	3000 LB	1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.11			03	
SOCKOLET	½" – ¾"	WELD	6000 LB	1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, MSS-SP-97				
SOCKOLET	1" – 2"	WELD	3000 LB	1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, MSS-SP-97				
THREDOLET	½" – 1"	WELD	6000 LB	1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, MSS-SP-97			03	
THREDOLET	1 ½" – 2"	WELD	3000 LB	1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, MSS-SP-97			03	
WELDOLET	3" – 20"	WELD		1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, MSS-SP-97				
90 ELL	3" – 24"	WELD		1 ¼ CR – ½ MO, ASTM A234 GRADE WP11 CL1-S, ASME B16.9				
45 ELL	3" – 24"	WELD		1 ¼ CR – ½ MO, ASTM A234 GRADE WP11 CL1-S, ASME B16.9				
TEE	3" – 24"	WELD		1 ¼ CR – ½ MO, ASTM A234 GRADE WP11 CL1-S, ASME B16.9				
TEE (RED.)	3" – 24"	WELD		1 ¼ CR – ½ MO, ASTM A234 GRADE WP11 CL1-S, ASME B16.9				
CAP	3" – 24"	WELD		1 ¼ CR – ½ MO, ASTM A234 GRADE WP11 CL1-S, ASME B16.9				
REDUCER (CC)	3" – 24"	WELD		1 ¼ CR – ½ MO, ASTM A234 GRADE WP11 CL1-S, ASME B16.9				
REDUCER (EC)	3" – 24"	WELD		1 ¼ CR – ½ MO, ASTM A234 GRADE WP11 CL1-S, ASME B16.9				
VALVES					TAG NO.	SHORT CODE		
GATE	½" – 2"	SW	CL 800	1 ¼ CR – ½ MO Body W/ 13 CR TRIM, HF ST (API #8)	GWMS01	VG		
GATE	½" – 2"	THRD/SW	CL 800	1 ¼ CR – ½ MO Body W/ 13 CR TRIM, HF ST (API #8)	GWMY01	VG2	06, 03	
GATE	½" – 2"	RF	CL 300	1 ¼ CR – ½ MO Body W/ 13 CR TRIM, HF ST (API #8), Conventional Port	GBMF03	VGf	15	
GATE	3" – 12"	RF	CL 300	1 ¼ CR – ½ MO Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GBMF01	VG		
GATE	14" – 24"	RF	CL 300	1 ¼ CR – ½ MO Body W/ 13 CR TRIM, HF ST (API #8), Full Port, G.O.	GBMF02	VG		
GLOBE	½" – 2"	SW	CL 800	1 ¼ CR – ½ MO Body W/ 13 CR TRIM, HF ST (API #8)	LWMS01	VL		
GLOBE	3" – 8"	RF	CL 300	1 ¼ CR – ½ MO Body W/ 13 CR TRIM, HF ST (API #8)	LBMF01	VL		
LIFT CHECK	½" – 2"	SW	CL 800	1 ¼ CR – ½ MO Body W/ 13 CR TRIM, HF ST (API #8), Piston Type	CWMS01	VC	61	
SWING CHECK	3" – 10"	RF	CL 300	1 ¼ CR – ½ MO Body W/ 13 CR TRIM, HF ST (API #8)	CBMF01	VC	62	
SWING CHECK	12" – 24"	RF	CL 300	1 ¼ CR – ½ MO Body W/ 13 CR TRIM, HF ST (API #8)	CBMF01	VCF	62	
DUAL PLT CHECK	12" – 24"	RF	CL 300	1 ¼ CR – ½ MO Body W/ 410 SS DISC, HF ST (API #8), DBL FLGD	CBMF02	VC	63	
FLANGES								
SOCKETWELD	½" – 2"	RF	CL 300	1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 300	1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.5				
BLIND	½" – 24"	RF	CL 300	1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2, ASME B16.5				
PR WN ORIFICE	1" – 24"	RF	CL 300	1 ¼ CR – ½ MO, ASTM A182 GRADE F11 CL2 W/ ½" SW TAPS, ASME B16.36				
MISCELLANEOUS								
FIGURE 8 BLANK	½" – 12"	RF	CL 300	1 ¼ CR – ½ MO, ASTM A387 GRADE 11 CL2, ASME B16.48				
PADDLE BLANK	½" – 24"	RF	CL 300	1 ¼ CR – ½ MO, ASTM A387 GRADE 11 CL2, ASME B16.48				
PADDLE SPACER	½" – 24"	RF	CL 300	1 ¼ CR – ½ MO, ASTM A387 GRADE 11 CL2, ASME B16.48				
Y-STRAINER	½" – 2"	SW	CL 600	1 ¼ CR – ½ MO, ASTM A217 GRADE WC6 Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDM01			553	
Y-STRAINER	½" – 2"	SW	CL 600	1 ¼ CR – ½ MO, ASTM A217 GRADE WC6 Body, TP 304SS Screen W / 1/32" Dia. Hole @ 3/64" Center, TAG# YSDM02			554	
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 300	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSBS01			555	
GASKETS								
	½" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304 SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING			588	3
	½" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304 SS WDG, W/MICA / GRAPHITE / MICA FILLER, TP 304 SS INNER RING, CS OUTER RING			589	3

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 	Piping Material Class Specification	Document No.: 000-SP-PI02-0062		
		Piping Material Class: 3CJ2S		
		Issue Date: 28-Feb-13	Revision 3	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION	NOTES	REV
BOLTING STUD	ALL		CL 300	ALLOY STEEL, ASTM A193 GRADE B16, ASTM A 194 GRADE 4 HEAVY HEX NUTS		

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0062		
		Piping Material Class: 3CJ2S		
		Issue Date: 28-Feb-13		Revision 3
		Prepared SN	Checked KAJ	Approved GAD

90° BRANCH CONNECTION CHART

BRANCH SIZE	24	T															
	20	E	T														
	18	P	E	T													
	16	P	P	E	T												
	14	P	P	P	E	T											
	12	P	P	P	P	E	T										
	10	P	P	P	P	P	E	T									
	8	W	W	W	W	W	W	E	T								
	6	W	W	W	W	W	W	W	E	T							
	4	W	W	W	W	W	W	W	W	E	T						
	3	W	W	W	W	W	W	W	W	W	E	T					
	2	S	S	S	S	S	S	S	S	S	S	T					
	1½	S	S	S	S	S	S	S	S	S	S	E	T				
	1	S	S	S	S	S	S	S	S	S	S	E	E	T			
	¾	S	S	S	S	S	S	S	S	S	S	E	E	T			
	½	S	S	S	S	S	S	S	S	S	S	E	E	E	T		
		24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
HEADER SIZE																	

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0062		
		Piping Material Class: 3CJ2S		
		Issue Date: 28-Feb-13	Revision 3	
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
15. These valves shall be used if mating to flanged nozzles.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
554. Use this strainer for Vapor / Gas Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
588. Use Flexible Graphite Filler material for Non-Oxidizing services limited up to 900°F (482°C) operating temperature.
589. Use Mica / Graphite / Mica Filler material for Non-Oxidizing services above 900°F (482°C) to 1100°F (593°C) operating temperature.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.

	Piping Material Class Specification	Document No.: 000-SP-PI02-0085		
		Piping Material Class: 6CB2S02		
Issue Date: 28-Feb-13		Revision 7		
Prepared SN		Checked KAJ	Approved GAD	
 Refinería de Cartagena S.A.				

Services	Boiler Feed Water, Steam & Condensate	Basic Material	Killed Carbon Steel
Pressure Rating:	CL 600, ASME B16.5-2003 (Note 09)	Corrosion Allowance	0.125"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > ¾")
Flange Facing:	RF	Basic Construction:	1/2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class B Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS ½" Through NPS 6" (Full flange ratings per B16.5)

Temp F	0 to 100	200	300	400	500	600	650	700	750	800
psig	1480	1360	1310	1265	1205	1135	1100	1060	1015	825

For NPS 8" Through NPS 48" (Not Full flange ratings per B16.5)

Temp F	0 to 100	200	300	400	500	600	650	700	750	800
psig	1148	1148	1148	1148	1085	993	976	947	746	620

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	½" – 2"	PE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	3" – 10"	BE	XS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	12" – 14"	BE	60	CS, ASTM A106 GRADE B, SMLS, ASME B36.10		
	16" – 24"	BE	60	LTCS, ASTM A333 GRADE 6, SMLS, ASME B36.10		
	30" – 30"	BE	1.125"	CS, ASTM A672 GRADE C65 CL42, EFW, STR SM, ASME B36.10		
	36" – 42"	BE	1.500"	CS, ASTM A672 GRADE C65 CL42, EFW, STR SM, ASME B36.10		
	48" – 48"	BE	1.750"	CS, ASTM A672 GRADE C65 CL42, EFW, STR SM, ASME B36.10		
NIPPLES	½" – 2"	PBE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503	
	½" – 1 ½"	TOE	XXS	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	03	
	2" – 2"	TOE	160	CS, ASTM A106 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	03	
CONC. SWAGES	½" – 2"	TBE	XXS/160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	03, 26	7
	½" – 2"	TSE	XXS/160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	03	
	½" – 2"	PBE	160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	3" – 4"	BLE x PSE	XS x 160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	(½" – 2")					
ECC. SWAGES	½" – 2"	PBE	160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		7
	3" – 4"	BLE x PSE	XS x 160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
FITTINGS	90 ELL	½" – 2"	SW	6000 LB	CS, ASTM A105, ASME B16.11	02
	45 ELL	½" – 2"	SW	6000 LB	CS, ASTM A105, ASME B16.11	
	TEE	½" – 2"	SW	6000 LB	CS, ASTM A105, ASME B16.11	
	TEE (RED)	½" – 2"	SW	6000 LB	CS, ASTM A105, ASME B16.11	
	PLUG	½" – 2"	THRD		CS, ASTM A105, ASME B16.11, ROUND HEAD	03
	PLUG	½" – ½"	PE		CS, ASTM A105, ASME B16.11, BARSTOCK, ROUND HEAD	53
	COUPLING	½" – 2"	SW	6000 LB	CS, ASTM A105, ASME B16.11	
	CAP	½" – 2"	SW	6000 LB	CS, ASTM A105, ASME B16.11	

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  Refineria de Cartagena S.A.	Piping Material Class Specification		Document No.: 000-SP-PI02-0085		
			Piping Material Class: 6CB2S02		
			Issue Date: 28-Feb-13		Revision 7
			Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION			NOTES	REV
CAP	1/2" - 1 1/2"	THRD	6000 LB	CS, ASTM A105, ASME B16.11			03	
CAP	2" - 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11			03	
SOCKOLET	1/2" - 2"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97				
SOCKOLET FLAT	1/2" - 2"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97				
THREDOLET	1/2" - 1 1/2"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97			03	
THREDOLET	2" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97			03	
WELDOLET	3" - 42"	WELD		CS, ASTM A105, MSS-SP-97				
90 ELL	3" - 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
90 ELL	16" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
90 ELL	30" - 48"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9				
45 ELL	3" - 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
45 ELL	16" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
45 ELL	30" - 48"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9				
TEE	3" - 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
TEE	16" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
TEE	30" - 48"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9				
TEE (RED.)	3" - 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
TEE (RED.)	16" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
TEE (RED.)	30" - 48"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9				
CAP	3" - 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
CAP	16" - 48"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
REDUCER (CC)	3" - 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
REDUCER (CC)	16" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
REDUCER (CC)	30" - 48"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9				
REDUCER (EC)	3" - 14"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
REDUCER (EC)	16" - 24"	WELD		LTCS, ASTM A420 GRADE WPL6-S, ASME B16.9				
REDUCER (EC)	30" - 48"	WELD		LTCS, ASTM A420 GRADE WPL6-W, ASME B16.9				
VALVES				TAG NO.	SHORT CODE			
GATE	1/2" - 2"	SW	CL 800	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	GWCS02	VG		
GATE	1/2" - 2"	THRD/SW	CL 800	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	GWCY02	VG2	06, 03	
GATE	1/2" - 2"	RF	CL 600	CS Body W/ 13 CR TRIM, Full HF ST (API #5), Conventional Port	GDCF06	VGf	15	
GATE	3" - 8"	RF	CL 600	CS Body W/ 13 CR TRIM, Full HF ST (API #5), Full Port	GDCF04	VG		
GATE	10" - 24"	RF	CL 600	CS Body W/ 13 CR TRIM, Full HF ST (API #5), Full Port, GO	GDCF05	VG		
GLOBE	1/2" - 2"	SW	CL 800	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	LWCS02	VL		
GLOBE	3" - 8"	RF	CL 600	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	LDCF02	VL		
LIFT CHECK	1/2" - 2"	SW	CL 800	CS Body W/ 13 CR TRIM, Full HF ST (API #5), Piston Type	CWCS02	VC	61	
SWING CHECK	3" - 10"	RF	CL 600	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	CDCF04	VC	62	
SWING CHECK	12" - 24"	RF	CL 600	CS Body W/ 13 CR TRIM, Full HF ST (API #5)	CDCF04	VCF	62	
DUAL PLT CHECK	12" - 24"	RF	CL 600	CS Body W/ 410 SS DISC, Full HF ST (API #5), DBL FLGD	CDCF05	VC	63	
BUTTER FLY	10" - 24"	RF	CL 600	CS Body W/ Resilient Metal ST, HF ST, DBL FLGD, GO.	FDCF01	VX	09	
BALL	3/4" - 2"	RF	CL 600	CS Body W/ RPTFE ST, 316SS Floating Ball, FP, LP, Lever	BDCF01	VB	09	
BALL	1/2" - 2"	THRD/SW	2000 WOG	CS Body W/ RPTFE ST, 316SS FLOATING BALL, FP, LEVER	BUCYAA	VB1	09, 26	7
FLANGES								
SOCKETWELD	1/2" - 2"	RF	CL 600	CS, ASTM A105, ASME B16.5				
WELDNECK	3" - 24"	RF	CL 600	CS, ASTM A105, ASME B16.5				
BLIND	1/2" - 24"	RF	CL 600	CS, ASTM A105, ASME B16.5				
WELDNECK	30" - 48"	RF	CL 600	CS, ASTM A105, ASME B16.47 SERIES A				
BLIND	30" - 48"	RF	CL 600	CS, ASTM A105, ASME B16.47 SERIES A				
PR WN ORIFICE	1" - 24"	RF	CL 600	CS, ASTM A105 W/ 1/2" SOCKETWELD TAPS, ASME B16.36				
MISCELLANEOUS								
FIGURE 8 BLANK	1/2" - 12"	RF	CL 600	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE BLANK	1/2" - 24"	RF	CL 600	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE SPACER	1/2" - 24"	RF	CL 600	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
STEAM TRAP	1/2" - 1"	SW		Steam Trap Thermodynamic W/Strainer & Blow Down Valve, ASTM A105, 900 psig PMO, 1500 psig PMA, TAG# ST-102			09	7

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  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0085		
		Piping Material Class: 6CB2S02		
		Issue Date: 28-Feb-13	Revision 7	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/RAT	MATERIAL DESCRIPTION	NOTES	REV
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDC01	553	
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/32" Dia. Hole @ 3/64" Center, TAG# YSDC02	554	
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 600	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSDS01	555	
GASKETS	½" – 24"		CL 600	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304 SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
	30" – 48"		CL 600	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304 SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
BOLTING						
STUD	ALL		CL 600	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0085		
		Piping Material Class: 6CB2S02		
		Issue Date: 28-Feb-13		Revision 7
		Prepared SN	Checked KAJ	Approved GAD

90° BRANCH CONNECTION CHART

BRANCH SIZE	48	T																		
	42	E	T																	
	36	P	E	T																
	30	P	P	E	T															
	24	P	P	P	E	T														
	20	P	P	P	P	E	T													
	18	P	P	P	P	P	E	T												
	16	P	P	P	P	P	P	E	T											
	14	P	P	P	P	P	P	P	E	T										
	12	P	P	P	P	P	P	P	P	E	T									
	10	P	P	P	P	P	P	P	P	P	E	T								
	8	W	W	W	W	W	W	W	W	W	W	E	T							
	6	W	W	W	W	W	W	W	W	W	W	W	E	T						
	4	W	W	W	W	W	W	W	W	W	W	W	W	E	T					
	3	W	W	W	W	W	W	W	W	W	W	W	W	W	E	T				
	2	S	S	S	S	S	S	S	S	S	S	S	S	S	S	T				
	1½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	T			
	1	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T		
	¾	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T		
	½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	E	T	
	48	42	36	30	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
HEADER SIZE																				

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet

  Refineria de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0085		
		Piping Material Class: 6CB2S02		
		Issue Date: 28-Feb-13		Revision 7
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
15. These valves shall be used if mating to flanged nozzles.
26. To be used only if indicated on the P&ID.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
504. Pipe and pipe components thicker than 0.611" may require impact-tested materials. See ASME B31.3, Paragraph 323.2.2.
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
554. Use this strainer for Vapor / Gas Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0160		
		Piping Material Class: 12CG0T01		
		Issue Date: 28-Feb-13		Revision 6
		Prepared SN	Checked KAJ	Approved GAD

Services	Fire Water, Dry System (A/G)	Basic Material	Galvanized Carbon Steel
Pressure Rating:	200 lb CWP	Corrosion Allowance	0"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > 3/4")
Flange Facing:	RF	Basic Construction:	1/2" - 2": THRD, 3" & UP: BW/FLGD
Examination:	Class B Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS 1/2" Through NPS 30" (Not Full flange ratings per B16.5)

Temp F	0 to 100	150	200
psig	200	200	200

For NPS 36" and Larger (Note 501)

Temp F	Calc	Calc	Calc
psig	Calc	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	1/2" - 2" 3" - 24" 30" - 30"	TE BE BE	XS STD STD	GALV, T&C, ASTM A53 GRADE B, SMLS, ASME B36.10 CS, ASTM A53 GRADE B, ERW, JE = 85%, ASME B36.10 CS, API 5L GRADE B, PSL1, SAWL, STR SM, JE = 95%, ASME B36.10	60 60	
NIPPLES	1/2" - 2" 1/2" - 2"	TBE TBE	XS 160	GALV, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG GALV, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503	
CONC. SWAGES	1/2" - 2" 3" - 4" (1/2" - 2")	TBE BLE x TSE	XS STD x XS	GALV, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
ECC. SWAGES	1/2" - 2" 3" - 4" (1/2" - 2")	TBE BLE x TSE	XS STD x XS	GALV, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		6 6
FITTINGS					02	
90 ELL	1/2" - 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
45 ELL	1/2" - 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
TEE	1/2" - 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
TEE (RED)	1/2" - 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
PLUG	1/2" - 2"	THRD		GALV, ASTM A105, ASME B16.11, ROUND HEAD		
COUPLING	1/2" - 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
COUPLING (RED.)	1/2" - 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
CAP	1/2" - 2"	THRD	3000 LB	GALV, ASTM A105, ASME B16.11		
UNION	1/2" - 2"	THRD	3000 LB	GALV, ASTM A105, GROUND JOINT, MSS-SP-83		
THREDOLET	1/2" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97		
WELDOLET	3" - 24"	WELD		CS, ASTM A105, MSS-SP-97		
90 ELL	3" - 30"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
45 ELL	3" - 30"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
TEE	3" - 30"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
TEE (RED.)	3" - 30"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		

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  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0160		
		Piping Material Class: 12CG0T01		
		Issue Date: 28-Feb-13	Revision 6	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION			NOTES	REV	
CAP REDUCER (CC) REDUCER (EC)	3" – 30" 3" – 30" 3" – 30"	WELD WELD WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9 CS, ASTM A234 GRADE WPB-W, ASME B16.9 CS, ASTM A234 GRADE WPB-W, ASME B16.9					
VALVES					TAG NO.	SHORT CODE			
GATE	½" – 2"	THRD	CL 200	Bronze Body W/ Bronze TRIM, Non-Listed DI Body W/ Bronze Trim, Resilient ST, FP, HW, FIRE WATER A/G SERVICE, UL / FM Approved DI Body W/ Bronze Trim, Resilient ST, FP, GO, Non-Listed	GUBT01	VG	06		
GATE	3" – 12"	FF	250 LB WWP		GUDF03	VG			
GATE	14" – 24"	FF	250 LB WWP		GUDF04	VG			
SWING CHECK	½" – 2"	THRD	CL 200	Bronze Body W/ Bronze TRIM, Swing Type, Non-Listed CS, Body W/ 13 CR TRIM, HF ST (API #8) , Non-Listed CS, Body W/ 13 CR TRIM, HF ST (API #8) , Non-Listed CS, Body W/ 410 SS DISC, HF ST (API #8), DBL FLGD, Non-Listed Bronze Body W/ Bronze TRIM, RP, Non-Listed	CUBT01	VC	62		
SWING CHECK	3" – 10"	RF	CL 150		CACF01	VC	62		
SWING CHECK	12" – 24"	RF	CL 150		CACF01	VCF	62		
DUAL PLT CHECK	12" – 24"	RF	CL 150		CACF02	VC	63		
BALL	½" – 2"	THRD	400 WOG		BUBT01	VB	09		
FLANGES									
THREADED	½" – 2"	RF	CL 150	GALV, ASTM A105, ASME B16.5 CS, ASTM A105, ASME B16.5 CS, ASTM A105, ASME B16.47 SERIES A GALV, ASTM A105, ASME B16.5 GALV, ASTM A105, ASME B16.47 SERIES A GALV, ASTM A105, ASME B16.5 CS, ASTM A105, ASME B16.5 CS, ASTM A105, ASME B16.47 SERIES A GALV, ASTM A105, ASME B16.5 GALV, ASTM A105, ASME B16.47 SERIES A				11 11	
WELDNECK	3" – 24"	RF	CL 150						
WELDNECK	30" – 30"	RF	CL 150						
BLIND	½" – 24"	RF	CL 150						
BLIND	30" – 30"	RF	CL 150						
THREADED	½" – 2"	FF	CL 150						
WELDNECK	3" – 24"	FF	CL 150						
WELDNECK	30" – 30"	FF	CL 150						
BLIND	½" – 24"	FF	CL 150						
BLIND	30" – 30"	FF	CL 150						
MISCELLANEOUS									
FIGURE 8 BLANK	½" – 12"	RF	CL 150	CS, ASTM A516 GRADE 70, GALVANIZED, ASME B16.48 CS, ASTM A516 GRADE 70, GALVANIZED, ASME B16.48 CS, ASTM A516 GRADE 70, GALVANIZED, ASME B16.48 Bronze, ASTM B61 Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSUB01				553	
PADDLE BLANK	½" – 24"	RF	CL 150						
PADDLE SPACER	½" – 24"	RF	CL 150						
Y-STRAINER	½" – 2"	THRD	300 psig CWP						
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 150	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSAS01				555	
GASKETS									
	½" – 24"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING GASKET FULL, ASME B16.21, ASME B16.5, 1/16" THK, GRAPHITE W/ TP 316 SS INSERT GASKET FULL, ASME B16.21, ASME B16.47 SERIES A, 1/16" THK, GRAPHITE W/ TP 316 SS INSERT				14 14	
	30" – 30"		CL 150						
	½" – 24"		CL 150						
	30" – 30"		CL 150						
BOLTING									
STUD	ALL		CL 150	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS					

 	Piping Material Class Specification	Document No.: 000-SP-PI02-0160		
		Piping Material Class: 12CG0T01		
		Issue Date: 28-Feb-13		Revision 6
		Prepared SN	Checked KAJ	Approved GAD

90° BRANCH CONNECTION CHART

BRANCH SIZE	30	T																
	24	E	T															
	20	P	E	T														
	18	P	P	E	T													
	16	P	P	P	E	T												
	14	P	P	P	P	E	T											
	12	P	P	P	P	P	E	T										
	10	P	P	P	P	P	P	E	T									
	8	W	W	W	W	W	W	W	E	T								
	6	W	W	W	W	W	W	W	W	E	T							
	4	W	W	W	W	W	W	W	W	W	E	T						
	3	W	W	W	W	W	W	W	W	W	W	E	T					
	2	D	D	D	D	D	D	D	D	D	D	D	T					
	1½	D	D	D	D	D	D	D	D	D	D	D	E	T				
	1	D	D	D	D	D	D	D	D	D	D	D	E	E	T			
	¾	D	D	D	D	D	D	D	D	D	D	D	E	E	E	T		
	½	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	T	
	30	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½	
HEADER SIZE																		

LEGEND:

E = Reducing Tee (BW for 3" and larger, THRD for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
D = Thredolet

T = Straight Tee (BW for 3" and larger, THRD for 2" and smaller)
W = Weldolet

 	Piping Material Class Specification	Document No.: 000-SP-PI02-0160		
		Piping Material Class: 12CG0T01		
		Issue Date: 28-Feb-13	Revision 6	
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
11. Flat-face flanges shall be provided adjacent to flat-face equipment nozzles.
14. Full-face gaskets shall be used at flat-faced flanges.
15. These valves shall be used if mating to flanged nozzles.
60. Pipe spools shall be flanged, shop fabrication shall be maximized and all spools shall be hot-dip galvanized after fabrication.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0161		
		Piping Material Class: 12CS2S		
		Issue Date: 28-Feb-13		Revision 7
		Prepared SN	Checked KAJ	Approved GAD

Services	Oily Water Sewer (U/G)	Basic Material	Carbon Steel (C & W)
Pressure Rating:	150 lb CWP	Corrosion Allowance	0.125"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > ¾")
Flange Facing:	FF	Basic Construction:	2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class B Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS 2" Through NPS 52" (Not Full flange ratings per B16.5)

Temp F	0 to 100	150
psig	150	150

For NPS 56" and Larger (Note 501)

Temp F	Calc	Calc
psig	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	½" – 2" 3" – 24" 30" – 48" 52" – 52"	PE BE BE BE	XS STD STD 0.375"	CS, ASTM A53 GRADE B, SMLS, ASME B36.10, C&W CS, ASTM A53 GRADE B, ERW, JE = 85%, ASME B36.10, C&W CS, API 5L GRADE B, PSL1, SAWL, STR SM, JE = 95%, ASME B36.10, C&W CS, API 5L GRADE B, PSL1, SAWL, STR SM, JE = 95%, ASME B36.10, C&W	1001, 516	7
NIPPLES	½" – 2" ½" – 2" ½" – ½" ¾" – 2" ½" – ½" ¾" – 2"	PBE PBE TOE TOE TBE TBE	XS 160 XXS 160 XXS 160	CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503 03 03 03 03	
CONC. SWAGES	½" – 2" 3" – 4" (2" – 2")	PBE BLE x PSE	XS STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		7
FITTINGS	90 ELL 2" – 2" 45 ELL 2" – 2" TEE 2" – 2" PLUG ½" – 2" PLUG 3" – 6" COUPLING 2" – 2" COUPLING 3" – 6" CAP 2" – 2" UNION 2" – 2" CAP ½" – ½" CAP ¾" – 2" SOCKOLET ½" – 2" THREDOLET ½" – ½" THREDOLET ¾" – 2"	SW SW SW THRD THRD SW SW x THRD SW SW SW THRD THRD WELD WELD WELD	3000 LB 3000 LB 3000 LB 3000 LB 3000 LB 3000 LB 3000 LB 6000 LB 3000 LB 3000 LB 3000 LB 6000 LB 3000 LB	CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11, ROUND HEAD CS, ASTM A105, ASME B16.11, RECESSED SQUARE SOCKET CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11 CS, ASTM A105, GROUND JOINT, MSS-SP-83 CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11 CS, ASTM A105, MSS-SP-97 CS, ASTM A105, MSS-SP-97 CS, ASTM A105, MSS-SP-97	02 03 03, 585 03, 585 03 03 03 03	

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  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0161		
		Piping Material Class: 12CS2S		
		Issue Date: 28-Feb-13	Revision 7	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION			NOTES	REV
WELDOLET	3" – 48"	WELD		CS, ASTM A105, MSS-SP-97				
90 ELL	3" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
90 ELL	52" – 52"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS				
45 ELL	3" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
45 ELL	52" – 52"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS				
TEE	3" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
TEE	52" – 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification For Non-STD Piping Components			1015	
TEE (RED.)	3" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
CAP	3" – 48"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
CAP	52" – 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification For Non-STD Piping Components			1015	
REDUCER (CC)	3" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
REDUCER (CC)	52" – 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification For Non-STD Piping Components			1015	
REDUCER (EC)	3" – 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
REDUCER (EC)	52" – 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification For Non-STD Piping Components			1015	
VALVES					TAG NO.	SHORT CODE		
GATE	½" – 2"	THRD	CL 200	Bronze Body W/ Bronze Trim	GUBT01	VG	06	
GATE	3" – 6"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GACF01	VG	543	
GATE	3" – 12"	FF	200 WWP	DI Body W/ BRONZE TRIM, RESILIENT ST, FULL PORT, W/2" SQUARE NUT, U/G SERVICE	GUDF07	VG1	09, 522, 543	7
KNIFE GATE	30" – 36"	RF	100 CWP	SS Body W/Buna Seat, Lug Style, GO, SERIES A, W/ HW Extension	KUSL04	VK	09	7
BUTTERFLY	2" – 4"	FF	200 CWP	DI Body W/ Buna Seat, Lug Style, Lever	FUDL01	VX	09	
BUTTERFLY	6" – 24"	FF	150 CWP	DI Body W/ Buna Seat, Lug Style, G.O.	FUDL02	VX	09	
BUTTERFLY	6" – 24"	FF	150 CWP	DI Body W/ Buna Seat, Lug Style, G.O. W/ Extended Stem	FUDL04	VX1	09	7
BALL	½" – 2"	THRD	400 WOG	Bronze Body W/ Bronze TRIM, RP	BUBT01	VB	09	
FLANGES								
SOCKETWELD	½" – 2"	FF	CL 150	CS, ASTM A105, ASME B16.5			11	
WELDNECK	3" – 24"	FF	CL 150	CS, ASTM A105, ASME B16.5			11	
WELDNECK	30" – 52"	FF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A			11	
BLIND	½" – 24"	FF	CL 150	CS, ASTM A105, ASME B16.5			11	
BLIND	30" – 52"	FF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A			11	
SOCKETWELD	½" – 2"	RF	CL 150	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5				
WELDNECK	30" – 52"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A				
BLIND	½" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5				
BLIND	30" – 52"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A				
MISCELLANEOUS								
FIGURE 8 BLANK	½" – 12"	FF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE BLANK	½" – 24"	FF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE SPACER	½" – 24"	FF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
VERTICAL PIPE TRAP	4" – 4"			Powder Coated Cast Iron, Vertical Pipe Trap W/Grate, NSERTASEAL VPT – 4" Type – 20 or Equal				
VERTICAL PIPE TRAP	6" – 6"			Powder Coated Cast Iron, Vertical Pipe Trap W/Grate, NSERTASEAL VPT – 6" Type – 19 or Equal				
VERTICAL PIPE TRAP	8" – 8"			Powder Coated Cast Iron, Vertical Pipe Trap W/Grate, NSERTASEAL VPT – 8" Type – 6 or Equal				7
FLANGE ISOLATION KIT	½" – 24"	RF	CL 150	ISOLATION GASKET, ASME B16.21, ASME B16.5, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.				7
FLANGE ISOLATION KIT	½" – 24"	FF	CL 150	ISOLATION GASKET, ASME B16.21, ASME B16.5, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.				7
GASKETS	½" – 24"		CL 150	GASKET FULL, ASME B16.21, ASME B16.5, 1/16" THCK, GRAPHITE W/ 316 SS INSERT			14	

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  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0161		
		Piping Material Class: 12CS2S		
		Issue Date: 28-Feb-13	Revision 7	Prepared SN
			Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
	1/2" – 24" 30" – 52" 30" – 52"		CL 150 CL 150 CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, CS OUTER RING, TP 304 SS INNER RING GASKET FULL, ASME B16.21, ASME B16.47 SERIES A, 1/16" THCK, GRAPHITE W/ 316 SS INSERT SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, CS OUTER RING, TP 304 SS INNER RING	14	7
BOLTING STUD	ALL		CL 150	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		

  Refinería de Cartagena S.A.	Piping Material Class Specification										Document No.: 000-SP-PI02-0161			
											Piping Material Class: 12CS2S			
											Issue Date: 28-Feb-13		Revision 7	
											Prepared SN	Checked KAJ	Approved GAD	

90° BRANCH CONNECTION CHART

BRANCH SIZE	52	T																				
	48	P	T																			
	42	P	E	T																		
	36	P	P	E	T																	
	30	P	P	P	E	T																
	24	P	P	P	P	E	T															
	20	P	P	P	P	P	E	T														
	18	P	P	P	P	P	P	E	T													
	16	P	P	P	P	P	P	P	E	T												
	14	P	P	P	P	P	P	P	P	E	T											
	12	P	P	P	P	P	P	P	P	P	E	T										
	10	P	P	P	P	P	P	P	P	P	P	E	T									
	8	W	W	W	W	W	W	W	W	W	W	W	E	T								
	6	W	W	W	W	W	W	W	W	W	W	W	W	E	T							
	4	W	W	W	W	W	W	W	W	W	W	W	W	W	E	T						
	3	W	W	W	W	W	W	W	W	W	W	W	W	W	W	E	T					
	2	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	T				
	1½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	X			
	1	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	X	X		
	¾	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	X	X	X	
	½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	X	X	X	X
		52	48	42	36	30	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
HEADER SIZE																						

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet
X = Do not use

 	Piping Material Class Specification	Document No.: 000-SP-PI02-0161		
		Piping Material Class: 12CS2S		
		Issue Date: 28-Feb-13	Revision 7	
		Prepared SN	Checked KAJ	Approved GAD

45° BRANCH CONNECTION CHART

BRANCH SIZE	52	B																
	48	B	B															
	42	B	B	B														
	36	B	B	B	B													
	30	B	B	B	B	B												
	24	B	B	B	B	B	B											
	20	B	B	B	B	B	B	B										
	18	B	B	B	B	B	B	B	B									
	16	B	B	B	B	B	B	B	B	B								
	14	B	B	B	B	B	B	B	B	B	B							
	12	B	B	B	B	B	B	B	B	B	B	B						
	10	B	B	B	B	B	B	B	B	B	B	B	B					
	8	B	B	B	B	B	B	B	B	B	B	B	B	B				
	6	B	B	B	B	B	B	B	B	B	B	B	B	B	B			
	4	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
	3	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
	2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	52	48	42	36	30	24	20	18	16	14	12	10	8	6	4	3	2	
HEADER SIZE																		

LEGEND:

B = Branch Weld (Note 516)
X = Do not use

 	Piping Material Class Specification	Document No.: 000-SP-PI02-0161		
		Piping Material Class: 12CS2S		
		Issue Date: 28-Feb-13	Revision 7	
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
11. Flat-face flanges shall be provided adjacent to flat-face equipment nozzles.
14. Full-face gaskets shall be used at flat-faced flanges.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
512. Underground piping shall be externally coated for corrosion protection in accordance with technical standard.
516. 45 degree stub-in's are permitted for U/G atmospheric sewers. See the 45 degree branch chart for permissible sizes.
522. Gaskets are not required at joints between HDPE flange adaptors. Gaskets are recommended when transitioning HDPE flange adaptors to non-lined metallic flanges.
543. These valves shall be used in valve boxes.
585. Use this for clean out.
1001. Underground piping shall be externally coated for corrosion protection in accordance with technical standard 166000-000-SP-MU10-0022.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.
1015. Non-Standard Piping Component shall be in accordance with "Specification For Non-Standard Piping Component", refer to document number: 000-SP-PI02-0232.

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0162		
		Piping Material Class: 12CS2S01		
		Issue Date: 28-Feb-13		Revision 6
		Prepared SN	Checked KAJ	Approved GAD

Services	Fire Water (A/G)	Basic Material	Carbon Steel
Pressure Rating:	200 lb CWP	Corrosion Allowance	0.125"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > ¾")
Flange Facing:	RF	Basic Construction:	1/2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class B Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS ½" Through NPS 24" (Not Full flange ratings per B16.5)

Temp F	0 to 100	150	200
psig	200	200	200

For NPS 30" and Larger (Note 501)

Temp F	Calc	Calc	Calc
psig	Calc	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	½" – 2" 3" – 24"	PE BE	XS STD	CS, ASTM A53 GRADE B, SMLS, ASME B36.10 CS, ASTM A53 GRADE B, ERW, JE = 85%, ASME B36.10	1022	
NIPPLES	½" – 2" ½" – 2" ½" – ½" ¾" – 2" 2 ½" – 2 ½"	PBE PBE TOE TOE TOE	XS 160 XXS 160 160	CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) LONG	503 03 03 03, 603	
CONC. SWAGES	½" – 2" ½" – 2" 3" – 4" (½" – 2")	TSE PBE BLE x PSE	XXS/160 XS STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	03	
FITTINGS					02	
90 ELL	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
45 ELL	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
TEE	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
TEE (RED)	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
PLUG	½" – 2"	THRD		CS, ASTM A105, ASME B16.11, ROUND HEAD	03	
COUPLING	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
CAP	½" – 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11		
CAP	½" – ½"	THRD	6000 LB	CS, ASTM A105, ASME B16.11	03	
CAP	¾" – 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11	03	
SOCKOLET	½" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97		
SOCKOLET	2 ½" – 2 ½"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97	603	
THREDOLET	½" – ½"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97	03	
THREDOLET	¾" – 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97	03	
WELDOLET	6" x 4"	WELD		CS, ASTM A105, MSS-SP-97	604	
WELDOLET	3" – 20"	WELD		CS, ASTM A105, MSS-SP-97		
90 ELL	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		
45 ELL	3" – 24"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		

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  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0162		
		Piping Material Class: 12CS2S01		
		Issue Date: 28-Feb-13	Revision 6	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION			NOTES	REV
TEE TEE (RED.) CAP REDUCER (CC) REDUCER (EC)	3" – 24" 3" – 24" 3" – 24" 3" – 24" 3" – 24"	WELD WELD WELD WELD WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 CS, ASTM A234 GRADE WPB-W, ASME B16.9 CS, ASTM A234 GRADE WPB-S, ASME B16.9 CS, ASTM A234 GRADE WPB-W, ASME B16.9 CS, ASTM A234 GRADE WPB-W, ASME B16.9				
VALVES					TAG NO.	SHORT CODE		
GATE	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8), Non-Listed	GWCS01	VG		
GATE	½" – 2"	THRD/SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8), Non-Listed	GWCY01	VG2	06, 03	
GATE	½" – 2"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Conventional Port, Non-Listed	GACF03	VGf	15	
GATE	2 ½" – 2 ½"	THRD	250 LB WWP	DI Body W/ Bronze Trim, Resilient ST, HW, FIRE WATER A/G SERVICE, UL / FM APPROVED	GUDT01	VGt	603	
GATE	3" – 12"	FF	250 LB WWP	DI Body W/ Bronze Trim, Resilient ST, FP, HW, FIRE WATER A/G SERVICE, UL / FM APPROVED	GUDF03	VG		
GATE	4" – 4"	FF	250 LB WWP	DI Body W/ Bronze Trim, Resilient ST, FP, HW, FIRE WATER A/G SERVICE, UL / FM APPROVED	GUDF06	VG1	604	
GATE	14" – 24"	FF	250 LB WWP	DI Body W/ Bronze Trim, Resilient ST, FP, GO, Non-Listed	GUDF04	VG		
LIFT CHECK	½" – 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API # 8), Piston Type, Non-Listed	CWCS01	VC	61	
SWING CHECK	3" – 10"	RF	CL 150	CS, Body W/ 13 CR TRIM, HF ST (API #8), Non-Listed	CACF01	VC	62	
SWING CHECK	12" – 24"	RF	CL 150	CS, Body W/ 13 CR TRIM, HF ST (API #8), Non-Listed	CACF01	VCF	62	
DUAL PLT CHECK	12" – 24"	RF	CL 150	CS, Body W/ 410 SS DISC, HF ST (API #8), DBL FLGD, Non-Listed	CACF02	VC	63	
FLANGES								
SOCKETWELD	½" – 2"	RF	CL 150	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5				
BLIND	½" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5				
SOCKETWELD	½" – 2"	FF	CL 150	CS, ASTM A105, ASME B16.5			11	
WELDNECK	3" – 24"	FF	CL 150	CS, ASTM A105, ASME B16.5			11	
BLIND	½" – 24"	FF	CL 150	CS, ASTM A105, ASME B16.5			11	
MISCELLANEOUS								
FIGURE 8 BLANK	½" – 12"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE BLANK	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE SPACER	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDC01			553	
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 150	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSAS01			555	
FLANGE ISOLATION KIT	½" – 24"	FF	CL 150	ISOLATION GASKET, ASME B16.21, ASME B16.5, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.				6
GASKETS								
	½" – 24"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING				6
	½" – 24"		CL 150	GASKET FULL, ASME B16.21, ASME B16.5, 1/16" THCK, GRAPHITE W/TP 316 SS INSERT			14	
BOLTING								
STUD	ALL		CL 150	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS				

 	Piping Material Class Specification	Document No.: 000-SP-PI02-0162		
		Piping Material Class: 12CS2S01		
		Issue Date: 28-Feb-13		Revision 6
		Prepared SN	Checked KAJ	Approved GAD

90° BRANCH CONNECTION CHART

BRANCH SIZE	24	T															
	20	E	T														
	18	P	E	T													
	16	P	P	E	T												
	14	P	P	P	E	T											
	12	P	P	P	P	E	T										
	10	P	P	P	P	P	E	T									
	8	W	W	W	W	W	W	E	T								
	6	W	W	W	W	W	W	W	E	T							
	4	W	W	W	W	W	W	W	W	E	T						
	3	W	W	W	W	W	W	W	W	W	E	T					
	2	S	S	S	S	S	S	S	S	S	S	T					
	1½	S	S	S	S	S	S	S	S	S	S	E	T				
	1	S	S	S	S	S	S	S	S	S	S	E	E	T			
	¾	S	S	S	S	S	S	S	S	S	S	S	E	E	T		
	½	S	S	S	S	S	S	S	S	S	S	S	E	E	E	T	
		24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
HEADER SIZE																	

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet

 	Piping Material Class Specification	Document No.: 000-SP-PI02-0162		
		Piping Material Class: 12CS2S01		
		Issue Date: 28-Feb-13	Revision 6	
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
11. Flat-face flanges shall be provided adjacent to flat-face equipment nozzles.
14. Full-face gaskets shall be used at flat-faced flanges.
15. These valves shall be used if mating to flanged nozzles.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
603. Use this for Fire Hydrant Hose Connections.
604. Use this for Pumper Connections.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.
1022. All fabricated Fire Hydrants shall be hot dip galvanized after fabrication in accordance with "Technical Specification For Pipe, Fittings & Flanges", refer to document number: 000-SP-PI02-0217.

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0166		
		Piping Material Class: 12CS2S02		
		Issue Date: 28-Feb-13	Revision 6	
		Prepared SN	Checked KAJ	Approved GAD

Services:	Oily Waste Water (A/G)	Basic Material	Carbon Steel
Pressure Rating:	150 lb CWP	Corrosion Allowance	0.125"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > ¾")
Flange Facing:	RF	Basic Construction:	1/2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class B Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS ½" Through NPS 52" (Not Full flange ratings per B16.5)

Temp F	0 to 100	150
psig	150	150

For NPS 56" and Larger (Note 501)

Temp F	Calc	Calc
psig	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	½" – 2" 3" – 24" 30" – 48" 52" – 52"	PE BE BE BE	XS STD STD 0.375"	CS, ASTM A53 GRADE B, SMLS, ASME B36.10 CS, ASTM A53 GRADE B, ERW, JE = 85%, ASME B36.10 CS, API 5L GRADE B, PSL1, SAWL, STR SM, JE = 95%, ASME B36.10 CS, API 5L GRADE B, PSL1, SAWL, STR SM, JE = 95%, ASME B36.10		
NIPPLES	½" – 2" ½" – 2" ½" – ½" ¾" – 2" ½" – ½" ¾" – 2"	PBE PBE TOE TOE TBE TBE	XS 160 XXS 160 XXS 160	CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503 03 03 03 03 03	
CONC. SWAGES	½" – 2" ½" – 2" 3" – 4" (½" – 2")	TSE PBE BLE x PSE	XXS/160 XS STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	03	6
ECC. SWAGES	½" – 2" ½" – 2" 3" – 4" (½" – 2")	TSE PBE BLE x PSE	XXS/160 XS STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95 CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	03	6 6 6
FITTINGS	90 ELL ½" – 2" 45 ELL ½" – 2" TEE ½" – 2" TEE (RED) ½" – 2" PLUG ½" – 2" PLUG ½" – ½" COUPLING ½" – 2" COUPLING ¾" – 2"	SW SW SW SW THRD PE SW THRD	3000 LB 3000 LB 3000 LB 3000 LB 3000 LB 3000 LB	CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11, ROUND HEAD CS, ASTM A105, ASME B16.11, BARSTOCK, ROUND HEAD CS, ASTM A105, ASME B16.11 CS, ASTM A105, ASME B16.11	02 03 53 03	 6 6

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  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0166		
		Piping Material Class: 12CS2S02		
		Issue Date: 28-Feb-13	Revision 6	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION		NOTES	REV
COUPLING (RED.)	2" x 3/8"	THRD	6000 LB	CS, ASTM A105, ASME B16.11		26	6
CAP	1/2" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11			
CAP	1/2" - 1/2"	THRD	6000 LB	CS, ASTM A105, ASME B16.11		03	
CAP	3/4" - 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11		03	
SOCKOLET	1/2" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97			
THREDOLET	1/2" - 1/2"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97		03	
THREDOLET	3/4" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97		03	
WELDOLET	3" - 48"	WELD		CS, ASTM A105, MSS-SP-97			
90 ELL	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			
90 ELL	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS			
45 ELL	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			
45 ELL	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS			
TEE	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			
TEE	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification For Non-STD Piping Components		1015	
TEE (RED.)	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			
CAP	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9			
CAP	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification For Non-STD Piping Components		1015	
REDUCER (CC)	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			
REDUCER (CC)	3" x 2 1/2"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9		26	
REDUCER (CC)	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification For Non-STD Piping Components		1015	
REDUCER (EC)	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			
REDUCER (EC)	52" - 52"	WELD		CS, ASTM A234 GRADE WPB-W, Specification For Non-STD Piping Components		1015	
VALVES							
GATE	1/2" - 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	TAG NO. GWCS01	SHORT CODE VG	
GATE	1/2" - 2"	THRD/SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	GWCY01	VG2	06, 03
GATE	1/2" - 2"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Conventional Port	GACF03	VGf	15
GATE	3" - 12"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GACF01	VG	
GATE	14" - 24"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, GO	GACF02	VG	
GATE	30" - 36"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, GO, Series-A	GACF22	VG	
GATE	42" - 48"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, GO, Series-A	GACF26	VG	
KNIFE GATE	2" - 12"	RF	150 CWP	SS Body W/Buna Seat, Lug Style	KUSL01	VK	09
DIAPHRAGM	4" - 4"	FF	CL 150	DI Body, PFA LINED, PTFE DIAPHRAGM	DADF01	VD	09, 1053
GLOBE	1/2" - 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	LWCS01	VL	
GLOBE	1/2" - 2"	THRD/SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	LWCY01	VLC	06, 03
GLOBE	3" - 8"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	LACF01	VL	
LIFT CHECK	1/2" - 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8), Piston Type	CWCS01	VC	61
SWING CHECK	3" - 6"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VC	62
SWING CHECK	8" - 24"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VCF	62
DUAL PLT CHECK	8" - 24"	RF	CL 150	CS Body W/ 410 SS DISC, (API #1), Wafer Type	CACW01	VC	63
DUAL PLT CHECK	30" - 48"	RF	CL 150	CS Body W/ 410 SS DISC, HF ST (API #8), DBL FLGD, Series-A	CACF03	VC	63
BUTTERFLY	2" - 4"	RF	200 CWP	DI Body W/ Buna-N Seat, DI Disc, Lug Style, Lever	FUDL01	VX	09
BUTTERFLY	6" - 24"	RF	150 CWP	DI Body W/ Buna-N Seat, DI Disc, Lug Style, G.O.	FUDL02	VX	09
BUTTERFLY	30" - 48"	FF	150 CWP	DI Body W/ Buna-N Seat, DI Disc, DBL FLGD, G.O., Series A	FUDF01	VX	09
FLANGES							
SOCKETWELD	1/2" - 2"	RF	CL 150	CS, ASTM A105, ASME B16.5			
WELDNECK	2 1/2" - 2 1/2"	RF	CL 150	CS, ASTM A105, ASME B16.5			
WELDNECK	3" - 24"	RF	CL 150	CS, ASTM A105, ASME B16.5			
WELDNECK	30" - 52"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A			
BLIND	1/2" - 24"	RF	CL 150	CS, ASTM A105, ASME B16.5			
BLIND	30" - 52"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A			
SOCKETWELD	1/2" - 2"	FF	CL 150	CS, ASTM A105, ASME B16.5			11
WELDNECK	3" - 24"	FF	CL 150	CS, ASTM A105, ASME B16.5			11
WELDNECK	30" - 52"	FF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A			11
BLIND	1/2" - 24"	FF	CL 150	CS, ASTM A105, ASME B16.5			11
BLIND	30" - 52"	FF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A			11
SOCKETWELD	1/2" - 2"	RF	CL 300	CS, ASTM A105, ASME B16.5			12

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		Piping Material Class: 12CS2S02		
		Issue Date: 28-Feb-13	Revision 6	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
WELDNECK	3" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5	12	6
SOCKETWELD	½" – 2"	RF	CL 600	CS, ASTM A105, ASME B16.5		6
WELDNECK	3" – 24"	RF	CL 600	CS, ASTM A105, ASME B16.5		6
PR WN ORIFICE	3" – 24"	RF	CL 300	CS, ASTM A105 W/ ½" SOCKETWELD TAPS, ASME B16.36		6
MISCELLANEOUS						
FIGURE 8 BLANK	½" – 12"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48	553	
PADDLE BLANK	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48		
PADDLE SPACER	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48		
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDC01		
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 150	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSAS01	555	
FLANGE ISOLATION KIT	½" – 24"	RF	CL 150	ISOLATION GASKET, ASME B16.21, ASME B16.5, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.		6
FLANGE ISOLATION KIT	½" – 24"	FF	CL 150	ISOLATION GASKET, ASME B16.21, ASME B16.5, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.		6
GASKETS						
	½" – 24"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, CS OUTER RING, TP 304 SS INNER RING	26	6
	2 ½" – 2 ½"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, CS OUTER RING, TP 304 SS INNER RING		6
	30" – 52"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, CS OUTER RING, TP 304 SS INNER RING		
	½" – 24"		CL 150	GASKET FULL, ASME B16.21, ASME B16.5, 1/16" THICK, GRAPHITE W/ 316 SS INSERT	14	
	30" – 52"		CL 150	GASKET FULL, ASME B16.21, ASME B16.47 SERIES A, 1/16" THICK, GRAPHITE W/ 316 SS INSERT	14	
	½" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, CS OUTER RING, TP 304 SS INNER RING		6
	½" – 24"		CL 600	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, CS OUTER RING, TP 304 SS INNER RING		6
BOLTING						
STUD	ALL		CL 150	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
STUD	ALL		CL 300	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
STUD	ALL		CL 600	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		6

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											Prepared SN	Checked KAJ	Approved GAD	

90° BRANCH CONNECTION CHART

BRANCH SIZE	52	T																			
	48	P	T																		
	42	P	E	T																	
	36	P	P	E	T																
	30	P	P	P	E	T															
	24	P	P	P	P	E	T														
	20	P	P	P	P	P	E	T													
	18	P	P	P	P	P	P	E	T												
	16	P	P	P	P	P	P	P	E	T											
	14	P	P	P	P	P	P	P	P	E	T										
	12	P	P	P	P	P	P	P	P	P	E	T									
	10	P	P	P	P	P	P	P	P	P	P	E	T								
	8	W	W	W	W	W	W	W	W	W	W	W	E	T							
	6	W	W	W	W	W	W	W	W	W	W	W	W	E	T						
	4	W	W	W	W	W	W	W	W	W	W	W	W	W	E	T					
	3	W	W	W	W	W	W	W	W	W	W	W	W	W	W	E	T				
	2	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	T			
	1½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	T		
	1	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T	
	¾	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T
	½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	E
	52	48	42	36	30	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
HEADER SIZE																					

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet

	Piping Material Class Specification	Document No.: 000-SP-PI02-0166		
 Refinería de Cartagena S.A.		Piping Material Class: 12CS2S02		
		Issue Date: 28-Feb-13		Revision 6
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NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
11. Flat-face flanges shall be provided adjacent to flat-face equipment nozzles.
12. These flanges shall be used only to match Class 300 flange connections at control valves and special equipment.
14. Full-face gaskets shall be used at flat-faced flanges.
15. These valves shall be used if mating to flanged nozzles.
26. To be used only if indicated on the P&ID.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.
1015. Non-Standard Piping Component shall be in accordance with "Specification For Non-Standard Piping Component", refer to document number: 000-SP-PI02-0232.
1053. These Diaphragm valves shall be limited to 150 psig maximum.

	Piping Material Class Specification	Document No.: 000-SP-PI02-0164		
		Piping Material Class: 12CS2S03		
Issue Date: 28-Feb-13		Revision 8		
Prepared SN		Checked KAJ	Approved GAD	
 Refinería de Cartagena S.A.				

Services	Fresh Cooling Water, Raw Water Service (A/G)	Basic Material	Carbon Steel
Pressure Rating:	150 lb CWP	Corrosion Allowance	0.125"
Material Group:	1.1	Stress Relief	ASME B31.3 (W.T. > ¾")
Flange Facing:	RF	Basic Construction:	1/2" - 2": SW, 3" & UP: BW/FLGD
Examination:	Class A Per Tech. Spec (Note 1013)	Design Code	ASME B31.3-2006

For NPS ½" Through NPS 56" (Not Full flange ratings per B16.5)

Temp F	0 to 100	150	200
psig	150	150	150

For NPS 60" and Larger (Note 501)

Temp F	Calc	Calc	Calc
psig	Calc	Calc	Calc

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
PIPE	½" – 2"	PE	XS	CS, ASTM A53 GRADE B, SMLS, ASME B36.10	26, 1061	8
	3" – 24"	BE	STD	CS, ASTM A53 GRADE B, ERW, JE = 85%, ASME B36.10		
	28" – 28"	BE	STD	CS, API 5L GRADE B, PSL1, SAWL, STR SM, JE = 95%, ASME B36.10		
	30" – 42"	BE	STD	CS, API 5L GRADE B, PSL1, SAWL, STR SM, JE = 95%, ASME B36.10		
	48" – 48"	BE	XS	CS, API 5L GRADE B, PSL1, SAWL, STR SM, JE = 95%, ASME B36.10		
	52" – 56"	BE	0.500"	CS, API 5L GRADE B, PSL1, SAWL, STR SM, JE = 95%, ASME B36.10		
	32" – 32"	BE	STD	CS, API 5L GRADE B, PSL1, SAWL, STR SM, JE = 95%, ASME B36.10	26	
NIPPLES	½" – 2"	PBE	XS	CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG	503 03 03 03, 26 03, 26 03, 26	8
	½" – 2"	PBE	160	CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
	½" – ½"	TOE	XXS	CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
	¾" – 2"	TOE	160	CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
	4" – 4"	TOE	XS	CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
	½" – ½"	TBE	XXS	CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
	¾" – 2"	TBE	160	CS, ASTM A53 GRADE B, SMLS, ASME B36.10, 3" (75mm) & 6" (150mm) LONG		
CONC. SWAGES	⅜" – 2"	TSE	XXS/160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95	03 03, 26	8 8
	½" – 2"	TBE	XXS/160	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	½" – 2"	PBE	XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	3" – 4"	BLE x PSE	STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
	(½" – 2")			CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
ECC. SWAGES	½" – 2"	PBE	XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		8
	3" – 4"	BLE x PSE	STD x XS	CS, ASTM A234 GRADE WPB, SMLS, MSS-SP-95		
FITTINGS	90 ELL	½" – 2"	SW	3000 LB	02	
	45 ELL	½" – 2"	SW	3000 LB		
	TEE	½" – 2"	SW	3000 LB		
	TEE (RED)	½" – 2"	SW	3000 LB		
		½" – 2"	SW	3000 LB		

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  Refineria de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0164		
		Piping Material Class: 12CS2S03		
		Issue Date: 28-Feb-13	Revision 8	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION			NOTES	REV
PLUG	1/2" - 2"	THRD		CS, ASTM A105, ASME B16.11, ROUND HEAD			03	
PLUG	1/2" - 1/2"	PE		CS, ASTM A105, ASME B16.11, BARSTOCK, ROUND HEAD			53	
COUPLING	3/8" - 1/2"	THRD	6000 LB	CS, ASTM A105, ASME B16.11			03	8
COUPLING	1/2" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11				
COUPLING	3/4" - 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11			03	
CAP	1/2" - 2"	SW	3000 LB	CS, ASTM A105, ASME B16.11				
CAP	1/2" - 1/2"	THRD	6000 LB	CS, ASTM A105, ASME B16.11			03	
CAP	3/4" - 2"	THRD	3000 LB	CS, ASTM A105, ASME B16.11			03	
UNION	1/2" - 2"	SW	3000 LB	CS, ASTM A105, GROUND JOINT, MSS-SP-83			26	8
UNION	1/2" - 1/2"	THRD	6000 LB	CS, ASTM A105, GROUND JOINT, MSS-SP-83			03, 26	8
UNION	3/4" - 2"	THRD	3000 LB	CS, ASTM A105, GROUND JOINT, MSS-SP-83			03, 26	8
SOCKET	1/2" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97				
SOCKET FLAT	1/2" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97				
SW ELBOLET	1 1/2" - 1 1/2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97			26	
THREDOLET	1/2" - 1/2"	WELD	6000 LB	CS, ASTM A105, MSS-SP-97			03	
THREDOLET	3/4" - 2"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97			03	
THRD ELBOLET	3/4" - 3/4"	WELD	3000 LB	CS, ASTM A105, MSS-SP-97			03	8
WELDOLET	3" - 52"	WELD		CS, ASTM A105, MSS-SP-97				
WELDOLET FLAT	6" - 8"	WELD		CS, ASTM A105, MSS-SP-97			26	8
90 ELL	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
90 ELL	28" - 28"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			26, 1061	8
90 ELL SR	24" - 24"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			26	8
90 ELL	52" - 56"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS				
45 ELL	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
45 ELL	28" - 28"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			26, 1061	8
45 ELL	52" - 56"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9 DESIGN W/ 1.5 D RADIUS				
TEE	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
TEE	52" - 56"	WELD		CS, ASTM A234 GRADE WPB-W, Specification for Non-STD Pipe Component			1015	
TEE (RED.)	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
CAP	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-S, ASME B16.9				
CAP	52" - 56"	WELD		CS, ASTM A234 GRADE WPB-W, Specification for Non-STD Pipe Component			1015	
REDUCER (CC)	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
REDUCER (CC)	52" - 56"	WELD		CS, ASTM A234 GRADE WPB-W, Specification for Non-STD Pipe Component			1015	
REDUCER (EC)	3" - 48"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9				
REDUCER (EC)	52" - 56"	WELD		CS, ASTM A234 GRADE WPB-W, Specification for Non-STD Pipe Component			1015	
REDUCER (EC)	42" X 32"	WELD		CS, ASTM A234 GRADE WPB-W, ASME B16.9			26	
VALVES					TAG NO.	SHORT CODE		
GATE	1/2" - 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	GWCS01	VG		
GATE	1/2" - 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8) , Full Port	GWCS10	VGS	08	
GATE	1/2" - 2"	THRD/SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	GWCY01	VG2	06, 03	
GATE	1/2" - 2"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Conventional Port	GACF03	VG1	15	
GATE	1/2" - 2"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GACF30	VG1	15, 26	
GATE	3" - 12"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port	GACF01	VG		
GATE	14" - 24"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8), Full Port, GO	GACF02	VG		
GLOBE	1/2" - 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	LWCS01	VL		
GLOBE	1/2" - 2"	THRD/SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8)	LWCY01	VLC	06, 03	8
GLOBE	3" - 8"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	LACF01	VL		
LIFT CHECK	1/2" - 2"	SW	CL 800	CS Body W/ 13 CR TRIM, HF ST (API #8), Piston Type	CWCS01	VC	61	
SWING CHECK	3" - 6"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VC	62	
SWING CHECK	2" - 2"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VCF	26, 62	
SWING CHECK	8" - 24"	RF	CL 150	CS Body W/ 13 CR TRIM, HF ST (API #8)	CACF01	VCF	62	
DUAL PLT CHECK	8" - 24"	RF	CL 150	CS Body W/ 410 SS DISC, (API #1), Wafer Type	CACW01	VC	63	
DUAL PLT CHECK	30" - 48"	RF	CL 150	CS Body W/ 410 SS DISC, (API #1), DBL FLGD SERIES A	CACF07	VC	63	
BUTTERFLY	2" - 4"	RF	200 CWP	DI Body W/ Buna-N Seat, DI Disc, Lug Style, Lever	FUDL01	VX	09	8
BUTTERFLY	3" - 4"	RF	175 CWP	DI Body W/ EPDM Seat, 316 SS Disc, Lug Style, Lever	FUDL06	VXL	09, 26	8
BUTTERFLY	6" - 24"	RF	150 CWP	DI Body W/ Buna-N Seat, DI Disc, Lug Style, G.O.	FUDL02	VX	09	8
BUTTERFLY	6" - 24"	RF	150 CWP	DI Body W/ EPDM Seat, 316 SS Disc, Lug Style, G.O.	FUDL07	VXL	09, 26	8

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  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0164		
		Piping Material Class: 12CS2S03		
		Issue Date: 28-Feb-13	Revision 8	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION			NOTES	REV
BUTTERFLY	30" – 48"	RF	150 CWP	DI Body W/ Buna-N Seat, DI Disc, DBL FLGD, G.O., Series A	FUDF01	VX	09	8
BUTTERFLY	30" – 30"	RF	150 CWP	DI Body W/ Buna-N Seat, DI Disc, Lug Style, G.O., Series A	FUDL05	VX1	09, 26	8
BALL	¾" – 6"	RF	CL 150	CS Body W/ RPTFE ST, 316 SS Floating Ball, FP, LP, Lever	BACF14	VB	09	
BALL	½" – 2"	THRD/SW	2000 WOG	CS Body W/ RPTFE ST, 316 SS Floating Ball, FP, LP, Lever	BUCYAA	VB1	09, 26	8
BALL	½" – 2"	THRD/SW	1000 WOG	CS Body W/ RPTFE ST, 316 SS Floating Ball, RP, LP, Lever	BUCY03	VBC	09, 26	8
BALL	½" – 2"	SW	1000 WOG	CS Body W/ RPTFE ST, 316 SS Floating Ball, RP, LP, Lever	BUCS03	VBS	09, 26	8
FLANGES								
SOCKETWELD	½" – 2"	RF	CL 150	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5				
BLIND	½" – 24"	RF	CL 150	CS, ASTM A105, ASME B16.5				
WELDNECK	30" – 56"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A				
WELDNECK	30" – 30"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES B			26	8
BLIND	30" – 56"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A				
WELDNECK	28" – 32"	RF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A			26	8
SOCKETWELD	½" – 2"	FF	CL 150	CS, ASTM A105, ASME B16.5			11	
WELDNECK	3" – 24"	FF	CL 150	CS, ASTM A105, ASME B16.5			11	
BLIND	½" – 24"	FF	CL 150	CS, ASTM A105, ASME B16.5			11	
WELDNECK	30" – 56"	FF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A			11	
BLIND	30" – 56"	FF	CL 150	CS, ASTM A105, ASME B16.47 SERIES A			11	
SOCKETWELD	½" – 2"	RF	CL 300	CS, ASTM A105, ASME B16.5			12	
WELDNECK	3" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5			12	
WELDNECK	3" – 24"	FF	CL 300	CS, ASTM A105, ASME B16.5			11, 12	8
BLIND	½" – 24"	RF	CL 300	CS, ASTM A105, ASME B16.5			12	
WELDNECK	3" – 24"	RF	CL 600	CS, ASTM A105, ASME B16.5				
WELDNECK	3" – 24"	RF	CL 900	CS, ASTM A105, ASME B16.5				
PR WN ORIFICE	1" – 24"	RF	CL 300	CS, ASTM A105 W/ ½" SOCKETWELD TAPS, ASME B16.36				
MISCELLANEOUS								
FIGURE 8 BLANK	½" – 12"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE BLANK	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE SPACER	½" – 24"	RF	CL 150	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				
PADDLE BLANK	½" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				8
PADDLE SPACER	½" – 24"	RF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				8
PADDLE BLANK	½" – 24"	FF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				8
PADDLE SPACER	½" – 24"	FF	CL 300	CS, ASTM A516 GRADE 70, NORMALIZED, ASME B16.48				8
Y-STRAINER	½" – 2"	SW	CL 600	CS, ASTM A216 GRADE WCB Body, TP 304SS Screen W / 1/16" Dia. Hole @ 3/32" Center, TAG# YSDC01			553	
CONE STRAINER – TRUNCATED TYPE	3" – 24"	RF	CL 150	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.5, TAG# TSAS01			555	
CONE STRAINER – TRUNCATED TYPE	30" – 30"	RF	CL 150	SS, ASTM A240 GRADE TP 304SS, Perforated Plate with 1/8" Dia. Hole @ 3/16" Center, ASME B16.47 Series A, TAG# TSAS06			555	8
FLANGE ISOLATION KIT	½" – 24"	RF	CL 150	ISOLATION GASKET, ASME B16.21, ASME B16.5, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.				8
FLANGE ISOLATION KIT	30" – 42"	RF	CL 150	ISOLATION GASKET, ASME B16.21, ASME B16.47 SERIES A, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.				8
FLANGE ISOLATION KIT	30" – 42"	RF	CL 150	ISOLATION GASKET, ASME B16.21, ASME B16.47 SERIES A, 1/8" THICK, G10 W/TEFLON SEAL ELEMENT ONE SIDE ONLY, ONE G10 FULL LENGTH ISOLATION SLEEVE SET, TWO G10 ISOLATION WASHER SETS, AND TWO SS WASHER SETS.			1062	8
GASKETS								
	½" – 24"		CL 150	GASKET FULL, ASME B16.21, ASME B16.5, 1/16" THICK, GRAPHITE W/ TP 316 SS INSERT			14	
	½" – 24"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING				

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		Piping Material Class: 12CS2S03		
		Issue Date: 28-Feb-13	Revision 8	
		Prepared SN	Checked KAJ	Approved GAD

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV
	1/2" – 24"		CL 150	GASKET FLAT RING, ASME B16.21, ASME B16.5, 1/16" THICK, GRAPHITE W/ TP 316 SS INSERT	1017	
	30" – 56"		CL 150	GASKET FULL, ASME B16.21, ASME B16.47 SERIES A, 1/16" THICK, GRAPHITE W/ TP 316 SS INSERT	14	
	30" – 56"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
	30" – 30"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES B, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING	26	8
	28" – 32"		CL 150	SPIRAL WOUND, ASME B16.20, ASME B16.47 SERIES A, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING	26	8
	30" – 56"		CL 150	GASKET FLAT RING, ASME B16.21, ASME B16.47 SERIES A, 1/16" THICK, GRAPHITE W/ TP 316 SS INSERT	1017	
	1/2" – 24"		CL 300	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
	3" – 24"		CL 600	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304 SS INNER RING, CS OUTER RING		
	3" – 24"		CL 900	SPIRAL WOUND, ASME B16.20, ASME B16.5, TP 304SS WDG, W/FLEXIBLE GRAPHITE FILLER, TP 304SS INNER RING, CS OUTER RING		
BOLTING						
STUD	ALL		CL 150	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
STUD	ALL		CL 300	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
STUD	ALL		CL 600	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		
STUD	ALL		CL 900	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS		

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		Prepared SN	Checked KAJ	Approved GAD

90° BRANCH CONNECTION CHART

BRANCH SIZE	56	T																					
	52	P	T																				
	48	P	P	T																			
	42	P	P	E	T																		
	36	P	P	P	E	T																	
	30	P	P	P	P	E	T																
	24	P	P	P	P	P	E	T															
	20	P	P	P	P	P	P	E	T														
	18	P	P	P	P	P	P	P	E	T													
	16	P	P	P	P	P	P	P	P	E	T												
	14	P	P	P	P	P	P	P	P	P	E	T											
	12	P	P	P	P	P	P	P	P	P	P	E	T										
	10	P	P	P	P	P	P	P	P	P	P	P	E	T									
	8	W	W	W	W	W	W	W	W	W	W	W	W	E	T								
	6	W	W	W	W	W	W	W	W	W	W	W	W	W	E	T							
	4	W	W	W	W	W	W	W	W	W	W	W	W	W	W	E	T						
	3	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	E	T					
	2	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	T				
	1½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	T			
	1	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T		
	¾	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	T		
	½	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	E	E	E	T	
		56	52	48	42	36	30	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½
	HEADER SIZE																						

LEGEND:

E = Reducing Tee (BW for 3" and larger, SW for 2" and smaller)
P = Branch Weld with Reinforcing Pad (Note 502)
S = Sockolet

T = Straight Tee (BW for 3" and larger, SW for 2" and smaller)
W = Weldolet

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 	Piping Material Class Specification	Document No.: 000-SP-PI02-0164		
		Piping Material Class: 12CS2S03		
		Issue Date: 28-Feb-13	Revision 8	
		Prepared SN	Checked KAJ	Approved GAD

NOTES:

02. All butt-welded component thicknesses shall match the pipe thickness.
03. Threaded joints are permitted only at the outlet of vent and drain valves, hydrostatic connections, outlet instrument take-off valves, and to match equipment.
06. These valves shall be used only for vent, drain, and instrument connections.
08. Full-port valves shall be used if indicated on the P&ID.
09. Pressure and temperature rating can be limited by certain components permitted by this Practice. Manufacturer's recommended pressure-temperature restrictions shall be consulted.
11. Flat-face flanges shall be provided adjacent to flat-face equipment nozzles.
12. These flanges shall be used only to match Class 300 flange connections at control valves and special equipment.
14. Full-face gaskets shall be used at flat-faced flanges.
15. These valves shall be used if mating to flanged nozzles.
26. To be used only if indicated on the P&ID.
53. This item shall be used for orifice flange tap connections only.
61. These check valves shall be installed in a horizontal position with cover up.
62. These check valves shall be installed in a horizontal position with cover up or in a vertical position with upward flow.
63. These check valves shall be installed in a horizontal position with hinge pin vertical or in a vertical position with upward flow.
501. Pressure limit for these size flanges are lower than the full flange rating. Based on the design condition, pipe thickness is calculated.
502. The pad thickness equals run pipe thickness, the pad width equals ½ of branch O.D. These items can be replaced with a Weldolet or Reducing Tee depending on engineering requirements, availability and economics.
503. Use this item for Branch Nipple which terminate at the valve or continue as tubing. (eg. For instrument connections, valved vents & drains, etc.).
553. Use this strainer for Liquid Service, blow off connection requirements per "Technical Specification for Pipe, Fittings, and Flanges".
555. Cone Strainer shall be installed between the 2 flanges with the small end pointed upstream.
565. Use only for Hydro-test vent and drain, seal weld after Hydro-test.
584. Large bore caps above 48" NPS shall be 2:1 Elliptical Head with 2 ½" long Tangent.
1013. Examination shall be in accordance with "TECHNICAL SPECIFICATION FOR PIPE WELD EXAMINATION REQUIREMENTS", refer to document number: 000-SP-PI02-0227.
1015. Non-Standard Piping Component shall be in accordance with "Specification For Non-Standard Piping Component", refer to document number: 000-SP-PI02-0232.
1017. Use only for Low Stress Gasket requirement.
1061. Used for Existing Lines and shall not be counted for MTO.
1062. Use only when isolation is required on valves that do not require a gasket.

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0163		
		Piping Material Class: 12PD0H		
		Issue Date: 28-Feb-13	Revision 9	Prepared SN
			Checked KAJ	Approved GAD

Services	Fire Water (U/G)	Basic Material	High Density Polyethylene(HDPE) (Note 87, 88, 89 & 97)
Pressure Rating:	200 lb CWP	Corrosion Allowance	0"
Material Group:	HDPE	Stress Relief	Not Required
Flange Facing:	FF	Basic Construction:	4" & UP: PE/FLGD
Examination:	ASME B31.3 (Note 587)	Design Code	NFPA 24, ASME B31.3-2006

For NPS 4" Through NPS 24" (Not Full flange ratings per B16.5)

Temp F	0 to 73	100
psig	200	156

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION	NOTES	REV	
PIPE	4" – 24"	PE	CL 200	HDPE, ASTM D3350 CL 345464C, ASTM F714 (PE 3608), FM APRD	523, 1023		
	4" – 4"	FF	250 LB WWP	DI, ASTM A395 PER AWWA C115 W/DI FLANGE CL 125 DRILLING, CEMENT LINING PER AWWA C104, FACE TO FACE DIMENSION = 6' – 5 ½", FIRE WATER U/G SERVICE, UL / FM APPROVED	545 590, 593		
	6" – 6"	FF	250 LB WWP	DI, ASTM A395 PER AWWA C115 W/DI FLANGE CL 125 DRILLING, CEMENT LINING PER AWWA C104, FACE TO FACE DIMENSION = 3' – 9", FIRE WATER U/G SERVICE, UL / FM APPROVED	590, 594		
	8" – 8"	FF	250 LB WWP	DI, ASTM A395 PER AWWA C115 W/DI FLANGE CL 125 DRILLING, CEMENT LINING PER AWWA C104, FACE TO FACE DIMENSION = 4' – 3", FIRE WATER U/G SERVICE, UL / FM APPROVED	590, 595		
	10" – 10"	FF	250 LB WWP	DI, ASTM A395 PER AWWA C115 W/DI FLANGE CL 125 DRILLING, CEMENT LINING PER AWWA C104, FACE TO FACE DIMENSION = 4' – 0 15/16", FIRE WATER U/G SERVICE, UL / FM APPROVED	590		
	12" – 12"	FF	250 LB WWP	DI, ASTM A395 PER AWWA C115 W/DI FLANGE CL 125 DRILLING, CEMENT LINING PER AWWA C104, FACE TO FACE DIMENSION = 3' – 11 15/16", FIRE WATER U/G SERVICE, UL / FM APPROVED	590		
	14" – 14"	FF	250 LB WWP	DI, ASTM A395 PER AWWA C115 W/DI FLANGE CL 125 DRILLING, CEMENT LINING PER AWWA C104, FACE TO FACE DIMENSION = 3' – 9 15/16", FIRE WATER U/G SERVICE, UL / FM APPROVED	590		
	20" – 20"	FF	250 LB WWP	DI, ASTM A395 PER AWWA C115 W/DI FLANGE CL 125 DRILLING, CEMENT LINING PER AWWA C104, FACE TO FACE DIMENSION = 3' – 6", FIRE WATER U/G SERVICE, UL / FM APPROVED	590	9	
FITTINGS	90 ELL	4" – 24"	PE	CL 200	HDPE, ASTM D3350 CL 345464C, ASTM D3261, FM APRD	545	
	45 ELL	4" – 24"	PE	CL 200	HDPE, ASTM D3350 CL 345464C, ASTM D3261, FM APRD		
	TEE	4" – 24"	PE	CL 200	HDPE, ASTM D3350 CL 345464C, ASTM D3261, FM APRD		
	TEE (RED.)	4" – 24"	PE	CL 200	HDPE, ASTM D3350 CL 345464C, ASTM D3261, FM APRD		
	CAP	4" – 8"	PE	CL 200	HDPE, ASTM D3350 CL 345464C, ASTM D3261, FM APRD		
	REDUCER (CC)	4" – 24"	PE	CL 200	HDPE, ASTM D3350 CL 345464C, ASTM D3261, FM APRD		
	FLANGE ADAPTER	4" – 24"	PE	CL 200	HDPE, ASTM D3350 CL 345464C, ASTM D3261, FM APRD		
	90 BEND	4" – 24"	FF	250 LB WWP	DI, ASTM A395 PER AWWA C110 W/DI FLANGE CL 125 DRILLING, CEMENT LINING PER AWWA C104, FIRE WATER U/G SERVICE, UL / FM APPROVED	590	
	TEE	10" – 10"	FF	250 LB WWP	DI, ASTM A395 PER AWWA C110 W/DI FLANGE CL 125 DRILLING, CEMENT LINING PER AWWA C104, FIRE WATER U/G SERVICE, UL / FM APPROVED	590	9
	REDUCER (CC)	20" x 16" 24" x 18" 24" x 20"	FF	250 LB WWP	DI, ASTM A395 PER AWWA C110 W/DI FLANGE CL 125 DRILLING, CEMENT LINING PER AWWA C104, FIRE WATER U/G SERVICE, UL / FM APPROVED	590	

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	Piping Material Class Specification	Document No.: 000-SP-PI02-0163		
		Piping Material Class: 12PD0H		
Issue Date: 28-Feb-13		Revision 9		
Prepared SN		Checked KAJ	Approved GAD	

ITEM	SIZE RANGE	ENDS	SCH/ RAT	MATERIAL DESCRIPTION			NOTES	REV
VALVES	GATE 4" – 16"	FF	250 LB WWP	DI Body W/ Bronze TRIM, Resilient ST, Full Port, W/ Post Indicator, FIRE WATER U/G SERVICE, UL / FM APPROVED	TAG NO. GUDF01	SHORT CODE VG	522	
	GATE 18" – 24"	FF	250 LB WWP	DI Body W/ Bronze TRIM, Resilient ST, Full Port, HW, Floor Stand W/ Indicator, FIRE WATER U/G SERVICE, Non-Listed	GUDF05	VG	522	
	GATE 4" – 12"	FF	250 LB WWP	DI Body W/ Bronze TRIM, Resilient ST, Full Port, W/2" Square Nut, FIRE WATER U/G SERVICE, UL / FM APPROVED	GUDF02	VG1	522, 543	
	GATE 4" – 12"	FF	250 LB WWP	DI Body W/ Bronze TRIM, Resilient ST, Full Port, FIRE WATER A/G SERVICE, UL / FM APPROVED	GUDF03	VG1	542	9
FLANGES	BACK UP 4" – 24"	FF	CL 150	DI, W/ RADIUS FOR HDPE FLANGE ADAPTER, ASTM A395 GR 60-40-18, ASME B16.5, CL 150 DRILLING, FM APRD				
	BLIND 4" – 24"	FF	CL 150	GALV, ASTM A105, ASME B16.5				
GASKETS	4" – 24"		CL 150	GASKET FULL FACE, COMPRESSED ARAMID FIBER WITH NITRILE RUBBER BINDER, 1/8" THICK, ASME B16.21, ASME B16.5			14	9
BOLTING								
STUD	ALL		CL 150	STAINLESS STEEL, ASTM A193 GRADE B8 CL 2, ASTM A194 GRADE 8 HEAVY HEX NUTS			41, 1012	9
STUD	ALL		CL 150	ALLOY STEEL, ASTM A193 GRADE B7, ASTM A 194 GRADE 2H HEAVY HEX NUTS			41	
MACHINE BOLT	ALL		CL 150	ASTM A307 GRADE B, ASTM A 563 GRADE A HEAVY HEX NUTS			41	

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90° BRANCH CONNECTION CHART

BRANCH SIZE	24	T									
	20	V	T								
	18	V	V	T							
	16	E	E	V	T						
	14	V	V	V	V	T					
	12	E	E	E	E	V	T				
	10	E	E	E	E	E	E	T			
	8	E	E	E	E	E	E	E	T		
	6	E	E	E	E	E	E	E	E	T	
	4	V	V	E	E	E	E	E	E	E	T
	24	20	18	16	14	12	10	8	6	4	
HEADER SIZE											

LEGEND:

E = Reducing Tee
T = Straight Tee
V = Combination of Tee / Reducing Tee and Concentric Reducers

  Refinería de Cartagena S.A.	Piping Material Class Specification	Document No.: 000-SP-PI02-0163		
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NOTES:

14. Full-face gaskets shall be used at flat-faced flanges.
41. Bolts shall be torqued to manufacturer's specifications. Bolts shall be retorqued to manufacturer's specifications.
87. All HPDE pipe and pipe components shall be manufactured and supplied through a single (same) manufacturer.
88. HPDE materials shall not be used in hydrocarbon-contaminated (2% concentration or greater) soil.
89. HPDE shall be provided with long-term UV protection (2% to 3% carbon black).
97. If used, buried metallic components shall be protected from corrosion by coating, cathodic protection, or other acceptable means.
522. Gaskets are not required at joints between HDPE flange adaptors. Gaskets are recommended when transitioning HDPE flange adapters to non-lined metallic flanges.
523. Metallic piping shall be used for transition to aboveground and shall be done using flanged joints in underground horizontal section just before the riser.
542. These components shall be used only for above ground section.
543. These valves shall be used in valve boxes.
545. HDPE Pipe & Fittings shall follow IPS system (ASTM F714/D3261) for outside diameter and tolerances.
587. Temperature Compensating Multipliers for Converting a Base Temperature Pressure:

Temperature	Multiplier
73°F	1
80°F	0.94
90°F	0.86
100°F	0.78

For a temperature that falls within any pair of listed temperatures, interpolate to determine the appropriate multiplier.
590. All U/G DI pipe and components shall be encased with Low Density Polyethylene Sheet per AWWA C105 for external corrosion protection.
593. For use with Fire Monitors.
594. For use with Fire Hydrants.
595. For use with Deluge System.
1012. Stainless Steel Stud Bolts shall be used as the default bolt.
1023. Pipe shall be color code by the supplier for identification of the Fire Water HDPE pipe in Red Color Stripe along the longitudinal axis of the Pipe.