GENERAL				
MATERIAL	CARBON STEEL			
RATING	ASME B16.5, CLASS 150, MATERIAL GROUP 1.1 285 PSIG @ 100°F 170 PSIG @ 500°F 1/16” CORROSION ALLOWANCE			
SERVICES	BLOWDOWN STEAM CONDENSATE [BD], BOILER FEED WATER [BFW], CARBON DIOXIDE [C02], COOLING WATER RETURN [CWR], COOLING WATER SUPPLY [CWS], DEMIN WATER [DMW], REFRIGERATION / OIL MIXTURE [FO], REFRIGERATION GAS [FRG], REFRIGERATION LIQUID [FRL], HYDROGEN GAS [H2], HYDROGEN CONDENSATE [H2C], NITROGEN [N], NATURAL GAS [NG], 50# STEAM [S50], 120# SOFT STEAM [S120], SANITARY [SAN], 50# STEAM CONDENSATE [SC50], PROCESS VAPOR [VAP], VENT [VE], WASTE WATER [WW]			
ITEM		**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	½” – 1½" 2" – 24" 30" 36"	SCH 80, A106 GR. B SMLS, PE STD WT, A106 GR. B SMLS, BE STD WT, API 5L GR. B, ERW, BE STD WT, API 5L GR. B, EFW, BE, 100% R.T.		1, 2, 3 1, 2, 3 1, 2, 3 1, 2, 3
FITTINGS	½” – 1½" ½" – 24" 30" – 36” ½” – 10”	SW, CL 3000, A105, ASME B16.11 BW, SCH TO MATCH PIPE, A234 GR. WPB, ASME B16.9 BW, STD WT, A234 GR. WPB, EFW, ASME B16.9 OLET, SCH/CLASS TO MATCH PIPE/FITTINGS, A105, MSS SP-97		1, 2 1, 2 1, 2 1, 2
FLANGES	½” – 1½" ½” – 6" 8" – 24" 30" – 36" ½” – 24” 2” – 24”	RF SW, CL 150, A105, SCH 80, ASME B16.5 RF WN, CL 150, A105, SCH TO MATCH PIPE, ASME B16.5 RF SO, CL 150, A105, ASME B16.5 RF WN, CL 150, A105, ASME B16.47 SER. A RF BLIND, CL 150, A105, ASME B16.5 RF ORIFICE FLANGE, CL 300, A105, SCH TO MATCH PIPE, ASME B16.36, ½” SW TAPS		1, 2, 4, 5, 6 1, 2, 4, 5, 6 1, 2, 4, 5, 6, 7 1, 2, 4, 5, 6, 7 4
UNIONS	NONE	USE FLANGES		
BOLTING	ALL	STUD BOLTS, A193 GR. B7, TEFLON COATED HEAVY HEX NUTS, A194 GR. 2H, TEFLON COATED		
GASKETS	ALL ALL	FILLED PTFE WITH INORGANIC FILLER, RING TYPE, CL 150, 1/8” THK, ASME B16.21; DURLON 9000 OR EQ W/ ENGINEERING APPROVAL SPIRAL WOUND, 304SS WINDINGS WITH GRAPHITE FILLER, CS OUTER RING, ANTI-BUCKLING, CL 150, 1/8” THK, ASME B16.20; FLEXITALLIC STYLE CGI, VSP AB-326, OR EQ W/ ENGINEERING APPROVAL		4,6 13
THREAD LUBE	PIPE BOLTS	PTFE TAPE (≤400°F), MOLYCOTE G OR EQ (>400°F) NONE		
TEMPORARY STRAINERS	ALL	CL 150, CONICAL, 150% OPEN AREA, SS SCREEN/PLATE		
“Y” STRAINERS	½” – 1½" 2" – 24"	CL 600, THD, A-216, 0.020" PERF. SS SCREEN CL 150, RF FLG, A-216, 0.020" PERF. SS SCREEN		

VALVES							
BALL	BUTTERFLY	CHECK	GATE	GLOBE	PLUG	OTHER	NOTES
VBA-628 VBA-665	VBF-913	VCH-302 VCH-303 VCH-415	VGA-101 VGA-112 VGA-120	VGL-200 VGL-292	VPL-500 VPL-521		8, 9, 10, 11, 12

NOTES

1. REQUIREMENTS FOR DESIGN, FABRICATION, WELDING, NON-DESTRUCTIVE EVALUATION, INSTALLATION, DOCUMENTATION, ETC. IN WESTLAKE STANDARD GES-230 "PIPING SPECIFICATIONS" MUST BE FOLLOWED.
2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 450 PSIG PER ASME B31.3. HYDROTEST PRESSURE DETERMINED BY ASME B16.5, PARA. 2.6.
3. ALL BURIED PIPING SHALL BE COATED AND WRAPPED IN ACCORDANCE WITH GES 2-2-1.
4. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.
5. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.
6. CL 300 FLANGES AND GASKETS MAY BE USED FOR MATING TO EQUIPMENT AS NECESSARY.
7. SLIP-ON FLANGES SHALL NOT BE USED DIRECTLY ON FITTINGS UNLESS SO INDICATED ON THE DESIGN DRAWINGS.
8. VGA-120 IS THE DEFAULT VENT, DRAIN, AND INSTRUMENT VALVE. ¾" SIZE IS THE DEFAULT SIZE, BUT ½" AND 1" MAY BE USED AS REQUIRED.
9. BALL VALVES SHAL BE LIMITED TO 350°F. BUTTERFLY VALVES SHALL BE LIMITED TO 300°F PER API 609. PLUG VALVES SHALL BE LIMITED TO 400°F. HIGHER TEMPERATURE ALLOWED ONLY WITH ENGINEERING APPROVAL OF DESIGNATED MAKE/MODEL.
10. VALVES SHALL BE SPECIFIED AND PURCHASED AS FIRE SAFE.
11. CHECK VALVES TO BE INSTALLED IN HORIZONTAL POSITION WITH COVER UP.
12. CHECK VALVE INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.
13. USE THIS GASKET IN STEAM SERVICE ONLY.

BRANCH CONNECTIONS

BRANCH

36	T																	
30	RT	T																
24	F	RT	T															
20	F	F	RT	T														
18	F	F	P	RT	T													
16	F	F	P	P	RT	T												
14	F	F	P	P	P	RT	T											
12	F	F	P	P	P	P	RT	T										
10	W	W	P	P	P	P	P	RT	T									
8	W	W	W	W	W	W	W	RT	RT	T								
6	W	W	W	W	W	W	W	W	RT	RT	T							
4	W	W	W	W	W	W	W	W	W	RT	RT	T						
3	W	W	W	W	W	W	W	W	W	W	RT	(1)	T					
2	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T				
1½	O	O	O	O	O	O	O	O	O	O	O	O	O	(1)	T			
1	O	O	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T		
¾	O	O	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	T	
½	O	O	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	(1)	T
	36	30	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

F – FULL ENCIRCLEMENT REINFORCEMENT (LENGTH EQUALS TWICE BRANCH PIPE OD)

O – OLET (MATCH END TYPE AND CLASS/SCHEDULE OF DESIGN PER PIPE SPEC)

P – BRANCH WELD WITH REINFORCING PAD (PAD THICKNESS EQUALS RUN PIPE THICKNESS, PAD WIDTH EQUALS ½ BRANCH OD.)

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.

	MATERIAL	CARBON STEEL		GES 2-3-0 **CLA** AA REV 12 07/20/2022
	RATING	ASME B16.5, CLASS 150, M.G. 1.1 285 PSIG @ 100°F 170 PSIG @ 500°F 1/16" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matthew J. Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES

BLOWDOWN STEAM CONDENSATE [BD], BOILER FEED WATER [BFW], CHILLED WATER RETURN [CHWR], CHILLED WATER SUPPLY [CHWS], COOLING WATER RETURN [CWR], COOLING WATER SUPPLY [CWS], DEMIN WATER [DMW], INSTRUMENT AIR [IA], CLARIFIED WATER [KW], NITROGEN [N], PLANT AIR [PA]

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	½" – 1½" 2" – 24" 30" 36"	SCH 80, A-106 GR. B SMLS, THD STD. WT., A-106 GR. B SMLS, BE STD. WT., API 5L GR. B, ERW, BE STD. WT., API 5L, GR. B, EFW, BE, 100% R.T.	1,2,3 1,2,3 1,2,3 1,2,3
FITTINGS	½" – 1½" 2" – 24" 30" - 36" ½" – 10"	3000#, A-105, THD, ASME B16.11 SCH TO MATCH PIPE, A-234 GR. WPB, BE, ASME B16.9 STD. WT., A-234 GR. WPB, EFW, BE, ASME B16.9 SCH/CLASS TO MATCH PIPE/FITTINGS, A-105, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), MSS SP-97	1,2 1,2 1,2 1,2
FLANGES	½" – 1½" 2" – 6" 8" – 24" 30", 36" ½" – 24" 2" – 24"	150#, A-105, SCH 80, RF THD, ASME B16.5 150#, A-105, SCH TO MATCH PIPE, RF WN, ASME B16.5 150#, A-105, RF SO, ASME B16.5 150#, A-105, RF SO, ASME B16.47 SER. A 150#, A-105, RF BLIND, ASME B16.5 300#, A-105, SCH TO MATCH PIPE, RF ORIFICE FLANGE, ASME B16.36, ½" THD TAPS	1,2,4,5,6 1,2,4,5,6 1,2,4,5,6,7 1,2,4,5,6,7 4
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B-7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HVY. NUTS, TEFLON COATED	
GASKETS	ALL	150#, 1/8" THK. RING TYPE, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21, DURLON 9000 OR EQ W/ ENGINEERING APPROVAL	4,6
THREAD LUBE	PIPE BOLTS	TFE TAPE (≤400°F), MOLYCOTE G OR EQ (>400°F) NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
TEMPORARY STRAINERS	ALL	150#, CONICAL, 150% OPEN AREA, SS SCREEN/PLATE	
"Y" STRAINERS	½" – 1½" 2" – 24"	600#, THD, A-216, 0.020" PERF. SS SCREEN 150#, RF FLG, A-216, 0.020" PERF. SS SCREEN	

	MATERIAL	CARBON STEEL		GES 2-3-0 **CLA** AA REV 12 07/20/2022
	RATING	ASME B16.5, CLASS 150, M.G. 1.1 285 PSIG @ 100°F 170 PSIG @ 500°F 1/16" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matthew J. Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

VALVES			
VGA-113 VGA-101 VGA-101G VGA-101GA	½" – 1½" ½" – 14" 16" – 24" 30" – 36"	GATE, CS, 800#, THD, TRIM #8 GATE, CS, 150#, RF FLG, TRIM #8 GATE, CS, 150#, RF FLG, TRIM #8, GO GATE, CS, 150#, RF FLG, TRIM #8, GO, ASME B16.47 SER. A	8
VGL-292 VGL-200 VGL-200G	½" – 1½" 2" – 8" 10" – 14"	GLOBE, CS, 150#, RF FLG, TRIM #8 GLOBE, CS, 150#, RF FLG, TRIM #8 GLOBE, CS, 150#, RF FLG, TRIM #8, GO	
VBF-913 VBF-913G VBF-913GA	3" – 4" 6" – 24" 30" – 36"	B-FLY, CS, 150#, THD LUG, SS DISC, PTFE SEATS/SEAL B-FLY, CS, 150#, THD LUG, SS DISC, PTFE SEATS/SEAL, GO B-FLY, CS, 150#, THD LUG, SS DISC, PTFE SEATS/SEAL, GO, ASME B16.47 SER. A	9,10 9,10 9,10
VCH-415 VCH-303L VCH-303F	½" – 1½" 2" – 6" 8" – 24"	CHECK, PISTON, CS, 150#, RF FLG, TRIM #8 CHECK, DUAL PLATE, CS, 150#, DRILLED LUG, CS DISC/TRIM CHECK, DUAL PLATE, CS, 150#, DBL FLG, CS DISC/TRIM	11 11,12 11,12
VPL-521 VPL-521G	2" – 4" 6" – 12"	PLUG, CS BODY/PLUG, 150#, RF FLG, SHORT PLUG, CS BODY/PLUG, 150#, RF FLG, SHORT, GO	9,10 9,10
VBA-618 VBA-628 VBA-628G VBA-665 VBA-665G	½" – 1½" ½" – 4" 6" – 8" ½" – 4" 6" – 8"	BALL, CS BODY, 316 SS BALL STEM, 1500/2000 WOG, THD, RPTFE SEATS, RED. PORT BALL, CS BODY, 316 SS BALL/STEM, 150#, RF FLG, XTREME SEATS, RED. PORT BALL, CS BODY, 316 SS BALL/STEM, 150#, RF FLG, XTREME SEATS, RED. PORT, GO BALL, CS BODY, 316 SS BALL/STEM, 150#, RF FLG, XTREME SEATS, FULL PORT BALL, CS BODY, 316 SS BALL/STEM, 150#, RF FLG, XTREME SEATS, FULL PORT, GO	9,10 9,10 9,10 9,10 9,10

	MATERIAL	CARBON STEEL	GES 2-3-0 **CLA** AA REV 12 07/20/2022
	RATING	ASME B16.5, CLASS 150, M.G. 1.1 285 PSIG @ 100°F 170 PSIG @ 500°F 1/16" CORR. ALLOW.	
MAINT. APPROVAL DocuSigned by: Matthew J. Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1, OR A MINIMUM OF 20% FOR CATEGORY M FLUID SERVICE PER ASME B31.3, PARA. M341.4.1. ENGINEERING MAY REQUIRE HIGHER PERCENTAGES FOR SPECIAL SERVICES.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 450 PSIG PER ASME B31.3. HYDROTEST PRESSURE DETERMINED BY ASME B16.5, PARA. 2.6.

3. ALL BURIED PIPING SHALL BE COATED AND WRAPPED IN ACCORDANCE WITH GES 2-2-1.

4. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.

5. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.

6. 300# FLANGES AND GASKETS MAY BE USED FOR MATING TO EQUIPMENT AS NECESSARY.

7. SLIP-ON FLANGES SHALL NOT BE USED DIRECTLY ON FITTINGS UNLESS SO INDICATED ON THE DESIGN DRAWINGS.

8. DEFAULT VENT, DRAIN, AND INTRUMENT VALVE. ¾" SIZE IS THE DEFAULT SIZE, BUT ½" AND 1" MAY BE USED AS REQUIRED.

9. BUTTERFLY VALVES SHALL BE LIMITED TO 300°F PER API 609. PLUG VALVES SHALL BE LIMITED TO 400°F. BALL VALVES SHALL BE LIMITED TO 300°F. HIGHER TEMPERATURE ALLOWED ONLY WITH ENGINEERING APPROVAL OF DESIGNATED MAKE/MODEL.

10. VALVES SHALL BE SPECIFIED AND PURCHASED AS FIRE SAFE.

11. INSTALL IN HORIZONTAL POSITION WITH COVER UP.

12. INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.

	MATERIAL	CARBON STEEL		GES 2-3-0 **CLA** AA REV 12 07/20/2022
	RATING	ASME B16.5, CLASS 150, M.G. 1.1 285 PSIG @ 100°F 170 PSIG @ 500°F 1/16" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matthew J. Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

BRANCH CONNECTIONS

BRANCH

36	T																
30	RT	T															
24	F	RT	T														
20	F	F	RT	T													
18	F	F	P	RT	T												
16	F	F	P	P	RT	T											
14	F	F	P	P	P	RT	T										
12	F	F	P	P	P	P	RT	T									
10	W	W	P	P	P	P	P	RT	T								
8	W	W	W	W	W	W	W	RT	RT	T							
6	W	W	W	W	W	W	W	W	RT	RT	T						
4	W	W	W	W	W	W	W	W	W	RT	RT	T					
3	W	W	W	W	W	W	W	W	W	W	RT	(1)	T				
2	W	W	W	W	W	W	W	W	W	W	W	(1)	(1)	T			
1½	O	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T		
1	O	O	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T	
¾	O	O	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	T
½	O	O	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	(1)	T
	36	30	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

F – FULL ENCIRCLEMENT REINFORCEMENT (LENGTH EQUALS TWICE BRANCH PIPE OD)

O – OLET (MATCH END TYPE AND CLASS/SCHEDULE OF DESIGN PER PIPE SPEC)

P – BRANCH WELD WITH REINFORCING PAD (PAD THICKNESS EQUALS RUN PIPE THICKNESS, PAD WIDTH EQUALS ½ BRANCH OD.)

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.

	MATERIAL	CARBON STEEL / HDPE		GES 2-3-0 **CLA** AAFW REV 9 07/20/2022
	RATING	LIMITED BY VGA-190/191 & HDPE 175 PSIG @ 100°F 1/16" CORR. ALLOW. (C.S. ONLY)		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES			
FIRE WATER [PWA]			
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	½" – 1½" 2" – 24" 6" - 18"	SCH 80, A-106 GR. B SMLS, THD STD. WT., A-106 GR. B SMLS, BE FM CLASS 267, HDPE, SMLS, EXTRUDED, PE, ASTM F714 GR. PE4710, ASTM D3350 CELL CLASSIFICATION 445574C (GR. PE47), AWWA C906, FM APPROVED	1,2,4 1,2,3 12
FITTINGS	½" – 1½" 2" – 24" ½" – 8" 6" - 18" 6" – 18"	3000#, A-105, THD, ASME B16.11 SCH TO MATCH PIPE, A-234, GR. WPB, BE, ASME B16.9 SCH/CLASS TO MATCH PIPE/FITTINGS, A-105, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), MSS SP-97 FM CLASS 267, HDPE, SMLS, FABRICATED OR MOLDED, BUTT FUSION ENDS, ASTM F714 GR. PE4710, ASTM D3350 CELL CLASSIFICATION 445574C (GR. PE47), AWWA C906, FM APPROVED, ASTM D3261 FLANGE ADAPTER, FM CLASS 267, HDPE, SMLS, MOLDED, BUTT FUSION ENDS, SERRATED SEALING SURFACE, ASTM F714 GR. PE4710, ASTM D3350 CELL CLASSIFICATION 445574C (GR. PE47), AWWA C906, FM APPROVED, ASTM D3261	1,2,4 1,2,3 1,2,3 12 12,13
FLANGES	½" – 1½" 2" – 6" 8" – 24" ½" – 24" 2" – 24" 6" – 18"	150#, A-105, SCH 80, FF THD, ASME B16.5 150#, A-105, STD. WT., FF WN, ASME B16.5 150#, A-105, STD WT, FF SO, ASME B16.5 150#, A-105, FF BLIND, ASME B16.5 300#, A-105, STD. WT., FF ORIFICE FLANGE, ASME B16.36, ½" THD TAPS FM CLASS 267, DUCTILE IRON, LAP JOINT BACK-UP RING, ASME B16.5 150# DRILLING, GALVANIZED, FM APPROVED	1,2,4,5,6 1,2,5,6 1,2,5,6,7 13
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B-7 STUD BOLTS, BLUE TEFLON COATED A-194 GR. 2H HVY. NUTS, BLUE TEFLON COATED	
GASKETS	ALL 6" – 18"	150#, 1/8" THK. FF, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21, DURLON 9000 OR EQ W/ ENGINEERING APPROVAL 150#, 1/8" THK. FF, COMPRESSED NON-ASBSTOS WITH SBR BINDER, GARLOCK 3200 OR EQ W/ ENGINEERING APPROVAL, ASME B16.5, ASME B16.21	6 13
THREAD LUBE	PIPE BOLTS	TFE TAPE (≤400°F), MOLYCOTE G OR EQ (>400°F) NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	

	MATERIAL	CARBON STEEL / HDPE		GES 2-3-0 **CLA** AAFW REV 9 07/20/2022
	RATING	LIMITED BY VGA-190/191 & HDPE 175 PSIG @ 100°F 1/16" CORR. ALLOW. (C.S. ONLY)		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

TEMPORARY STRAINERS	ALL	150# FF, CONICAL, 150% OPEN AREA, SS SCREEN/PLATE	
"Y" STRAINERS	½" – 1½" 2" – 12"	3000#, THD, A-216, 0.020" PERF. SS SCREEN 125#, FF FLG, A-216, 0.020" PERF. SS SCREEN	
HYDRANT	6"	CAST IRON BODY, CLASS 125 ASTM B16.1 FLANGED INLET TO MATCH WATER MAIN PIPE SIZE, 5 ¼" VALVE OPENING, TWO (2) 2 ½" NST HOSE CONNECTIONS, NATIONAL STD. OPERATING NUT, LEFT TO OPEN (CCW), AWWA C502, KENNEDY GUARDIAN K81D OR EQ.	
VALVES			
VGA-190 VGA-191 VGA-216 VGA-176	½" – 2" 2" – 12" 2½" – 12" 2" – 12"	GATE, B62 BRONZE BODY/TRIM, 175#, RS, THD, UL/FM GATE, A126 CL B CAST IRON, 125#, RS, FF FLG, UL/FM GATE, DUCTILE IRON, 125#, NRS, FF FLG, UL/FM POST INDICATOR GATE, A126 CL B, IBBM, NRS, FF FLG	8
VBF-905	4" – 24"	POST INDICATOR B-FLY, DUCTILE IRON, 125#, FF FLG, UL/FM	9
VCH-328	2½" – 12"	CHECK, SWING, A126 CL B CAST IRON,125#, FF FLG, UL/FM	10,11

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1, OR A MINIMUM OF 20% FOR CATEGORY M FLUID SERVICE PER ASME B31.3, PARA. M341.4.1. ENGINEERING MAY REQUIRE HIGHER PERCENTAGES FOR SPECIAL SERVICES.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 265 PSIG PER ASME B31.3. HYDROTEST PRESSURE DETERMINED BY ASME B31.3.

3. ALL BURIED CARBON STEEL PIPING SHALL BE COATED AND WRAPPED IN ACCORDANCE WITH GES 2-2-1.

4. THREADED COMPONENTS ARE NOT ALLOWED IN UNDERGROUND PIPING.

5. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.

6. 300# FLANGES AND GASKETS MAY BE USED FOR MATING TO EQUIPMENT AS NECESSARY.

7. SLIP-ON FLANGES SHALL NOT BE USED DIRECTLY ON FITTINGS.

8. DEFAULT VENT, DRAIN, AND INTRUMENT VALVE. ¾" SIZE IS THE DEFAULT SIZE.

9. VALVES SHALL BE SPECIFIED AND PURCHASED AS FIRE SAFE AND FURNISHED WITH A LOCKING DEVICE.

10. INSTALL IN HORIZONTAL POSITION WITH COVER UP.

	MATERIAL	CARBON STEEL / HDPE		GES 2-3-0 **CLA** AAFW REV 9 07/20/2022
	RATING	LIMITED BY VGA-190/191 & HDPE 175 PSIG @ 100°F 1/16" CORR. ALLOW. (C.S. ONLY)		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

11. INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.

12. HDPE COMPONENTS SHALL BE USED IN UNDERGROUND APPLICATIONS ONLY.

13. FLANGE ADAPTER WITH BACKING RING AND NON-ASBESTOS GASKET SHALL BE USED TO MATE HDPE TO CARBON STEEL PIPING OR UNDERGROUND VALVES.

BRANCH CONNECTIONS

BRANCH

24	T														
20	RT	T													
18	P	RT	T												
16	P	P	RT	T											
14	P	P	P	RT	T										
12	P	P	P	P	RT	T									
10	P	P	P	P	P	RT	T								
8	W	W	W	W	W	RT	RT	T							
6	W	W	W	W	W	W	RT	RT	T						
4	W	W	W	W	W	W	W	RT	RT	T					
3	W	W	W	W	W	W	W	W	RT	(1)	T				
2	O	O	O	O	O	O	O	O	O	(1)	(1)	T			
1½	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T		
1	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T	
¾	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	T
½	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	(1)	T
	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

F – FULL ENCIRCLEMENT REINFORCEMENT (LENGTH EQUALS TWICE BRANCH PIPE OD)

O – OLET (MATCH END TYPE AND CLASS/SCHEDULE OF DESIGN PER PIPE SPEC)

P – BRANCH WELD WITH REINFORCING PAD (PAD THICKNESS EQUALS RUN PIPE THICKNESS, PAD WIDTH EQUALS ½ BRANCH OD.)

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.

	MATERIAL	CARBON STEEL, GALVANIZED		GES 2-3-0 **CLA** AB REV 11 07/20/2022
	RATING	MSS SP-70, CLASS 125 150 PSIG @ 100°F 125 PSIG @ 250°F 1/16" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES			
INSTRUMENT AIR [IA], PLANT AIR [PA], POTABLE WATER ABOVE GROUND [PWA]			
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	½" – 3 4" – 8"	SCH 80, A-106 GR. B, GALVANIZED, SMLS, THD STD. WT., A-106 GR. B, GALVANIZED, SMLS, BE	2,3 1,2,3,10
FITTINGS	½" – 3" 4" – 8" ½" – 8"	3000#, A-105, THD, GALVANIZED, ASME B16.11 SCH TO MATCH PIPE, A-234, GR. WPB, BE, GALVANIZED, ASME B16.9 SCH/CLASS TO MATCH PIPE/FITTINGS, A-105, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), GALVANIZED, MSS SP-97	2 1,2,10 1,2,10
FLANGES	½" – 3 4" – 8" ½" – 8" 2" – 3" 4" – 8"	150#, A-105, SCH 80, FF THD, GALVANIZED, ASME B16.5 150#, A-105, STD. WT., FF WN, GALVANIZED, ASME B16.5 150#, A-105, FF BLIND, GALVANIZED ASME B16.5 300#, A-105, STD. WT., THD ORIFICE FLANGE, GALVANIZED, ASME B16.36, ½" THD TAPS 300#, A-105, STD. WT., FF ORIFICE FLANGE, GALVANIZED, ASME B16.36, ½" THD TAPS	2,4,5,6 1,2,4,5,6,10 4
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HVY. NUTS, TEFLON COATED	
GASKETS	ALL	150#, 1/8" THK. FF, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21, DURLON 9000 OR EQ W/ ENGINEERING APPROVAL	4,6
THREAD LUBE	PIPE BOLTS	TFE TAPE (≤400°F), MOLYCOTE G OR EQ (>400°F) NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
TEMPORARY STRAINERS	ALL	150#, CONICAL, 150% OPEN AREA, SS SCREEN/PLATE	
"Y" STRAINERS	½" – 1½" 2" – 8"	600#, THD, A-216, 0.020" PERF. SS SCREEN 150#, RF FLG, A-216, 0.020" PERF. SS SCREEN	
VALVES			
VGA-189 VGA-114	½" – 3" 4" – 8"	GATE, B61 BRONZE, 200#, UNION BONNET, RS, THD GATE, A-126 CL. B CAST IRON, 125#, FF FLG	7
VGL-313 VGL-217	½" – 3" 4" – 8"	GLOBE, B61 BRONZE, 200#, UNION BONNET, THD GLOBE, A-126 CL. B CAST IRON, 125#, FF FLG	
VCH-413 VCH-311	½" – 3" 4" – 8"	CHECK, B61 BRONZE, 200#, SWING, THD CHECK, WAFER, A-126 CL. B CAST IRON, 125#	9 9
VBA-642	½" – 2"	BALL, BRASS BODY/BALL, 200#, THD, PTFE SEATS	

	MATERIAL	CARBON STEEL, GALVANIZED		GES 2-3-0 **CLA** AB REV 11 07/20/2022
	RATING	MSS SP-70, CLASS 125 150 PSIG @ 100°F 125 PSIG @ 250°F 1/16" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1, OR A MINIMUM OF 20% FOR CATEGORY M FLUID SERVICE PER ASME B31.3, PARA. M341.4.1. ENGINEERING MAY REQUIRE HIGHER PERCENTAGES FOR SPECIAL SERVICES.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 225 PSIG PER ASME B31.3. HYDROTEST PRESSURE DETERMINED BY ASME B16.5, PARA. 2.6.

3. ALL BURIED PIPING SHALL BE COATED AND WRAPPED IN ACCORDANCE WITH GES 2-2-1.

4. USE RAISED FACED FLANGES AGAINST EQUIPMENT OR VALVES WITH RAISED FACED FLANGES. RING TYPE GASKETS SHALL BE USED BETWEEN THESE FLANGES.

5. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.

6. 300# FLANGES AND GASKETS MAY BE USED FOR MATING TO EQUIPMENT AS NECESSARY.

7. DEFAULT VENT, DRAIN, AND INTRUMENT VALVE. ¾" SIZE IS THE DEFAULT SIZE, BUT ½" AND 1" MAY BE USED AS REQUIRED.

8. VALVES SHALL BE SPECIFIED AND PURCHASED AS FIRE SAFE.

9. INSTALL IN HORIZONTAL POSITION WITH COVER UP OR IN VERTICAL POSITION WITH UPWARD FLOW.

10. HOT DIP GALVANIZE WELDED SPOOLS AFTER FABRICATION.

BRANCH CONNECTIONS

FOR 3" AND SMALLER HEADERS, USE THREADED FITTINGS.

FOR 4" AND LARGER HEADERS, USE TEE, REDUCING TEE, OR TEE WITH REDUCER.

GENERAL			
MATERIAL	CARBON STEEL		
RATING	ASME B16.5, CLASS 150, MATERIAL GROUP 1.1 285 PSIG @ -20°F TO 100°F 170 PSIG @ 500°F 1/16" CORROSION ALLOWANCE		
SERVICES	DRY CHLORINE GAS [DCG] DOWNSTREAM OF THE DRY MIST F-15210 AND UPSTREAM OF LIQUEFACTION C-15230/15240		
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	½" – 1½" 2" – 24"	SCH 80, A-106 GR. B SMLS, PE STD. WT., A-106 GR. B SMLS, BE	1, 2, 4, 6 1, 2, 4, 5, 6
FITTINGS	½" – 1½" ½" – 24" ½" – 10"	SW, CL 3000, A105, ASME B16.11 BE, SCH TO MATCH PIPE, A234 GR. WPB, ASME B16.9 OLET, SCH/CLASS TO MATCH PIPE/FITTINGS, A105, MSS SP-97	1, 2, 4, 6 1, 2, 4, 5, 6 1, 2, 4, 5, 6
FLANGES	½" – 1½" ½" – 6" 8" – 24" ½" – 24" 2" – 24"	RF SW, CL 150, A105, SCH 80, ASME B16.5 RF WN, CL 150, A105, SCH TO MATCH PIPE, ASME B16.5 RF SO, CL 150, A105, ASME B16.5 RF BLIND, CL 150, A105, ASME B16.5 RF ORIFICE FLANGE, CL 300, A105, SCH TO MATCH PIPE, ASME B16.36, ½" SW TAPS	1, 2, 6 1, 2, 6 1, 2, 5, 6 1, 2, 5, 6 1, 2, 5, 6
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	STUD BOLTS, A193 GR. B7, TEFLON COATED NUTS, A194 GR. 2H, TEFLON COATED	
GASKETS	ALL ALL	EXPANDED PTFE W/ CORRUGATED INSERT, RING TYPE, CL 150, 1/8" THK, ASME B16.21; VSP PITA OR EQ W/ ENGINEERING APPROVAL FILLED PTFE W/ INORGANIC FILLER, RING TYPE, CL 150, 1/8" THK, ASME B16.21; DURLON 9000 OR EQ W/ ENGINEERING APPROVAL **DO NOT APPLY LUBRICANT TO THE FLANGE FACES OR GASKETS FOR CHLORINE SERVICE**	
THREAD LUBE	BOLTS OTHER	NONE – TEFLON COATING NONFLAMMABLE LUBRICANT RATED FOR OXYGEN/CHLORINE SERVICE; FLUOROLUBE OR EQ W/ ENGINEERING APPROVAL	
TEMPORARY STRAINERS	ALL	CL 150, CONICAL, 150% OPEN AREA, SS SCREEN/PLATE	
"Y" STRAINERS	½" – 1½" 2" – 24"	CL 600, THD, A216, 0.020" PERF. SS SCREEN CL 150, RF FLG, A216, 0.020" PERF. SS SCREEN	

VALVES							
BALL	BUTTERFLY	CHECK	GATE	GLOBE	PLUG	OTHER	NOTES
VBA-605 VBA-619 VBA-628	VBF-913 VBF-935 VBF-936	VCH-394	VGA-101 VGA-112 VGA-120	VGL-200 VGL-292 VGL-297	VPL-521 VPL-578		4, 8, 9, 10

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE PER WESTLAKE STANDARD GES-230 "PIPING SPECIFICATIONS". REQUIREMENTS FOR DESIGN, FABRICATION, WELDING, NON-DESTRUCTIVE EVALUATION, INSTALLATION, DOCUMENTATION, ETC. MUST BE FOLLOWED.
2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 225 PSIG. HYDROTEST PRESSURE DETERMINED BY ASME B31.3, PARA 345.4. DRAIN AND BLOW FREE OF LIQUID. WESTLAKE PERSONNEL TO DRY BY BLOWING WITH MINIMUM (-)40°F DEWPOINT AIR OR NITROGEN UNTIL DEWPOINT LEAVING IS SAME AS DEWPOINT ENTERING. BALL VALVES AND PLUG VALVES SHOULD BE HALF OPEN TO DRY THE BODY CAVITY.
3. PURGE GAS / DRYING GAS / INERTING GAS MUST BE OIL FREE.
4. ALL PIPING AND VALVES MUST CONFORM TO CHLORINE INSTITUTE PAMPHLET 6.
5. FOR PIPING SYSTEMS 8 INCH AND LARGER, CONSULT THE CHLORINE INSTITUTE PAMPHLET 6 AND WESTLAKE ENGINEERING REPRESENTATIVE FOR APPROVAL.
6. FLANGED CONNECTIONS ARE PREFERRED FOR CHLORINE SERVICE INCLUDING VENTS AND DRAINS. THREADED CONNECTIONS ARE NOT PERMITTED.
7. EQUIVALENT CHLORINE SERVICE VALVES MAY BE USED IF CHECKED AND APPROVED BY A WESTLAKE ENGINEERING REPRESENTATIVE. (CHECK FACE TO FACE DIMENSIONS)
8. ALL VALVES AND INSTRUMENTS ARE TO BE PREPARED, DOUBLE BAGGED, AND TAGGED FOR CHLORINE SERVICE. VALVES SHALL BE CLEANED AND PACKAGED AS PER REQUIREMENTS OF CHLORINE INSTITUTE PAMPHLET 6.
9. VPL-758 TO BE USED ONLY WITH APPROVAL FROM OPERATIONS. VGL-297 IS THE PREFERRED VALVE.
10. CHECK VALVES TO BE INSTALLED IN HORIZONTAL POSITION WITH COVER UP. INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.
11. USE OF WEAR PADS (DYNAGARD OR EQ.) ARE REQUIRED AT ALL STRUCTURAL STEEL/CONCRETE SUPPORT POINTS. IF BOLT-ON PIPE SHOES ARE NEEDED AS A SUBSTITUTE, THEY SHALL BE GALVANIZED AND BE PROVIDED WITH A BUILT-IN NON- METALLIC CONTACT PLATE BETWEEN THE PIPE AND THE SUPPORT.
12. WHEN CONNECTING OTHER PIPING SYSTEMS TO CL2 SPECIFIED PIPING, IT IS REQUIRED TO HAVE A PRIMARY ISOLATION VALVE, A BLEED VALVE, AND A SECONDARY ISOLATION VALVE. THE PRIMARY ISOLATION VALVE AND BLEED VALVE MUST BE OF THE AFFECTED CL2 PIPING SPECIFICATION. THE PIPE SPECIFICATION BREAK WILL BE AT THE SECONDARY ISOLATION VALVE.
13. USE OF REDUCED PORT BALL VALVES IS ALLOWED IN BLEEDS.

BRANCH CONNECTIONS

BRANCH																
24	T															
20	RT	T														
18	P	RT	T													
16	P	P	RT	T												
14	P	P	P	RT	T											
12	P	P	P	P	RT	T										
10	P	P	P	P	P	RT	T									
8	W	W	W	W	W	RT	RT	T								
6	W	W	W	W	W	W	RT	RT	T							
4	W	W	W	W	W	W	W	W	RT	T						
3	W	W	W	W	W	W	W	W	W	(1)	T					
2	O	O	O	O	O	O	O	O	O	(1)	(1)	T				
1½	O	O	O	O	O	O	O	O	O	O	O	(1)	T			
1	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T		
¾	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	T	
½	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	(1)	T
	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

O OLET (MATCH END TYPE AND CLASS/SCHEDULE OF DESIGN PER PIPE SPEC)

P BRANCH WELD WITH REINFORCING PAD (PAD THICKNESS = RUN PIPE THICKNESS, PAD WIDTH = ½ BRANCH OD)

RT REDUCING TEE

T TEE

W WELDOLET

(1) USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.

GENERAL			
MATERIAL	CARBON STEEL (LOW TEMP)		
RATING	150 PSIG @ -50°F TO 100°F 150 PSIG @ 300°F 1/8" CORROSION ALLOWANCE		
SERVICES	DRY CHLORINE GAS [DCG], DRY CHLORINE OFF GAS [DCLO], WET CHLORINE OFF GAS [CLO], PLANT AIR [PA], NITROGEN [N]		
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	½" – 1½" 2" – 12" 14" – 24" 26" – 40"	SCH 80, A333 GR. 6, SMLS, BE SCH 40, A333 GR. 6, SMLS, BE STD WT, A333 GR. 6, SMLS, BE STD WT, A333 GR. 6, SMLS OR ERW 100% RT, BE	1, 2, 5 1, 2, 5, 6 1, 2, 5, 6 1, 2, 5, 6
FITTINGS	½" – 40" PER CHART	BW, SCH TO MATCH PIPE, A420 GR. WPL6 CL. 1, ASME B16.9 OLET, SCH/CLASS TO MATCH PIPE/FITTINGS, A350 GR. LF2 CL. 1, MSS SP-97	1, 2, 5, 6 1, 2, 5, 6
FLANGES	½" – 24" 26" – 40" ½" – 24" 26" – 40"	RF WN, CL 150, A350 GR. LF2 CL. 1, SCH TO MATCH PIPE, ASME B16.5 RF WN, CL 150, A350 GR. LF2 CL. 1, SCH TO MATCH PIPE, ASME B16.47 SER. A RF BLIND, CL 150, A350 GR. LF2 CL. 1, ASME B16.5 RF BLIND, CL 150, A350 GR. LF2 CL. 1, ASME B16.47 SER. A	1, 2, 5, 6 1, 2, 5, 6 5
UNIONS	NONE	USE FLANGES	5
BOLTING	ALL ALL	STUD BOLTS, A320 GR. L7, GREEN TEFLON COATED HEAVY HEX NUTS, A194 GR. 7L, GREEN TEFLON COATED	
GASKETS	ALL ALL ALL	EXPANDED PTFE W/ ENCAPSULATED C-276 CORRUGATED RING, RING TYPE, CL 150, 1/8" THK, ASME B16.21; VSP PITA OR APPROVED EQ. 100% EXPANDED PTFE, RING TYPE, CL 150, 1/8" THK, ASME B16.21; GORE UPG 800 OR APPROVED EQ. FILLED PTFE WITH INORGANIC FILLER, RING TYPE, CL 150, 1/8" THK, ASME B16.21; DURLON 9000 OR APPROVED EQ. **DO NOT APPLY LUBRICANT TO THE FLANGE FACES OR GASKETS FOR CHLORINE SERVICE**	9 9 9
THREAD LUBE	BOLTS	PTFE COATING; IF APPLICABLE, NONFLAMMABLE LUBRICANT RATED FOR OXYGEN/CHLORINE SERVICE; FLUOROLUBE OR EQ W/ ENGINEERING APPROVAL	

VALVES

BALL	BUTTERFLY	CHECK	GATE	GLOBE	PLUG	OTHER	NOTES
VBA-608 VBA-700	VBF-935	VCH-394		VGL-297	VPL-578		5, 9, 10, 11, 12, 13, 16

NOTES

1. REQUIREMENTS FOR DESIGN, FABRICATION, WELDING, NON-DESTRUCTIVE EVALUATION, INSTALLATION, DOCUMENTATION, ETC. IN WESTLAKE STANDARD GES-230 "PIPING SPECIFICATIONS" MUST BE FOLLOWED.
2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 225 PSIG. HYDROTEST PRESSURE DETERMINED BY ASME B31.3, PARA 345.4. DRAIN AND BLOW FREE OF LIQUID. WESTLAKE PERSONNEL TO DRY BY BLOWING WITH MINIMUM (-)40°F DEWPOINT AIR OR NITROGEN UNTIL DEWPOINT LEAVING IS SAME AS DEWPOINT ENTERING. BALL VALVES AND PLUG VALVES SHOULD BE HALF OPEN TO DRY THE BODY CAVITY.
3. PURGE GAS / DRYING GAS / INERTING GAS MUST BE OIL FREE.

4. WELDING SHALL BE PER ASME CODE SECTION IX, LATEST EDITION. WPS SHOULD BE SUITABLE FOR LOW TEMPERATURE SERVICE.
5. ALL PIPING AND VALVES MUST CONFORM TO CHLORINE INSTITUTE PAMPHLET 6.
6. PIPING SYSTEMS 8 INCH AND LARGER, CONSULT THE CHLORINE INSTITUTE PAMPHLET 6 AND WESTLAKE ENGINEERING REPRESENTATIVE FOR APPROVAL.
7. FLANGED CONNECTIONS ARE PREFERRED FOR CHLORINE SERVICE INCLUDING VENTS AND DRAINS. THREADED CONNECTIONS ARE NOT PERMITTED.
8. SEVERAL VALVE MANUFACTURERS MAKE EQUIVALENT CHLORINE SERVICE VALVES. THESE "OR EQUAL" VALVES MAY BE USED IF CHECKED AND APPROVED BY A WESTLAKE ENGINEERING REPRESENTATIVE. (CHECK FACE TO FACE DIMENSIONS)
9. ALL VALVES, INSTRUMENTS, AND GASKETS ARE TO BE PREPARED, DOUBLE BAGGED, AND TAGGED FOR CHLORINE SERVICE. VALVES SHALL BE CLEANED AND PACKAGED AS PER REQUIREMENTS OF CHLORINE INSTITUTE PAMPHLET
10. VPL-578 TO BE USED ONLY WITH APPROVAL FROM OPERATIONS. VGL-297 IS THE PREFERRED VALVE.
11. VPL-578 TO BE USED ONLY IN THE CHLORINE LOADING RACK.
12. CHECK VALVES TO BE INSTALLED IN HORIZONTAL POSITION WITH COVER UP.
13. CHECK VALVE INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.
14. USE OF WEAR PADS (DYNAGARD OR EQ.) ARE REQUIRED AT ALL STRUCTURAL STEEL/CONCRETE SUPPORT POINTS. IF BOLT-ON PIPE SHOES ARE NEEDED AS A SUBSTITUTE, THEY SHALL BE GALVANIZED AND BE PROVIDED WITH A BUILT-IN NON- METALLIC CONTACT PLATE BETWEEN THE PIPE AND THE SUPPORT.
15. WHEN CONNECTING OTHER PIPING SYSTEMS TO CL2 SPECIFIED PIPING, IT IS REQUIRED TO HAVE A PRIMARY ISOLATION VALVE, A BLEED VALVE, AND A SECONDARY ISOLATION VALVE. THE PRIMARY ISOLATION VALVE AND BLEED VALVE MUST BE OF THE AFFECTED CL2 PIPING SPECIFICATION. THE PIPE SPECIFICATION BREAK WILL BE AT THE SECONDARY ISOLATION VALVE.
16. USE OF REDUCED PORT BALL VALVES IS ALLOWED IN BLEEDS.

BRANCH CONNECTIONS

BRANCH

40	T																					
36	RT	T																				
34	RT	RT	T																			
32	RT	RT	RT	T																		
30	RT	RT	RT	RT	T																	
28	RT	RT	RT	RT	RT	T																
26	RT	RT	RT	RT	RT	RT	T															
24	RT	RT	RT	RT	RT	RT	RT	T														
20	RT	RT	RT	RT	RT	RT	RT	RT	T													
18	W	RT	RT	RT	RT	RT	RT	RT	RT	T												
16	W	W	W	RT	RT	RT	RT	RT	RT	RT	T											
14	W	W	W	W	W	RT	RT	RT	RT	RT	RT	T										
12	W	W	W	W	W	W	W	RT	RT	RT	RT	RT	T									
10	W	W	W	W	W	W	W	W	RT	RT	RT	RT	RT	T								
8	W	W	W	W	W	W	W	W	W	W	RT	RT	RT	RT	T							
6	W	W	W	W	W	W	W	W	W	W	W	W	RT	RT	RT	T						
4	W	W	W	W	W	W	W	W	W	W	W	W	W	W	RT	RT	T					
3	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	RT	(1)	T				
2	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	(1)	(1)	T			
1½	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	(1)	(1)	T		
1	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	(1)	(1)	T	
¾	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	(1)	(1)	(1)	T
½	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W	(1)	(1)	(1)	(1)	T
	40	36	34	32	30	28	26	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.

	MATERIAL	STAINLESS STEEL, 304L		GES 2-3-0 **CLA** AF REV 13 07/20/2022
	RATING	ASME B16.5, CLASS 150, M.G. 2.3 230 PSIG @ 100°F 150 PSIG @ 500°F 0.030" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES

BRINE CONDENSATE [BCOND], BOILER FEED WATER [BFW], CHEM. FEED BOILER FEED WATER TREATMENT [TRT], CAUSTIC 0-20% [CAU], CAUSTIC CONDENSATE [CCOND], NITROGEN FOR CELLROOM (VERY LOW PRESSURE) [NC], LEAN BRINE (AFTER DECHLOR) [DCB], DEMINERALIZED WATER [DMW], HYDROGEN [H2], HYDROGEN CONDENSATE [H2C], INSTRUMENT AIR [IA], LUBE OIL [LO], SODIUM BISULFATE [NAHSO3], PLANT AIR [PA], PLANT WATER [PWA], 50# STEAM CONDENSATE [SC50], SEAL WATER [SW], PROCESS VAPOR [VAP], VENT [VE], WASH WATER [WAW], WASTE WATER [WW]

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	½" – 1" ½" – 1½" 1½" – 3" 4" – 24" 30" 36"	SCH 80S, A-312 TP-304L, SMLS, PE OR BE SCH 80S, A-312 TP-304L, SMLS, PExTE SCH 40S, A-312 TP-304L, SMLS, BE SCH 10, A-312 TP-304L, SMLS, BE SCH 10, A-312 TP-304L, SMLS OR EFW W/ 100% R.T., BE SCH 40S, A-312 TP-304L, SMLS OR EFW W/ 100% R.T., BE	1,2,3 1,2,15 1,2 1,2 1,2,16 1,2,16
FITTINGS	½" – 1" ½" – 24" 30" – 36" ½" – 10"	3000#, A-182, GR. 304L, SW, ASME B16.11 SCH TO MATCH PIPE, A-403, WP-304L-S, BE, ASME B16.9 SCH TO MATCH PIPE, A-403, WP-304L-S OR WX-304L, BE, ASME B16.9 SCH/CLASS TO MATCH PIPE/FITTINGS, A-182, GR. 304L, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), MSS SP-97	1,2,3 1,2,4 1,2,16 1,2
FLANGES	½" – 1" ½" – 4" 2" – 24" 30", 36" ½" – 24" 2" – 24"	150#, A-182, GR. 304L, SCH 80S, RF SW, ASME B16.5 150#, A-182, GR. 304L, SCH TO MATCH PIPE, RF WN, ASME B16.5 150#, A-105, LAP JOINT, ASME B16.5 150#, A-182, GR. 304L, SCH TO MATCH PIPE, RF WN, ASME B16.47 SER. A 150#, A-182, GR. 304L, RF BLIND, ASME B16.5 300#, A-182, GR. 304L, SCH TO MATCH PIPE, RF ORIFICE FLANGE, ASME B16.36, ½" SW TAPS	1,2,5,6,7 1,2,5,6,7 1,2,5,6,7 1,2,5,6,7
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HVY. NUTS, TEFLON COATED	
GASKETS	ALL	150#, 1/8" THK. RING TYPE, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21, DURLON 9000 OR EQ W/ ENGINEERING APPROVAL	5,7
THREAD LUBE	PIPE BOLTS	TFE TAPE (≤400°F), MOLYCOTE G OR EQ (>400°F) NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
TEMPORARY STRAINERS	ALL	150#, CONICAL, 150% OPEN AREA, 304/316 SS SCREEN/PLATE	
"Y" STRAINERS	½" – 1½" 2" – 24"	600#, SW, A-351 GR. CF3, 0.020" PERF. SS SCREEN 150#, RF FLG, A-351 GR. CF3, 0.020" PERF. SS SCREEN	

	MATERIAL	STAINLESS STEEL, 304L		GES 2-3-0 **CLA** AF REV 13 07/20/2022
	RATING	ASME B16.5, CLASS 150, M.G. 2.3 230 PSIG @ 100°F 150 PSIG @ 500°F 0.030" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1E1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD498...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

VALVES			
VGA-153 VGA-122 VGA-130	½" – 1" ½" – 1" ½" – 12"	GATE, EXTENDED BODY, 316L SS, 800#, SWxNPT, TRIM #12 GATE, 316L SS, 800#, SW, TRIM #10 GATE, 316 SS, 150#, RF FLG, TRIM #10	8
VGL-239	½" – 10"	GLOBE, 316 SS, 150#, RF FLG, TRIM #10	
VBF-921 VBF-921G VBF-921GA	2" – 4" 6" – 24"	B-FLY, 316 SS, 150#, THD LUG, SS DISC, XTREME/SS SEATS, GRAPHITE SEAL B-FLY, 316 SS, 150#, THD LUG, SS DISC, XTREME/SS SEATS, GRAPHITE SEAL, GO B-FLY, 316 SS, 150#, THD LUG, SS DISC, XTREME/SS SEATS, GRAPHITE SEAL, GO, ASME B16.47 SER. A	9,10,14 9,10,14 9,10,14
VCH-305L VCH-305F VCH-342	2" – 6" 8" – 12" ½" – 12	CHECK, DUAL PLATE, 316 SS, 150#, DRILLED LUG, 316 SS DISC/TRIM, INCONEL X-750 SPRING CHECK, DUAL PLATE, 316 SS, 150#, DBL FLG, 316 SS DISC/TRIM, INCONEL X-750 SPRING CHECK, SWING, 316 SS, 150#, RF FLG, TRIM #10	11 11 11,12
VBA-610 VBA-643 VBA-643G	½" – 1½" ½" – 4" 6" – 8"	BALL, 316 SS BODY, 316 SS BALL/STEM, 1500/2000 WOG, THD, RPTFE SEATS, RED. PORT BALL, 316 SS BODY/BALL/STEM, 150#, RF FLG, XTREME SEATS, FULL PORT, LONG BALL, 316 SS BODY/BALL/STEM, 150#, RF FLG, XTREME SEATS, FULL PORT, LONG, GO	9,10,13 9,10 9,10

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1, OR A MINIMUM OF 20% FOR CATEGORY M FLUID SERVICE PER ASME B31.3, PARA. M341.4.1. ENGINEERING MAY REQUIRE HIGHER PERCENTAGES FOR SPECIAL SERVICES.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 350 PSIG PER ASME B31.3. HYDROTEST PRESSURE DETERMINED BY ASME B16.5, PARA. 2.6.

3. SOCKET WELD PIPE/FITTINGS SHALL BE THE DEFAULT TO BE USED FOR SIZES ½" – 1". BUTT WELD PIPE/FITTINGS ARE ALLOWED WHERE REQUIRED.

4. STUB ENDS SHALL BE USED FOR FLANGED CONECTIONS. THEY SHALL BE SHORT PATTERN AND LIMITED TO 24" PIPE SIZE PER ASME B16.9.

5. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.

6. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.

	MATERIAL	STAINLESS STEEL, 304L		GES 2-3-0 **CLA** AF REV 13 07/20/2022
	RATING	ASME B16.5, CLASS 150, M.G. 2.3 230 PSIG @ 100°F 150 PSIG @ 500°F 0.030" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

7. 300# FLANGES AND GASKETS MAY BE USED FOR MATING TO EQUIPMENT AS NECESSARY.

8. DEFAULT VENT, DRAIN, AND INSTRUMENT VALVE. ¾" SIZE IS THE DEFAULT SIZE, BUT ½" AND 1" MAY BE USED AS REQUIRED.

9. BUTTERFLY VALVES SHALL BE LIMITED TO 300°F PER API 609. BALL VALVES SHALL BE LIMITED TO 300°F. HIGHER TEMPERATURE ALLOWED ONLY WITH ENGINEERING APPROVAL OF DESIGNATED MAKE/MODEL.

10. VALVES SHALL BE SPECIFIED AND PURCHASED AS FIRE SAFE.

11. INSTALL IN HORIZONTAL POSITION WITH COVER UP.

12. INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.

13. THIS VALVE IS FOR USE IN INSTRUMENT AIR SERVICE ONLY.

14. IN H2 SERVICE USE VBF-921 ONLY.

15. FOR USE WITH VBA-610 ONLY.

16. SEAMLESS PIPE AND FITTINGS ARE DEFAULT TO BE USED. IF SEAMLESS IS NOT READILY AVAILABLE, WELDED PIPE AND FITINGS WITH 100% R.T. MAY BE USED.

	MATERIAL	STAINLESS STEEL, 304L		GES 2-3-0 **CLA** AF REV 13 07/20/2022
	RATING	ASME B16.5, CLASS 150, M.G. 2.3 230 PSIG @ 100°F 150 PSIG @ 500°F 0.030" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

BRANCH CONNECTIONS

BRANCH

36	T																
30	RT	T															
24	F	RT	T														
20	F	F	RT	T													
18	F	F	P	RT	T												
16	F	F	P	P	RT	T											
14	F	F	P	P	P	RT	T										
12	F	F	P	P	P	P	RT	T									
10	W	W	P	P	P	P	P	RT	T								
8	W	W	W	W	W	W	W	RT	RT	T							
6	W	W	W	W	W	W	W	W	RT	RT	T						
4	W	W	W	W	W	W	W	W	W	RT	RT	T					
3	W	W	W	W	W	W	W	W	W	W	RT	(1)	T				
2	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T			
1½	O	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T		
1	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	T	
¾	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	(1)	T
½	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T
	36	30	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

F – FULL ENCIRCLEMENT REINFORCEMENT (LENGTH EQUALS TWICE BRANCH PIPE OD)

O – OLET (MATCH END TYPE AND CLASS/SCHEDULE OF DESIGN PER PIPE SPEC)

P – BRANCH WELD WITH REINFORCING PAD (PAD THICKNESS EQUALS RUN PIPE THICKNESS, PAD WIDTH EQUALS ½ BRANCH OD.)

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.

	MATERIAL	STAINLESS STEEL, 304L		GES 2-3-0 **CLA** AFU REV 2 07/20/2022
	RATING	ASME B16.5, CLASS 150, M.G. 2.3 230 PSIG @ 100°F 160 PSIG @ 400°F 0.030" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES

PRESSURE RELIEF VALVE DISCHARGES TO ATMOSPHERE ONLY

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	½" – 1½"	SCH 40S, A-312 TP-304L, SMLS OR EFW, PE	1,2
	½" – 1½"	SCH 40S, A-312 TP-304L, SMLS OR EFW, TE	2
	2" – 14"	SCH 10S, A-312 TP-304L, SMLS OR EFW, BE	1,2
	16" – 20"	SCH 10, A-312 TP-304L, SMLS OR EFW, BE	1,2
	24" – 30"	STD. WT., A-358 TP-304L, EFW, BE	1,2
FITTINGS	½" – 1½"	CL 3000, A-182, GR. 304L, SW, ASME B16.11	1,2
	½" – 1½"	CL 3000, A-182, GR. 304L, THD, ASME B16.11	2
	½" – 30"	SCH TO MATCH PIPE, A-403, WP-304L, BE, ASME B16.9	1,2
	½" – 10"	SCH/CLASS TO MATCH PIPE/FITTINGS, A-182, GR. 304L, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), MSS SP-97	1,2
FLANGES	½" – 1½"	CL 150, A-182, GR. 304L, SCH TO MATCH PIPE, RF SW, ASME B16.5	1,2,3,4,5
	½" – 1½"	CL 150, A-182, GR. 304L, SCH TO MATCH PIPE, RF THD, ASME B16.5	2,3,4,5
	2" – 24"	CL 150, A-182, GR. 304L, SCH TO MATCH PIPE, RF WN, ASME B16.5	1,2,3,4,5
	26" – 30"	CL 150, A-182, GR. 304L, SCH TO MATCH PIPE, RF WN, ASME B16.47 SER. A	1,2,3,4,5
	½" – 24"	CL 150, A-182, GR. 304L, RF BLIND, ASME B16.5	
	26" – 30"	CL 150, A-182, GR. 304L, RF BLIND, ASME B16.47 SERIES A	
	2" – 12"	CL 300, A-182, GR. 304L, SCH TO MATCH PIPE, RF ORIFICE FLANGE, ASME B16.36, ½" SW TAPS	
UNIONS	½" – 1½"	CL 3000, A-182, GR. 304L, THD, MSS SP-83	2
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HVY. NUTS, TEFLON COATED	
GASKETS	ALL	CL 150, 1/8" THK. SPIRAL WOUND, 304SS WINDINGS WITH GRAPHITE FILLER, CS OUTER RING, ANTI-BUCKLING, ASME B16.20; FLEXITALLIC STYLE CGI, VSP AB-326, OR EQ W/ ENGINEERING APPROVAL	3,5
THREAD LUBE	PIPE BOLTS	TFE TAPE (≤400°F), MOLYCOTE G OR EQ (>400°F) NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
TEMPORARY STRAINERS	ALL	CL 150, CONICAL, 150% OPEN AREA, 304/316 SS SCREEN/PLATE	
"Y" STRAINERS	½" – 12"	CL 150, RF FLG, A-351 GR. CF8M, 0.020" PERF. SS SCREEN	

	MATERIAL	STAINLESS STEEL, 304L	GES 2-3-0 **CLA** AFU REV 2 07/20/2022
	RATING	ASME B16.5, CLASS 150, M.G. 2.3 230 PSIG @ 100°F 160 PSIG @ 400°F 0.030" CORR. ALLOW.	

MAINT. APPROVAL	HSE APPROVAL	OPER. APPROVAL	ENG. APPROVAL
DocuSigned by: Matt Martin 1F1037AA1859411...	DocuSigned by: Ryan Esteveus 402213A8234D4F3...	DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...

VALVES			
VBA-643	½" – 4"	BALL, 316 SS BODY, 316 SS BALL/STEM, 150#, RF FLG, XTREME SEATS, FULL PORT	7,11
VBA-643G	6" – 8"	BALL, 316 SS BODY, 316 SS BALL/STEM, 150#, RF FLG, XTREME SEATS, FULL PORT, GO	7,11
VGL-239	½" – 12"	GLOBE, 316SS, CL 150, RF FLG, TRIM #10	
VGL-442	¾" X ½"	SAMPLING, 316SS BODY/TRIM, CL 150, RF FLG, SPECIFY PISTON LENGTH	
VCH-342	½" – 12"	CHECK, SWING, 316SS, CL 150, RF FLG, TRIM #10	9
VPL-504	½" – 4"	PLUG, 316SS BODY/PLUG, CL 150, RF FLG, PTFE SLEEVE, SHORT	6,8
VPL-504G	6" – 12"	PLUG, 316SS BODY/PLUG, CL 150, RF FLG, PTFE SLEEVE, SHORT, GO	8

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1, OR A MINIMUM OF 100% FOR CATEGORY M FLUID SERVICE PER ASME B31.3, PARA. M341.4.1. ENGINEERING MAY REQUIRE HIGHER PERCENTAGES FOR SPECIAL SERVICES.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 350 PSIG PER ASME B31.3. HYDROTEST PRESSURE DETERMINED BY ASME B16.5, PARA. 2.6.

3. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.

4. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.

5. CL 300 FLANGES AND GASKETS MAY BE USED FOR MATING TO EQUIPMENT AS NECESSARY.

6. VENT, DRAIN, AND INTRUMENT VALVE. ¾" SIZE IS THE DEFAULT SIZE, BUT ½" AND 1" MAY BE USED IF REQUIRED.

7. BALL VALVES SHALL BE LIMITED TO 300°F. HIGHER TEMPERATURE ALLOWED ONLY WITH ENGINEERING APPROVAL OF DESIGNATED MAKE/MODEL.

8. VALVES SHALL BE SPECIFIED AND PURCHASED AS FIRE SAFE PER API-607.

9. INSTALL IN HORIZONTAL POSITION WITH COVER UP OR IN VERTICAL POSITION WITH UPWARD FLOW.

10. PIPING IN CATEGORY D FLUID SERVICE MAY BE SUBJECT TO AN INITIAL SERVICE LEAK TEST IN ACCORDANCE WITH ASME B31.3 PARA. 345.7, IN LIEU OF THE HYDROSTATIC LEAK TEST.

11. VALVES SHALL BE SPECIFIED AS FIRE SAFE AND FURNISHED WITH A LOCKING DEVICE.

	MATERIAL	STAINLESS STEEL, 304L		GES 2-3-0 **CLA** AFU REV 2 07/20/2022
	RATING	ASME B16.5, CLASS 150, M.G. 2.3 230 PSIG @ 100°F 160 PSIG @ 400°F 0.030" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

BRANCH CONNECTIONS

BRANCH

30	T															
24	RT	T														
20	F	RT	T													
18	F	P	RT	T												
16	F	P	P	RT	T											
14	F	P	P	P	RT	T										
12	F	P	P	P	P	RT	T									
10	W	P	P	P	P	P	RT	T								
8	W	W	W	W	W	W	RT	RT	T							
6	W	W	W	W	W	W	W	RT	RT	T						
4	W	W	W	W	W	W	W	W	RT	RT	T					
3	W	W	W	W	W	W	W	W	W	RT	(1)	T				
2	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T			
1½	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T		
1	O	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T	
¾	O	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	T
½	O	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	(1)	T
	30	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

F – FULL ENCIRCLEMENT REINFORCEMENT (LENGTH EQUALS TWICE BRANCH PIPE OD)

O – OLET (MATCH END TYPE AND CLASS/SCHEDULE OF DESIGN PER PIPE SPEC)

P – BRANCH WELD WITH REINFORCING PAD (PAD THICKNESS EQUALS RUN PIPE THICKNESS, PAD WIDTH EQUALS ½ BRANCH OD.)

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.

	MATERIAL	STAINLESS STEEL, 316L		GES 2-3-0 **CLA** AH REV 12 07/20/2022
	RATING	ASME B16.5, CLASS 150, M.G. 2.3 230 PSIG @ 100°F 150 PSIG @ 500°F 0.030" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES			
DEMINERALIZED WATER [DMW], LUBE OIL [LO], WASTE WATER [WW], BRINE SLUDGE [SLD], COLD CAUSTIC AFTER CAUSTIC EVAP [CCAU]			
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	½" – 1½" 2" – 6" 8" – 18"	SCH 40S, A-312 TP-316L, SMLS, PE SCH 40S, A-312 TP-316L, SMLS, BE SCH 10, A-312 TP-316L, SMLS OR EFW, BE	1,2 1,2 1,2
FITTINGS	½" – 1½" 2" – 18" ½" – 10"	CL 3000, A-182, GR. F316L, SW, ASME B16.11 SCH TO MATCH PIPE, A-403, WP-316L, BW, ASME B16.9 SCH/CLASS TO MATCH PIPE/FITTINGS, A-182, GR. F316L, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), MSS SP-97	1,2 1,2,3 1,2
FLANGES	½" – 1½" 2" – 18" 2" – 18" ½" – 18" 2" – 18"	CL 150, A-182, GR. F316L, SCH 40S, RFSW, ASME B16.5 CL 150, A-105, LAP JOINT, ASME B16.5 CL 150, A-182, GR. F316L, RF SO, ASME B16.5 CL 150, A-182, GR. F316L, RF BLIND, ASME B16.5 CL 300, A-182, GR. F316L, SCH TO MATCH PIPE, RF ORIFICE FLANGE, ASME B16.36, ½" SW TAPS	1,2,4,5,6 1,2,4,5,6 1,2,4,5, 6,7 4
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HVY. NUTS, TEFLON COATED	
GASKETS	ALL	CL 150, 1/8" THK. RING TYPE, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21, DURLON 9000 OR EQ W/ ENGINEERING APPROVAL	4,6
THREAD LUBE	PIPE BOLTS	TFE TAPE (≤400°F), MOLYCOTE G OR EQ (>400°F) NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
TEMPORARY STRAINERS	ALL	CL 150, CONICAL, 150% OPEN AREA, 304/316 SS SCREEN/PLATE	
"Y" STRAINERS	½" – 1½" 2" – 18"	CL 600, SW, A351, GR. CF3M, 0.020" PERF. SS SCREEN CL 150, RF FLG, A351, GR. CF8M, 0.020" PERF. SS SCREEN	
VALVES			
VGA-122 VGA-130 VGA-130G VGA-167	½" – 1½" ½" – 14" 16" – 18" ½" – 1½"	GATE, 316L SS, CL 800, SW, TRIM #10 GATE, 316 SS, CL 150, RF FLG, TRIM #10 GATE, 316 SS, CL 150, RF FLG, TRIM #10 GATE, EXTENDED BODY, 316L SS, CL 800, MSWxFNPT, TRIM #12	 8
VGL-237 VGL-237G	½" – 8" 10" – 12"	GLOBE, 316L SS, CL 150, RF FLG, TRIM #10 GLOBE, 316L SS, CL 150, RF FLG, TRIM #10, GO	
VPL-504 VPL-504G	½" – 4" 6" – 18"	PLUG, 316 SS BODY/PLUG, CL 150, RF FLG, PTFE SLEEVE, PLUG, 316 SS BODY/PLUG, CL 150, RF FLG, PTFE SLEEVE, GO7	9 9

	MATERIAL	STAINLESS STEEL, 316L		GES 2-3-0 **CLA** AH REV 12 07/20/2022
	RATING	ASME B16.5, CLASS 150, M.G. 2.3 230 PSIG @ 100°F 150 PSIG @ 500°F 0.030" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Esteveus 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

VCH-305 VCH-340	2" – 18" ½" – 12"	CHECK, DUAL PLATE, 316 SS, CL 150, WAFER, 316SS DISC/SEAT CHECK, SWING, 316 SS, CL 150, RF FLG, TRIM #10	10 10
VBA-662 VBA-662G	½" – 4" 6"	BALL, DUCTILE IRON BODY, ALLOY BALL, CL 150 RF FLG, PFA LINER, FULL PORT BALL, DUCTILE IRON BODY, ALLOY BALL, CL 150 RF FLG, PFA LINER, FULL PORT, GO	9 9
VBF-921 VBF-921G	2" – 4" 6" – 18"	B-FLY, 316 SS, CL 150, THD LUG, SS DISC, PTFE SEATS/SEAL B-FLY, 316 SS, CL 150, THD LUG, SS DISC, PTFE SEATS/SEAL, GO	9 9

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1. ENGINEERING MAY REQUIRE HIGHER PERCENTAGES FOR SPECIAL SERVICES.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 345 PSIG PER ASME B31.3. HYDROTEST PRESSURE DETERMINED BY ASME B16.5, PARA. 2.6.

3. STUB ENDS SHALL BE USED FOR FLANGED CONECTIONS. THEY SHALL BE SHORT PATTERN PER ASME B16.9.

4. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.

5. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.

6. CL 300 FLANGES AND GASKETS MAY BE USED FOR MATING TO EQUIPMENT AS NECESSARY.

7. SLIP-ON FLANGES SHALL NOT BE USED DIRECTLY ON FITTINGS UNLESS SO INDICATED ON THE DESIGN DRAWINGS.

8. VENT, DRAIN, AND INSTRUMENT VALVE. ¾" SIZE IS THE DEFAULT SIZE, BUT ½" AND 1" MAY BE USED AS REQUIRED.

9. BUTTERFLY VALVES SHALL BE LIMITED TO 300°F PER API 609. BALL VALVES SHALL BE LIMITED TO 300°F. PLUG VALVES SHALL BE LIMITED TO 400°F. HIGHER TEMPERATURE ALLOWED ONLY WITH ENGINEERING APPROVAL OF DESIGNATED MAKE/MODEL.

10. INSTALL IN HORIZONTAL POSITION WITH COVER UP (SWING) OR HINGE PIN VERTICAL (DUAL PLATE). INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.

11. PIPING IN CATEGORY D FLUID SERVIDE MAY BE SUBJECT TO AN INITIAL SERVICE LEAK TEST IN ACCORDANCE WITH ASME B31.3 PARA. 345.7, IN LIEU OF THE HYDROSTATIC LEAK TEST.

	MATERIAL	STAINLESS STEEL, 316L		GES 2-3-0 **CLA** AH REV 12 07/20/2022
	RATING	ASME B16.5, CLASS 150, M.G. 2.3 230 PSIG @ 100°F 150 PSIG @ 500°F 0.030" CORR. ALLOW.		
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BRANCH CONNECTIONS

BRANCH

18	T												
16	RT	T											
14	RT	RT	T										
12	RT	RT	RT	T									
10	RT	RT	RT	RT	T								
8	W	RT	RT	RT	RT	T							
6	W	W	W	RT	RT	RT	T						
4	W	W	W	W	W	RT	RT	T					
3	W	W	W	W	W	W	RT	(1)	T				
2	O	O	O	O	O	O	O	(1)	(1)	T			
1½	O	O	O	O	O	O	O	O	(1)	(1)	T		
1	O	O	O	O	O	O	O	O	O	(1)	(1)	T	
¾	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	T
½	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	(1)
	18	16	14	12	10	8	6	4	3	2	1½	1	¾

SYMBOLS

O – OLET (MATCH END TYPE AND CLASS/SCHEDULE OF DESIGN PER PIPE SPEC)

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.

	MATERIAL SUPER DUPLEX SS 2507		GES 2-3-0 **CLA** AHB REV 2 07/20/2022
	RATING LIMITED BY VBA-609 & VBF-903 150 PSIG @ 100°F 130 PSIG @ 300°F 1/16" CORR. ALLOW.		
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CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES

BRINE CONDENSATE [BCOND]

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	½" – 1½" 2" – 12"	SCH 80S, ASTM A-790 UNS NO. S32750, SEAMLESS, BE SCH 40S, ASTM A-790 UNS NO. S32750, SEAMLESS, BE	1,2,8 1,2,8
FITTINGS	½" – 12" 1" – 10"	SCH TO MATCH PIPE, ASTM A-815 GR. WPS32750-S, SEAMLESS, BW, ASME B16.9 SCH/CLASS TO MATCH PIPE/FITTINGS, ASTM A-182 F53 UNS NO. S32750, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), MSS SP-97	1,2,3,8 1,2,8
FLANGES	½" – 12" ½" – 12"	CL 150, A-105, LAP JOINT, ASME B16.5 CL 150, A-182-F53 UNS NO. S32750, RF BLIND, ASME B16.5	1,2,3,5,6,7 5
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HVY. NUTS, TEFLON COATED	
GASKETS	ALL	CL 150, 1/8" THK, RING TYPE, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21, DURLON 9000 OR EQ W/ ENGINEERING APPROVAL	5,7
THREAD LUBE	PIPE BOLTS	TFE TAPE (≤400°F), MOLYCOTE G OR EQ (>400°F) NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
TEMPORARY STRAINERS	ALL	CL 150, CONICAL, 150% OPEN AREA, ASTM A240 UNS. NO. S32750 SCREEN/PLATE	
VALVES			
VCH-323	½" – 6"	CHECK, PISTON, HORIZ OR VERT, CAST STEEL, CL 150 FLGD, TFE OR PFA LINER	
VPL-506 VPL-506G	½" – 4" 6" – 8"	PLUG, DUCTILE IRON BODY/PLUG, CL 150 RF FLG, PFA LINER PLUG, DUCTILE IRON BODY/PLUG, CL 150 RF FLG, PFA LINER, GO	4
VBA-662 VBA-662G VBA-609	½" – 4" 6" 1" – 6"	BALL, DUCTILE IRON BODY, ALLOY BALL, CL 150 RF FLG, PFA LINER, FULL PORT BALL, DUCTILE IRON BODY, ALLOY BALL, CL 150 RF FLG, PFA LINER, FULL PORT, GO BALL, DUCTILE IRON BODY/BALL, CL 150 RF FLG, PFA LINER, REDUCED PORT	
VBF-903 VBF-903G	2" – 6" 8" – 12"	B-FLY, DI BODY, CL 150, LUG, PTFE LINER/TRIM B-FLY, DI BODY, CL 150, LUG, PTFE LINER/TRIM, GO	

	MATERIAL	SUPER DUPLEX SS 2507		GES 2-3-0 **CLA** AHB REV 2 07/20/2022
	RATING	LIMITED BY VBA-609 & VBF-903 150 PSIG @ 100°F 130 PSIG @ 300°F 1/16" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1. ENGINEERING MAY REQUIRE HIGHER PERCENTAGES FOR SPECIAL SERVICES.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 345 PSIG. HYDROTEST PRESSURE DETERMINED BY ASME B31.3, PARA. 345.4. DRAIN AND BLOW DRY.

3. STUB ENDS SHALL BE USED FOR FLANGED CONNECTIONS. THEY SHALL BE SHORT PATTERN PER ASME B16.9. IF WELDED STUB ENDS ARE USED, THEY SHALL BE OF WX CONSTRUCTION (100% R.T.).

4. DEFAULT VENT, DRAIN, AND INTRUMENT VALVE. 1" SIZE IS THE STANDARD SIZE.

5. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.

6. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.

7. CL 300 FLANGES AND GASKETS MAY BE USED FOR MATING TO EQUIPMENT AS NECESSARY.

8. THREADED COMPONENTS SHALL NOT BE USED.

	MATERIAL	SUPER DUPLEX SS 2507		GES 2-3-0 **CLA** AHB REV 2 07/20/2022
	RATING	LIMITED BY VBA-609 & VBF-903 150 PSIG @ 100°F 130 PSIG @ 300°F 1/16" CORR. ALLOW.		
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BRANCH CONNECTIONS

BRANCH

12	T										
10	RT	T									
8	RT	RT	T								
6	RT	RT	RT	T							
4	W	W	RT	RT	T						
3	W	W	W	RT	(1)	T					
2	W	W	W	W	(1)	(1)	T				
1½	W	W	W	W	W	W	(1)	T			
1	W	W	W	W	W	W	(1)	(1)	T		
¾	W	W	W	W	W	W	(1)	(1)	(1)	T	
½	W	W	W	W	W	W	(1)	(1)	(1)	(1)	T
	12	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

T – TEE

RT – REDUCING TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS

	MATERIAL	DUPLEX STAINLESS STEEL 2205		GES 2-3-0 **CLA** AHD REV 10 07/20/2022
	RATING	LIMITED BY VBA-609 & VBF-903 150 PSIG @ 100°F 130 PSIG @ 300°F 1/16" CORR. ALLOW.		
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SERVICES

CATHOLYTE [CAT], CAUSTIC 0 – 20% [CAU], COLD CAUSTIC AFTER CAUSTIC EVAP [CCAU], NITROGEN FOR CELLROOM (VERY LOW PRESSURE) [NC]

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	½" – 1½" 2" – 8"	SCH 80S, ASTM A-790, TYPE 2205, UNS NO. S32205, SEAMLESS, BE SCH 40S, ASTM A-790, TYPE 2205, UNS NO. S32205, SEAMLESS, BE	1,2,8 1,2,8
FITTINGS	½" – 8" ½" – 6"	SCH TO MATCH PIPE, ASTM A-815 GR. WPS32205-S, SEAMLESS, BW, ASME B16.9 BRANCH, SCH TO MATCH PIPE, ASTM A-182-F60 UNS NO. S32205, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), BW, MSS SP-97	1,2,3,8 1,2,8
FLANGES	½" – 8" ½" – 8"	CL 150, A-105, LAP JOINT, ASME B16.5 CL 150, A-182- F60 UNS NO. S32205, RF BLIND, ASME B16.5	1,2,3,5,6,7 5
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HEAVY NUTS, TEFLON COATED	
GASKETS	ALL	CL 150, 1/8" THK, RING TYPE, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21, DURLON 9000 OR EQ W/ ENGINEERING APPROVAL	5,7
THREAD LUBE	BOLTS	NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
TEMPORARY STRAINERS	ALL	CL 150, CONICAL, 150% OPEN AREA, ASTM A240, TYPE 2205, UNS. NO. S32205 SCREEN/PLATE	
VALVES			
VCH-323	1" – 6"	CHECK, PISTON, HORIZ OR VERT, CAST STEEL, CL 150 FLGD, TFE OR PFA LINER	
VPL-506 VPL-506G	½" – 4" 6" – 8"	PLUG, DUCTILE IRON BODY/PLUG, CL 150 RF FLG, PTFE/PFA LINER PLUG, DUCTILE IRON BODY/PLUG, CL 150 RF FLG, PTFE/PFA LINER, GO	4 4
VBA-662 VBA-662G VBA-609 VBA-609G	½" – 4" 6" 1" – 6" 8"	BALL, DUCTILE IRON BODY, ALLOY BALL, CL 150 RF FLG, PFA LINER, FULL PORT BALL, DUCTILE IRON BODY, ALLOY BALL, CL 150 RF FLG, PFA LINER, FULL PORT, G/O BALL, DUCTILE IRON BODY/BALL, CL 150 RF FLG, PFA LINER, REDUCED PORT BALL, DUCTILE IRON BODY/BALL, CL 150 RF FLG, PFA LINER, REDUCED PORT, G/O	
VBF-903 VBF-903G	2" – 6" 8"	BUTTERFLY, D.I. LUG BODY, PTFE LINER, CL 150 FF FLG BUTTERFLY, D.I. LUG BODY, PTFE LINER, CL 150 FF FLG, G/O	

	MATERIAL	DUPLEX STAINLESS STEEL 2205		GES 2-3-0 **CLA** AHD REV 10 07/20/2022
	RATING	LIMITED BY VBA-609 & VBF-903 150 PSIG @ 100°F 130 PSIG @ 300°F 1/16" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARAGRAPH 341.4.1.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 225 PSIG. HYDROTEST PRESSURE DETERMINED BY ASME B31.3, SECTION 345.4.2. DRAIN AND BLOW DRY.

3. STUB ENDS SHALL BE USED FOR FLANGED CONNECTIONS. THEY SHALL BE SHORT PATTERN PER ASME B16.9. IF WELDED STUB ENDS ARE USED, THEY SHALL BE OF WX CONSTRUCTION (100% R.T.). WELDED STUB ENDS REQUIRE ENGINEERING APPROVAL.

4. VENT, DRAIN, AND INTRUMENT VALVE. 1" SIZE IS THE STANDARD SIZE.

5. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.

6. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.

7. CL 300 FLANGES AND GASKETS MAY BE USED FOR MATING TO EQUIPMENT AS NECESSARY.

8. THREADED COMPONENTS SHALL NOT BE USED.

	MATERIAL	DUPLEX STAINLESS STEEL 2205		GES 2-3-0 **CLA** AHD REV 10 07/20/2022
	RATING	LIMITED BY VBA-609 & VBF-903 150 PSIG @ 100°F 130 PSIG @ 300°F 1/16" CORR. ALLOW.		
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BRANCH CONNECTIONS

BRANCH

8	T								
6	RT	T							
4	RT	RT	T						
3	W	RT	(1)	T					
2	W	W	(1)	(1)	T				
1½	W	W	W	(1)	(1)	T			
1	W	W	W	W	(1)	(1)	T		
¾	W	W	W	W	(1)	(1)	(1)	T	
½	W	W	W	W	(1)	(1)	(1)	(1)	T
	8	6	4	3	2	1½	1	¾	½

SYMBOLS

T – TEE

RT – REDUCING TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCTING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS

	MATERIAL	HDPE		GES 2-3-0 **CLA** AI
	RATING	LIMITED BY HDPE PIPE/FITTINGS 150 PSIG @ 140°F 0" CORR. ALLOW.		
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SERVICES			
WASTEWATER SUMPS [WW], HCL SAMPLE POINTS [HCL], CAUSTIC SAMPLE POINTS [CAU]			
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	2" – 8"	DR 7, HDPE, SMLS, EXTRUDED, PE, ASTM F714 GR. PE4710, ASTM D3350 CELL CLASSIFICATION 445574C (GR. PE47)	1
FITTINGS	2" – 8" 2" – 8"	DR 7, HDPE, SMLS, FABRICATED OR MOLDED, BUTT FUSION ENDS, ASTM F714 GR. PE4710, ASTM D3350 CELL CLASSIFICATION 445574C (GR. PE47), ASTM D3261 FLANGE ADAPTER, DR 7, HDPE, SMLS, MOLDED, BUTT FUSION ENDS, SERRATED SEALING SURFACE, ASTM F714 GR. PE4710, ASTM D3350 CELL CLASSIFICATION 445574C (GR. PE47), ASTM D3261	1 1,4
FLANGES	2" – 8"	DUCTILE IRON, LAP JOINT BACK-UP RING, ASME B16.5 150# DRILLING, GALVANIZED	1,2,3,4
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HVY. NUTS, TEFLON COATED, WITH FLAT SS WASHERS BETWEEN NUTS AND BACK-UP RING	
GASKETS	ALL ALL	150#, 1/8" THK. FF, EXPANDED PTFE, ASME B16.21, GORE UPG 800 OR EQ W/ ENGINEERING APPROVAL 150#, 1/8" THK. FF W/ RAISED MOLDED-IN SEALING RINGS, PTFE BONDED TO EPDM, ASME B16.21, GARLOCK STRESS SAVER 370 OR EQ W/ ENGINEERING APPROVAL	
THREAD LUBE	BOLTS	NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
TEMPORARY STRAINERS	ALL	150# FF, CONICAL, 150% OPEN AREA, SS SCREEN/PLATE	
"Y" STRAINERS	2" – 8"	150#, FF FLG, DI, 0.020" PERF. SS SCREEN	
VALVES			
VBF-902 VBF-902G	2" – 4" 6" – 8"	B-FLY, DI, 150#, THD LUG, DI DISC, BUNA-N SEATS/SEAL B-FLY, DI, 150#, THD LUG, DI DISC, BUNA-N SEATS/SEAL, GO	

	MATERIAL HDPE			GES 2-3-0 **CLA** AI
	RATING LIMITED BY HDPE PIPE/FITTINGS 150 PSIG @ 140°F 0" CORR. ALLOW.			
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	REV 0 07/20/2022

NOTES

1. HYDROSTATIC TESTING SHALL BE PERFORMED AT 1.5 TIMES SYSTEM DESIGN PRESSURE.
2. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.
3. 300# FLANGES AND GASKETS MAY BE USED FOR MATING TO EQUIPMENT AS NECESSARY.
4. FLANGE ADAPTER WITH BACKING RING AND NON-ASBESTOS GASKET SHALL BE USED TO MATE HDPE TO VALVES AND OTHER PIPING SYSTEMS.

BRANCH CONNECTIONS

BRANCH

8	T				
6	RT	T			
4	S	S	T		
3	S	S	S	T	
2	RT	RT	RT	RT	T
	8	6	4	3	2

SYMBOLS

RT – BUTT TEE W/ BUTT REDUCER(S)

T – BUTT TEE

S – BUTT SADDLE

	MATERIAL	PTFE TUBING		GES 2-3-0 **CLA** APT REV 0 07/20/2022
	RATING	LIMITED BY ¾" TUBING SEE RATING TABLE ON NOTE 5 0" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

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SERVICES			
CHEMICAL FEED [CF], DEPLETED BRINE (ANYOLYTE) (BEFORE DECHLOR) [DPB], SUPPLY BRINE [SB]			
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
TUBING	¼" – 1"	0.062" WALL, PTFE OR PFA TUBING, PE	1,2,4,5
FITTINGS	¼" – 1"	PTFE OR PFA COMPRESSION TYPE FITTINGS	1,2,4,5
FLANGES	NONE		
UNIONS	NONE		
BOLTING	NONE		
GASKETS	NONE		
THREAD LUBE	NONE		
TEMPORARY STRAINERS	NONE		
"Y" STRAINERS	NONE		
BRANCH CONNECTIONS	¼" – 1"	USE COMPRESSION FITTINGS AS NECESSARY	
VALVES			
VCH-463	¼" – ¾"	CHECK, POPPET, PFA, 100 PSIG, COMPRESSION ENDS	3,4
VNE-06	¼" – ½"	NEEDLE, PFA BODY/STEM, 110 PSIG, COMPRESSION ENDS	3,4

	MATERIAL	PTFE TUBING		GES 2-3-0 **CLA** APT REV 0 07/20/2022
	RATING	LIMITED BY ¾" TUBING SEE RATING TABLE ON NOTE 5 0" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D40D...	

NOTES

1. WELDING NOT ALLOWED FOR THIS PIPING SPECIFICATION.

2. CHECK VALVES SHALL BE LIMITED TO 200°F.

3. VERIFY PRESSURE RATING OF TUBING, FITTINGS, AND VALVES AT INTERMEDIATE SYSTEM DESIGN TEMPERATURES.

4. IF TUBE FITTINGS ARE REQUIRED, VERIFY PRESSURE/TERMPERATURE RATINGS WITH MANUFACTURER. THESE FITTINGS MAY LIMIT THE SYSTEM DESIGN PRESSURE/TEMPERATURE.

5. TUBE PRESSURE RATINGS AND DE-RATING FACTORS SHOWN BELOW ARE BASED ON PARKER SERIES 101 HEAVY WALL (0.062") PTFE TUBING. VERIFY TUBING RATING WITH MANUFACTURER FOR APPLICATION BEFORE PURCHASE.

NOMINAL TUBE SIZE (IN.)		**1/4**	**3/8**	**1/2**	**5/8**	**3/4**	**1**
Design Temp. (°F)	**DE-RATING FACTOR**	**Design Pressure (PSIG)**					
73	1	290	180	130	100	80	100
100	0.85	246	153	110	85	68	85
150	0.70	203	126	91	70	56	70
200	0.55	159	99	71	55	44	55
250	0.40	116	72	52	40	32	40
300	0.30	87	54	39	30	24	30

GENERAL			
MATERIAL	PTFE-LINED CARBON STEEL		
RATING	LIMITED BY VBF-903 150 PSIG @ 100°F 150 PSIG @ 150°F 0" CORROSION ALLOWANCE		
SERVICES	CHLORINE OFF GAS [CLO], CHLORINATED WATER [CLW], LEAN BRINE (AFTER DECHLOR) [DCB], DRY CHLORINE OFF GAS [DCLO], HYDROCHLORIC ACID [HCL] UP TO 35.2%, SODIUM BISULFATE [NAHSO3], SULFURIC ACID [SA], SUPPLY BRINE [SB], TREATMENT CHEMICAL BY OTHERS [TRT], WASTE WATER [WW]		
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	1" – 12"	PTFE LINED FLANGED SPOOLS PER ASTM F1545. FABRICATED FROM PTFE LINED A53 GR. B (ERW) OR A106 GR. B, CARBON STEEL PIPE WITH ANSI CLASS 150 CARBON STEEL (A105) OR DUCTILE IRON (A395) LAP JOINT FLANGES PER ASME B16.5 (CS) OR ASME B16.42 (DI), SCH 40 (1"-8") / SCH30 (10") / SCH20 (12") MINIMUM SCHEDULE, WELDED FLANGES ALLOWED WITH ENGINEERING APPROVAL, RESISTOFLEX / 3P / AEGIS OR EQ	3,4,5,6
FITTINGS	1" – 12"	CLASS 150, PTFE LINED FLANGED FITTINGS PER ASTM F1545. HOUSING TO BE CAST STEEL (A216), WROUGHT STEEL (A234), DUCTILE IRON (A395), OR FABRICATED CARBON STEEL; FLANGES TO BE DUCTILE IRON (A395) OR CARBON STEEL (A105), INTEGRAL OR LAP JOINT. FLANGES PER ASME B16.5 (CS) OR B16.42 (DI), FABRICATED CS BODY AS SUPPLIED BY MANUFACTURER TO MEET B31.3 COMPLIANCE, RESISTOFLEX / 3P / AEGIS OR EQ	3,5,6
INSTRUMENT TEE	1" – 12"	LINE SIZE X 1 INCH FLANGED BRANCH CONNECTION, PTFE LINED CS HOUSING, CLASS 150 FLANGE (A105), SUPPLIED BY MANUFACTURER TO MEET B31.3 COMPLIANCE, RESISTOFLEX / 3P / AEGIS OR EQ.	5,6
SPACER	1" – 12"	ARMORED PTFE SPACER, TAPER BORE TO MATCH ID OF BUTTERFLY VALVE AND LINED PIPE. USE ONLY WHEN NEEDED TO PREVENT INTERFERENCE BETWEEN DISC AND LINED PIPE., RESISTOFLEX / 3P / AEGIS OR EQ	5,6
FLANGES	1" – 12" 1" – 12"	TO BE SUPPLIED WITH FITTINGS AND PIPE SPOOLS BLIND, CL 150, A105, PTFE LINED, ASME B16.5, RESISTOFLEX / 3P / AEGIS OR EQ	3,5 5
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	STUD BOLTS, A193 GR. B7, TEFLON COATED HEAVY HEX NUTS, A194 GR. 2H, TEFLON COATED	
GASKETS	ALL	CL 150, 1/8" THK, RING TYPE, 100% EXPANDED PTFE, ASME B16.21; GORE UPG STYLE 800 OR EQ	
THREAD LUBE	BOLTS	NONE	

VALVES							
BALL	BUTTERFLY	CHECK	GATE	GLOBE	PLUG	OTHER	NOTES
VBA-609 VBA-662	VBF-903	VCH-301 VCH-323			VPL-506		7, 8

NOTES

1. WELDING IS NOT PERMITTED ON LINED PIPING COMPONENTS.
2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 425 PSIG.
3. PIPING AND FITTINGS TO BE PURCHASED AS FLANGED SPOOLS PER DESCRIPTION.
4. MANUFACTURER'S GUIDELINES FOR ALLOWABLE PIPE SPAN DISTANCES SHOULD BE FOLLOWED.
5. ALL LINED ASSEMBLIES SHALL HAVE THE LINER/GASKET FACE PROTECTED BY AN END PLATE (E.G. PLYWOOD / PLASTIC CAP) UNTIL FINAL INSTALLATION.
6. LINED PIPE AND FITTING SHALL CONTAIN VENT HOLES IN THE METALLIC HOUSINGS. PLUGGING OF THESE HOLES BY PAINT OR OTHER SUBSTANCE SHALL NOT BE ALLOWED.
7. CHECK VALVES TO BE INSTALLED IN HORIZONTAL POSITION WITH COVER UP. REFER TO MANUFACTURER'S RECOMMENDATIONS FOR INSTALLATION OF VCH-301.
8. CHECK VALVE INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.
9. FOR USE WITH LINED PIPE CONNECTIONS TO BARE METAL.

BRANCH CONNECTIONS

BRANCH									
12	T								
10	RT	T							
8	RT	RT	T						
6	RT	RT	RT	T					
4	RT	RT	RT	RT	T				
3	RT	RT	RT	RT	RT	T			
2	RT	RT	RT	RT	RT	RT	T		
1½	RT	RT	RT	RT	RT	RT	RT	T	
1	RT	RT	RT	RT	RT	RT	RT	RT	T
	12	10	8	6	4	3	2	1½	1

SYMBOLS

O – OLET

RT – REDUCING TEE

T – TEE

W – WELDOLET

GENERAL			
MATERIAL	CARBON STEEL, RUBBER LINED		
RATING	200 PSIG @ 100°F 150 PSIG @ 150°F 0" CORROSION ALLOWANCE		
SERVICES	HYDROCHLORIC ACID [HCL], SUPPLY BRINE [SB], ULTRAPURE BRINE [UPB], TREATMENT CHEMICALS [TRT]		
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
LINER	1" – 3" 4" – 24"	RUBBER, CHLOROBUTYL, BLACK, POLYMERIC 1055, 1/8" THK, 55 +/- 5 SHORE A DUROMETER AFTER VULCANIZING, PER ASTM D-3486-85 RUBBER, CHLOROBUTYL, BLACK, POLYMERIC 1055, 3/16" THK, 55 +/- 5 SHORE A DUROMETER AFTER VULCANIZING, PER ASTM D-3486-85	1, 2, 3, 4, 5, 6, 7 1, 2, 3, 4, 5, 6, 7
PIPE	1" – 24"	STD WT, A53 GR B, SMLS / ERW 100% RT, ASME B36.10M, RUBBER LINED PER LINER SPEC	8, 9, 10, 11
FITTINGS	ALL	CL 150, A234 GR WPB, SCH TO MATCH PIPE, WELDED, ASME B16.9, RUBBER LINED PER LINER SPEC	8, 9, 10, 11
FLANGES	ALL ALL	CL 150, A105, FFSO/FFWN, SCH TO MATCH PIPE, ASME B16.5 CL 150, A105, FF, BLIND INCLUDING BLIND GASKET, ASME B16.5	4, 8, 9, 10, 11, 12 12
BOLTING	ALL	A193 B7 STUD BOLTS, TEFLON COATED A194 2H HEAVY NUTS, TEFLON COATED	
GASKETS	ALL ALL ALL ALL ALL	CL 150, 1/8" THK, FF, EPDM, ASME B16.21 CL 150, 1/8" THK, FF, EPDM W/ RAISED INNER RINGS PTFE COATED, ASME B16.21; GARLOCK STRESS SAVER STYLE 370 OR EQ CL 150, 1/8" THK, FF, FLUOROELASTOMER, ASME B16.21; VITON OR EQ CL 150, 1/8" THK, FF, EXPANDED PTFE, ASME B16.21; GORE UPG STYLE 800 OR EQ CL 150, 1/8" THK, FF OR OPRA, EPTFE W/ C-276 CORRUGATED INSERT, ASME B16.21; VSP FR-PITA OR EQ	12 12 12 12 12
THREAD LUBE	BOLTS	NONE	

VALVES							
BALL	BUTTERFLY	CHECK	GATE	GLOBE	PLUG	OTHER	NOTES
VBA-609 VBA-662	VBF-903 VBF-907	VCH-301 VCH-322			VPL-506		12

NOTES

1. NO RUBBER STOCK SHALL BE APPLIED WHEN THE AMBIENT TEMPERATURE OF THE WORK IS BELOW 65°F OR BELOW THE DEW POINT OF THE SURROUNDING AIR. ADHESIVE SHALL NOT BE APPLIED WHEN THE SURROUNDING AIR HAS EITHER A RELATIVE HUMIDITY ABOVE 85% OR A TEMPERATURE BELOW 65°F MEASURED IN ACCORDANCE WITH SSPC-PA1-74.
2. THE RUBBER STOCK SHALL BE JOINED WITH A 45 DEGREE SKIVED EDGE OVERLAPPING AT LEAST 3-6 TIMES OF THE RUBBER THICKNESS

3. NO CIRCUMFERENTIAL SEAMS ARE ALLOWED WITHIN THE PIPE BORE OF STRAIGHT-RUN PIECES UNLESS THE BEAD SHALL BE FINISHED.
4. THE RUBBER STOCK SHALL BE ROLLED OUT OVER THE ENTIRE FACE OF THE FLANGE. ALL FLANGE FACES SHALL BE FLAT WITHOUT SEAMS OR OVERLAPS. NO SEAM WILL BE ALLOWED AT THE JUNCTION OF THE PIPE OR FLANGE.
5. ALL RUBBER LINING PIPES SHALL BE VULCANIZED BY SATURATED STEAM IN AN AUTOCLAVE. THE REQUIRED PRESSURE, TEMPERATURE, AND VULCANIZING HOURS SHALL BE CHOSEN FOR EACH LINING BY THE VENDOR TO ACHIEVE THE DESIRED PROPERTIES. IF A HOLE TO VENTILATE AIR BEHIND THE LINING IS NECESSARY TO AVOID AIR POCKETS, IT SHALL BE MADE BY THE FABRICATION OF THE RUBBER LINING.
6. A TEST SAMPLE SHALL BE PREPARED ALONG WITH EACH AUTOCLAVE LOAD. CERTIFIED TEST RESULTS MUST BE SUBMITTED FOR THE DUROMETER AND ADHESION FOR EACH SAMPLE.
7. SPARK TESTING SHALL BE CONDUCTED ON ALL RUBBER LINED PIPING BEFORE AND AFTER CURING PER ASTM D3486. REPAIRS MADE AFTER VULCANIZATION SHALL BE RE-TESTED.
8. REQUIREMENTS FOR PIPING DESIGN, FABRICATION, WELDING, NON-DESTRUCTIVE EVALUATION, INSTALLATION, DOCUMENTATION, ETC. IN WESTLAKE STANDARD GES-230 “PIPING SPECIFICATIONS” MUST BE FOLLOWED. PIPING SHOULD BE HYDROSTATIC TESTED BEFORE DELIVERY TO WESTLAKE GEISMAR.
9. ALL METAL SURFACES TO WHICH RUBBER IS TO BE ADHERED MUST BE CLEAN AND FREE FROM SURFACE DEFECTS. ALL INSIDE WELD SEAMS SHALL BE GROUND SMOOTH, ALL BURRS REMOVED, AND ALL CONSTRUCTION SCARS REPAIRED.
10. DEGREASING OIL OR GREASE ATTACHED ON THE INTERIOR SURFACE OF THE PIPING COMPONENTS SHALL BE REMOVED BY HEATING / PRE-CURING IN AN AUTOCLAVE.
11. ALL METAL SURFACES TO BE LINED SHALL BE ABRASIVE BLAST CLEANED TO A WHITE METAL CONDITION IN ACCORDANCE WITH SSPC-SP5 AND ASTM D3486.
12. SPACERS ARE REQUIRED BETWEEN ANY RAISED FACE COMPONENTS AND RUBBER LINED FLANGES. FULL FACE SPACERS MAY ALSO BE USED TO MAKE UP GAPS IN ASSEMBLY. USE GASKETS ON EACH SIDE OF SPACERS.

BRANCH CONNECTIONS

- BRANCHES SHOULD BE MADE USING TEES, REDUCING TEES, OR FOLLOWING MANUFACTURER RECOMMENDATION

	MATERIAL	NICKEL 200		GES 2-3-0 **CLA** AS REV 9 07/20/2022
	RATING	LIMITED BY VBA-609 150 PSIG @ 100°F 130 PSIG @ 300°F 0" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES

CATHOLYTE [CAT], CAUSTIC 0 – 20% [CAU], COLD CAUSTIC AFTER CAUSTIC EVAP [CCAU], HOT CAUSTIC [HCAU]

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	½" – ¾" 1" – 8" 10" – 20"	SCH 40S, B-161 (UNS N02200), ANNEALED, SMLS, TE SCH 10, B-161 (UNS N02200), ANNEALED, SMLS, BE SCH 10, B-161 (UNS N02200), ANNEALED, SEAMED 100% RT, BE	2 1,2
FITTINGS	½" – ¾" 1" – 20" 1" – 20"	CL 2000, B-366 OR B-564 (UNS N02200), ANNEALED, SMLS, THD, ASME B16.11 SCH 10, B-366 (UNS N02200) GR. WPN, SMLS, BE, ASME B16.9 SCH/CLASS TO MATCH PIPE/FITTINGS, B-564 (UNS N02200), ANNEALED, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), MSS SP-97	2 1,2,3 1,2
FLANGES	½" – ¾" 1" – 20" 1" – 20" 2" – 20"	CL 150, B-564 (UNS N02200), SCH 40S, RF THD, ASME B16.5 CL 150, A-105, GALVANIZED, LAP JOINT, ASME B16.5 CL 150, B-564 (UNS N02200), RF BLIND, ASME B16.5 CL 300, B-564 (UNS N02200), SCH 10S, RF ORIFICE FLANGE, ASME B16.36, ½" THD TAPS	4,6 2,4,5,6 4
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HEAVY NUTS, TEFLON COATED	
GASKETS	ALL	CL 150, 1/8" THK. SPIRAL WOUND, NICKEL 200 WINDINGS WITH PTFE FILLER, 304SS OUTER RING, ANTI-BUCKLING, ASME B16.20; FLEXITALLIC STYLE CGI, VSP AB-326, OR EQ W/ ENGINEERING APPROVAL CL 150, 1/8" THK, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21, DURLON 9000 OR EQ W/ ENGINEERING APPROVAL	6 4,6
THREAD LUBE	PIPE BOLTS	TFE TAPE (≤ 400°F), MOLYCOTE G OR EQ (> 400°F) NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
VALVES			
VGA-103 VGA-105	½" – ¾" 1" – 12"	GATE, A494-CZ100 (NICKEL 200) BODY/TRIM, CL 150/200, THD GATE, A494-CZ100 (NICKEL 200) BODY/TRIM, CL 150, RF FLG	7
VCH-317 VCH-301 VCH-322	1" – 12" 1" – 8" 4" – 12"	CHECK, SWING, A494-CZ100 (NICKEL 200) BODY/TRIM, CL 150, RF FLG CHECK, BALL, D.I., PFA LINED, CL 150, FLGD CHECK, SWING, D.I., PFA LINED, CL 150, WAFER	9
VPL-506 VPL-506G VPL-514 VPL-513	1" – 4" 6" – 8" ½" – ¾" 1" – 4"	PLUG, PFA LINED A395 DUCTILE IRON BODY/PLUG, CL 150, RF FLG PLUG, PFA LINED A395 DUCTILE IRON BODY/PLUG, CL 150, RF FLG, GO PLUG, A494-CZ100 (NICKEL 200) BODY/PLUG, CL 150, THD, PTFE SLEEVE PLUG, A494-CZ100 (NICKEL 200) BODY/PLUG, CL 150, RF FLG, PTFE SLEEVE	8 8 8,10 8,10

	MATERIAL	NICKEL 200		GES 2-3-0 **CLA** AS REV 9 07/20/2022
	RATING	LIMITED BY VBA-609 150 PSIG @ 100°F 130 PSIG @ 300°F 0" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

VPL-513G	6" – 12"	PLUG, A494-CZ100 (NICKEL 200) BODY/PLUG, CL 150, RF FLG, PTFE SLEEVE, GO	8,10
VBA-662	1" – 6"	BALL, PFA LINED A395 DUCTILE IRON BODY, PFA LINED BALL, CL 150 RF FLG, FULL PORT	8
VBA-609	1" – 6"	BALL, DUCTILE IRON BODY/BALL, CL 150 RF FLG, PFA LINER, REDUCED PORT	
VBF-903	2" – 6"	BUTTERFLY, PTFE LINED, DUCTILE IRON LUG BODY, CL 150 FF	
VBF-903G	8" – 12"	BUTTERFLY, PTFE LINED, DUCTILE IRON LUG BODY, CL 150 FF, GEAR OPERATOR	

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1. ENGINEERING MAY REQUIRE HIGHER PERCENTAGES FOR SPECIAL SERVICES.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 280 PSIG PER ASME B31.3. HYDROTEST PRESSURE DETERMINED BY ASME B31.3, PARA. 345.4.2.

3. STUB ENDS SHALL BE USED FOR FLANGED CONNECTIONS. THEY SHALL BE SHORT PATTERN PER ASME B16.9.

4. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.

5. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.

6. CL 300 FLANGES AND GASKETS MAY BE USED FOR MATING TO EQUIPMENT AS NECESSARY.

7. VENT, DRAIN, AND INTRUMENT VALVE. ¾" SIZE IS THE DEFAULT SIZE, BUT ½" AND 1" MAY BE USED IF REQUIRED.

8. VALVES SHALL BE SPECIFIED AND PURCHASED AS FIRE SAFE PER API-607.

9. INSTALL IN HORIZONTAL POSITION WITH COVER UP OR IN VERTICAL POSITION WITH UPWARD FLOW.

10. FOR CHLOR ALKALI PLANT 32% - 50% HOT CAUSTIC SERVICE, USE THESE VALVES ONLY. (TEFLON LINED PLUG OR BALL VALVE CAN BE USED WITHIN ALLOWABLE PRESSURE AND TEMPERATURE ALLOWED BY VALVE MANUFACTURER.)

	MATERIAL	NICKEL 200		GES 2-3-0 **CLA** AS REV 9 07/20/2022
	RATING	LIMITED BY VBA-609 150 PSIG @ 100°F 130 PSIG @ 300°F 0" CORR. ALLOW.		
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BRANCH CONNECTIONS

BRANCH

20	T														
18	RT	T													
16	RT	RT	T												
14	RT	RT	RT	T											
12	RT	RT	RT	RT	T										
10	W	RT	RT	RT	RT	T									
8	W	W	W	RT	RT	RT	T								
6	W	W	W	W	RT	RT	RT	T							
4	W	W	W	W	W	W	RT	RT	T						
3	W	W	W	W	W	W	W	RT	RT	T					
2	W	W	W	W	W	W	W	W	(1)	RT	T				
1½	W	W	W	W	W	W	W	W	W	(1)	(1)	T			
1	W	W	W	W	W	W	W	W	W	W	(1)	(1)	T		
¾	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	T	
½	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	(1)	T
	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

RT – REDUCING TEE

O – OLET (MATCH END TYPE AND CLASS/SCHEDULE OF DESIGN PER PIPE SPEC)

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCTING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS

	MATERIAL	PVC		GES 2-3-0 **CLA** AT REV 6 07/20/2022
	RATING	LIMTED BY VALVES/FLANGES 150 PSIG @ 100°F 50 PSIG @ 140°F 0" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES

POTABALE WATER – UNDERGROUND [PWA], UNCONTAMINATED WASTEWATER – UNDERGROUND (7) [WW], CHLORINATED WATER [CLW], HYDROCHLORIC ACID [HCL] SAMPLE DRAIN, CHLORINE CHEMICAL FEED [TRT], DEMIN WATER [DMW], SLUDGE [SLD]

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	½" – 6"	SCH 80, PVC, TYPE 1, GR 1, ASTM D1784, CELL CLASSIFICATION 12454-B, PVC 1120 PER ASTM D1785, SMLS, PE	1,3,10
FITTINGS	½" – 6"	SCH 80, PVC, ASTM D1784, CELL CLASSIFICATION 12454-B, PVC 1120, ASTM D2467, SOCKET ENDS	3,10
FLANGES	½" – 6" ½" – 6"	CL 150, PVC, ASTM D1784, CELL CLASSIFICATION 12454-B, SOCKET TYPE, SCH 80, FF, ASTM F1970, SOCKET DIMENSION PER ASTM D2467 CL 150, PVC, ASTM D1784, CELL CLASSIFICATION 12454-B, SOCKET TYPE, SCH 80, FF BLIND, ASTM F1970, SOCKET DIMENSION PER ASTM D2467	3,10 10
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HVY. NUTS, TEFLON COATED ASTM F436 WASHERS	4,5
GASKETS	ALL	CL 150, 1/8" THICK, FULL FACE, EPDM RUBBER, ASME B16.21 CL 150, 1/8" THICK, GORE STRESS SAVER	
THREAD LUBE	PIPE BOLTS	TFE TAPE NEVER-SEEZ OR EQ.	
JOINT CEMENT	ALL	PVC SOLVENT CEMENT, ASTM D2564, (USE SAME MANUFACTURER AS PIPE AND FITTINGS. FOLLOW MANUFACTURERS RECOMMENDED FORMULATION FOR THE SERVICE)	9,13
VALVES			
VGL-330	½" – 1"	GLOBE, Y-PATTERN, PVC BODY/DISC, CL 150, SW, FKM O-RINGS	
VCH-434	½" – 2"	CHECK, BALL, PVC BODY/BALL, CL 150, SW, FKM O-RINGS	11
VBA-621 VBA-658 VBA-659	½" – 4" ½" – 1½" 3" – 4"	BALL, CPVC BODY/BALL, CL 150, SW, PTFE SEATS, FULL PORT BALL, PVC BODY/BALL, CL 150, SW, PTFE SEATS, FULL PORT BALL, PVC BODY/BALL, CL 150, FLGD, PTFE SEATS, FULL PORT	

	MATERIAL	PVC		GES 2-3-0 **CLA** AT REV 6 07/20/2022
	RATING	LIMTED BY VALVES/FLANGES 150 PSIG @ 100°F 50 PSIG @ 140°F 0" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Esteveus 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

NOTES

1. ALL PIPING SHALL BE FURNISHED WITH A PAINTED RING OR OTHER ACCEPTABLE MARKING SUITABLE FOR DETERMINING WHETHER OR NOT THE PIPE HAS BEEN PROPERLY INSERTED INTO THE COUPLING. EACH PIPE SHALL BE CLEARLY MARKED WITH THE PIPE TYPE, GRADE, NOMINAL DIAMETER, SCHEDULE, CLASS PRESSURE RATING, MANUFACTURER'S NAME, AND IDENTIFICATION CODE
2. PRESSURE LIMITED BY VALVES/FLANGES.
3. HYDROSTATIC TESTING SHALL BE PERFORMED PER ASME B31.3, SECTION A345.4. SEE THE TABLE ON PAGE 3.
4. WASHERS SHALL BE USED ON BACKSIDE OF FLANGES.
5. BOLTS SHALL BE TORQUED TO MANUFACTURERS SPECIFICATIONS, AND RE-CHECKED AFTER START-UP.
6. MANUFACTURERS INSTRUCTIONS ON JOINT ASSEMBLY AND SUPPORT REQUIREMENTS SHALL BE PROVIDED WITH PIPE AND FITTINGS AND SHALL BE STRICTLY FOLLOWED.
7. DO NOT USE IN AIR OR GAS SERVICE.
8. FLEXIBILTY MUST BE IMPLEMENTED IN PIPING DESIGN AND/OR FLEXIBLE CONNECTIONS TO EQUIPMENT FLANGES.
9. PVC AND CPVC CEMENT MUST BE RESISTANT TO SODIUM HYPOCHLORITE, SODIUM HYDROXIDE, AND HYPOCHLOROUS ACID. USE IPS WELD-ON 724 OR EQ.
10. ALL PVC PIPE, FITTINGS, AND FLANGES ARE RATED PER CHEMTROL THERMOPLASTIC PIPING TECHNICAL MANUAL, 2014 EDITION.
11. INSTALL IN HORIZONTAL POSITION WITH COVER UP OR IN VERTICAL POSITION WITH UPWARD FLOW.
12. CL 150 IN THIS SPEC PERTAINS TO BOLTING COMPATIBILITY WITH ASME B16.5 CL 150 METAL FLANGES PER CHEMTROL THERMOPLASTIC PIPING TECHNICAL MANUAL, 2014.
13. BACKWELDS ARE REQUIRED FOR HCL SERVICE. BACKWELD TO OCCUR 24 HOURS AFTER CEMENT IS APPLIED.

	MATERIAL	PVC		GES 2-3-0 **CLA** AT REV 6 07/20/2022
	RATING	LIMTED BY VALVES/FLANGES 150 PSIG @ 100°F 50 PSIG @ 140°F 0" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD498...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

PIPE SPECIFICATION RATING TABLE		
Design Temp (°F)	**De-Rating Factor**	**Design Pressure (PSIG)**
73	1.00	150
80	0.90	150
90	0.75	150
100	0.62	150
110	0.50	135
120	0.40	110
130	0.30	85
140	0.22	50

HYDROTEST PRESSURE TABLE	
Hydrostatic Test Temp (°F)	**Hydrostatic Test Pressure (PSIG)**
73°F	225
80°F	225
90°F	225
100°F	225

MAXIMUM NON-SHOCK OPERATING CONDITIONS PER CHEMTROL THERMOPLASTIC PIPING TECHNICAL MANUAL, 2014.

	MATERIAL CPVC		GES 2-3-0 **CLA** ATA
	RATING LIMITED BY VALVES/FLANGES 150 PSIG @ 100°F 110 PSIG @ 350°F 0" CORR. ALLOW.		
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CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES

CHEMICAL FEED [CF], WET CHLORINE OFF GAS [CLO], LEAN BRINE (AFTER DECHLOR) [DCB], DEMIN WATER [DMW], HYDROCHLORIC ACID [HCL], SODIUM HYPOCHLORITE [NACLO], MAGNESIUM CHLORIDE [MGCL2], SUPPLY BRINE [SB], SLUDGE [SLD], WASTE WATER [WW]

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	½" – 2"	SCH 80, CPVC, TYPE IV, GR 1, ASTM D1784, CELL CLASSIFICATION 23447, CPVC 4120, ASTM F441, SMLS, TE	1,2,11
	½" – 6"	SCH 80, CPVC, TYPE IV, GR 1, ASTM D1784, CELL CLASSIFICATION 23447, CPVC 4120, ASTM F441, SMLS, PE	1,2,11
FITTINGS	½" – 2"	SCH 80, CPVC, ASTM D1784, CELL CLASSIFICATION 23447, CPVC 4120, ASTM F439, THREADED ENDS	2,11
	½" – 6"	SCH 80, CPVC, ASTM D1784, CELL CLASSIFICATION 23447, CPVC 4120, ASTM F439, SOCKET ENDS	2,11
FLANGES	½" – 2"	CL 150, FF, SCH 80, THREADED TYPE, CPVC, ASTM D1784, CELL CLASSIFICATION 23447, CPVC 4120, ASTM F1970	2,11
	½" – 6"	CL 150, FF, SCH 80, SOCKET TYPE, CPVC, ASTM D1784, CELL CLASSIFICATION 23447, CPVC 4120, ASTM F1970	2,11
	½" – 6"	CL 150, FF, BLIND, CPVC, ASTM D1784, CELL CLASSIFICATION 23447, CPVC 4120, ASTM F1970	11
UNIONS	½" – 2"	SCH 80, CPVC, ASTM D1784, CELL CLASSIFICATION 23447, CPVC 4120, ASTM F439, SOCKET OR THREADED ENDS	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HVY. NUTS, TEFLON COATED ASTM F436 WASHERS	
GASKETS	ALL	CL 150, 1/8" THICK, FULL FACE, EPDM RUBBER, ASME B16.21 CL 150, 1/8" THICK, GORE STRESS SAVER	
JOINT CEMENT	ALL	CPVC SOLVENT CEMENT, ASTM F493, (USE SAME MANUFACTURER AS PIPE AND FITTINGS. FOLLOW MANUFACTURERS RECOMMENDED FORMULATION FOR THE SERVICE)	
BRANCHES	½" – 6"	ALL BRANCH CONNECTIONS SHALL BE MADE USING FULL OR REDUCING TEES OR REDUCING TEES WITH REDUCER BUSHINGS	
VALVES			
VDI-808	½" – 2"	DIAPHRAGM, WEIR TYPE, CPVC BODY, CL 150, THD, FKM O-RINGS, PTFE DIAPHRAGM	
VCH-406	½" – 4"	CHECK, BALL, CPVC BODY/BALL, CL 150, FF, FKM O-RINGS	9
VBA-621	½" – 4"	BALL, CPVC BODY/BALL, CL 150, SW, PTFE SEATS, FULL PORT	10
VBA-621	6"	BALL, CPVC BODY/BALL, CL 150, SW, PTFE SEATS, RED. PORT	

	MATERIAL	CPVC		GES 2-3-0 **CLA** ATA REV 6 07/20/2022
	RATING	LIMITED BY VALVES/FLANGES 150 PSIG @ 100°F 110 PSIG @ 350°F 0" CORR. ALLOW.		
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NOTES

1. ALL PIPING SHALL BE FURNISHED WITH A PAINTED RING OR OTHER ACCEPTABLE MARKING SUITABLE FOR DETERMINING WHETHER OR NOT THE PIPE HAS BEEN PROPERLY INSERTED INTO THE COUPLING. EACH PIPE SHALL BE CLEARLY MARKED WITH THE PIPE TYPE, GRADE, NOMINAL DIAMETER, SCHEDULE, CLASS PRESSURE RATING, MANUFACTURER'S NAME, AND IDENTIFICATION CODE
2. HYDROSTATIC TESTING SHALL BE PERFORMED PER ASME B31.3, SECTION A345.4. SEE THE TABLE ON PAGE 3.
3. WASHERS SHALL BE USED ON BACKSIDE OF FLANGES.
4. BOLTS SHALL BE TORQUED TO MANUFACTURERS SPECIFICATIONS, AND RE-CHECKED AFTER START-UP.
5. MANUFACTURERS INSTRUCTIONS ON JOINT ASSEMBLY AND SUPPORT REQUIREMENTS SHALL BE PROVIDED WITH PIPE AND FITTINGS AND SHALL BE STRICTLY FOLLOWED.
6. DO NOT USE IN AIR OR GAS SERVICE.
7. FLEXIBILTY MUST BE IMPLEMENTED IN PIPING DESIGN AND/OR FLEXIBLE CONNECTIONS TO EQUIPMENT FLANGES SHALL BE USED.
8. PVC AND CPVC CEMENT MUST BE RESISTANT TO SODIUM HYPOCHLORITE, SODIUM HYDROXIDE, AND HYPOCHLORIC ACID. USE IPS WELD-ON 724 OR EQ.
9. INSTALL IN HORIZONTAL POSITION WITH COVER UP OR IN VERTICAL POSITION WITH UPWARD FLOW.
10. VENT, DRAIN, AND INSTRUMENT VALVE. ¾" SIZE IS THE DEFAULT SIZE, BUT ½" AND 1" MAY BE USED IF REQUIRED.
11. ALL CPVC PIPE, FITTINGS, AND FLANGES ARE RATED PER CHEMTROL THERMOPLASTIC PIPING TECHNICAL MANUAL, 2014 EDITION.
12. CL 150 IN THIS SPEC PERTAINS TO BOLTING COMPATIBILITY WITH ASME B16.5 CL 150 METAL FLANGES PER CHEMTROL THERMOPLASTIC PIPING TECHNICAL MANUAL, 2014.
13. PREFERRED GASKET IS THE STRESS SAVER GASKET.
14. BACKWELDS ARE REQUIRED FOR HCL SERVICE. BACKWELD TO OCCUR 24 HOURS AFTER CEMENT IS APPLIED.

	MATERIAL	CPVC	GES 2-3-0 **CLA** ATA REV 6 07/20/2022
	RATING	LIMITED BY VALVES/FLANGES 150 PSIG @ 100°F 110 PSIG @ 350°F 0" CORR. ALLOW.	

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PIPE SPECIFICATION RATING TABLE		
Design Temp (°F)	**De-Rating Factor**	**Design Pressure (PSIG)**
73	1.00	150
80	0.96	150
90	0.92	150
100	0.85	150
110	0.77	140
120	0.70	130
130	0.62	120
140	0.55	110

HYDROTEST PRESSURE TABLE	
Hydrostatic Test Temp (°F)	**Hydrostatic Test Pressure (PSIG)**
73°F	225
80°F	225
90°F	225
100°F	225

MAXIMUM NON-SHOCK OPERATING CONDITIONS PER CHEMTROL THERMOPLASTIC PIPING TECHNICAL MANUAL, 2014.

	MATERIAL	PVDF "KYNAR"		GES 2-3-0 **CLA** ATK REV 1 07/20/2022
	RATING	LIMITED BY KINAR PIPE/FLANGES/VALVES FV/112 PSIG @ 100°F 30 PSIG @ 350°F 0" CORR. ALLOW.		
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CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES			
CAUSTIC 0-20% [CAU], WET CHLORINE OFF GAS [CLO], DEPLETED BRINE (ANOLYTE) (BEFORE DECHLOR) [DPB], SODIUM HYPOCHLORITE [NACLO], RAW BRINE [SB]			
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	½" – 2" ½" – 3"	SCH 80, ASTM D3222 TP. 1 GR. 2, RED CHEMTROL PVDF, TE SCH 80, ASTM D3222 TP. 1 GR. 2, RED CHEMTROL PVDF, PE	1,2 1,2
FITTINGS	½" – 2" ½" – 3"	SCH 80, ASTM D3222 TP. 1 GR. 2, RED CHEMTROL PVDF, THREADED ENDS SCH 80, ASTM D3222 TP. 1 GR. 2, RED CHEMTROL PVDF, SOCKET ENDS	1,2 1,2
FLANGES	½" – 2" ½" – 3" ½" – 3"	CL 150, SCH 80, FF, ASTM D3222 TP. 1 GR. 2, RED CHEMTROL PVDF, THREADED FLANGE CL 150, SCH 80, FF, ASTM D3222 TP. 1 GR. 2, RED CHEMTROL PVDF, SOCKET FLANGE CL 150, SCH 80, ASTM D3222 TP. 1 GR. 2, RED CHEMTROL PVDF, FF BLIND FLANGE	1,2 1,2 1,2
UNIONS	UNIONS	USE FLANGES	
BOLTING	ALL	A-193 GR. B8 CL. 2 STUD BOLTS A-194 GR. 8 HVY. NUTS	
GASKETS	ALL	1/8" THK. FULL FACE PTFE, ASME B16.21, GORE UNIVERSAL PIPE GASKET, STYLE 800, OR EQ W/ ENGINEERING APPROVAL 1/8" THK. FULL FACE, ASME B16.21, STRESS SAVER® STYLE 370 FULL FACE GASKET, PTFE BONDED TO EPDM OR EQ W/ ENGINEERING APPROVAL	
THREAD LUBE	PIPE BOLTS	NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
SOCKET JOINT ADHESIVE	ALL	SOCKET HEAT FUSION REQUIRED, SOLVENT CEMENTS NOT ALLOWED	
VALVES			
VBF-903	2" – 3"	B-FLY, DI BODY, CL 150, FF, THD LUG, PTFE LINER/TRIM	
VCH-301	½" – 3"	CHECK, BALL, DI BODY, CL 150 RF FLG, PFA LINED, SOLID PTFE BALL	8
VBA-603 VBA-609	½" – 3" ½" – 3"	BALL, PVDF BODY, RED KYNAR BALL/TRIM, PTFE SEATS W/ VITON O-RINGS, SCH 80, SW, FULL PORT BALL, DI BODY / BALL PFA LINED, PTFE SEATS, CL 150 RF FLG, PFA LINER, REDUCED PORT	9

	MATERIAL	PVDF "KYNAR"	GES 2-3-0 **CLA** ATK REV 1 07/20/2022
	RATING	LIMITED BY KINAR PIPE/FLANGES/VALVES FV/112 PSIG @ 100°F 30 PSIG @ 350°F 0" CORR. ALLOW.	
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NOTES

1. MAXIMUM PRESSURE FOR FLANGED PVDF PIPING SHALL NOT EXCEED 112 PSIG. AT ELEVATED TEMPERATURES THE PRESSURE RATING OF FLANGED PVDF PIPING IS AS FOLLOWS:

OPERATING TEMPERATURE [°F]	MAX OPERATING PRESSURE [PSIG]	OPERATING TEMPERATURE [°F]	MAX OPERATING PRESSURE [PSIG]
100	112	170	63
110	105	180	58
120	95	190	54
130	86	200	50
140	81	210	46
150	72	240	35
160	68	260	30

MAXIMUM NON-SHOCK OPERATING CONDITIONS PER CHEMTROL THERMOPLASTIC PIPING TECHNICAL MANUAL, 2014.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 170 PSIG. DRAIN AND BLOW DRY.
3. PVDF PIPING TO BE USED FOR PRESSURE GAGES, DRAINS, AND SAMPLING CONNECTIONS.
4. UNDERGROUND PIPING SHALL BE INSTALLED IN STRICT ACCORDANCE WITH MANUFACTURER'S LATEST "PIPE BURIAL SPECIFICATIONS".
5. USE HARD GASKET MATERIAL TO FILL THE VOID SPACE BEYOND THE RING FACE OF A RAISED FACE FLANGE AND USE FULL FACE GASKET FOR SEALING.
6. MANUFACTURERS INSTRUCTIONS ON JOINT ASSEMBLY AND SUPPORT REQUIREMENTS SHALL BE PROVIDED WITH PIPE AND FITTINGS AND SHALL BE STRICTLY FOLLOWED.
7. BRANCH CONNECTIONS SHALL USE FULL SIZE TEES AND REDUCERS. FLANGES SHALL BE USED FOR MATING DIFFERENT MATERIALS.
8. INSTALL IN VERTICAL POSITION WITH UPWARD FLOW.
9. DEFAULT VENT, DRAIN, AND INSTRUMENT VALVE.
10. FLEXIBILITY MUST BE IMPLEMENTED IN PIPING DESIGN AND/OR FLEXIBLE CONNECTIONS TO EQUIPMENT FLANGES.
11. CL 150 IN THIS SPEC PERTAINS TO BOLTING COMPATIBILITY WITH ASME B16.5 CL 150 METAL FLANGES PER CHEMTROL THERMOPLASTIC PIPING TECHNICAL MANUAL, 2014.

	MATERIAL	TITANIUM GR 12		GES 2-3-0 **CLA** AV REV 0 07/20/2022
	RATING	LIMITED BY VBA-609 150 PSIG @ 100°F 130 PSIG @ 300°F 0" CORR. ALLOW.		
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CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES			
LEAN BRINE (AFTER DECHLOR) [DCB], SODIUM SULFATE BRINE [NA2SO4B], SALT BRINE [NACLB], VENT [VE], WASH WATER [WAW]			
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	½" – 4" 6" – 24"	SCH 40, B-861/862 GR. 12, TITANIUM, SMLS OR WELDED (100% RT), BE 0.25 MIN WALL THK., B-862 GR. 12, TITANIUM, WELDED (100% RT), BE	1,2 1,2
FITTINGS	½" – 24" ½" – 12"	SCH TO MATCH PIPE, B-363, WPT12, BW, SMLS OR WELDED (100% RT), ASME B16.9 SCH/CLASS TO MATCH PIPE/FITTINGS, B-381, GR. F-12, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), MSS SP-97	1,2,3 1,2
FLANGES	½"– 24" ½"– 24" ½"– 24"	CL 150, A-182 F304, LAP JOINT, ASME B16.5 CL 150, A-182 F304, RF BLIND, LINED WITH 0.125" THICK SB-265 GR12 SHEET, ASME B16.5 CL 150, TITANIUM, B-381, GR. F-12, RF BLIND, ASME B16.5	2,4,5,6 2,4,5,6 2,4,5,6,11
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HVY. NUTS, TEFLON COATED	
GASKETS	ALL	CL 150, 1/8" THK, RING TYPE, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21, DURLON 9000 OR EQ W/ ENGINEERING APPROVAL	4,6,12
THREAD LUBE	NONE	NONFLAMMABLE LUBRICANT RATED FOR OXYGEN/CHLORINE SERVICE; FLUOROLUBE OR EQ W/ ENGINEERING APPROVAL	
VALVES			
VPL-506 VPL-506G	½" – 4" 6" – 8"	PLUG, PFA LINED A395 DUCTILE IRON BODY/PLUG, CL 150, RF FLG PLUG, PFA LINED A395 DUCTILE IRON BODY/PLUG, CL 150, RF FLG, GO	9 9
VCH-301 VCH-323	½" – 8" 1" – 6"	CHECK, BALL, DI BODY, CL 150, RF FLG, PFA LINED, SOLID PTFE BALL CHECK, PISTON, CS BODY, CL 150, RF FLG, PFA LINED, PFA/PTFE DISC/SEAT	10 8,10
VBA-662 VBA-662G VBA-609 VBA-609G	½" – 4" 6" 1" – 6" 8" – 12"	BALL, DUCTILE IRON BODY, ALLOY BALL, CL 150 RF FLG, PFA LINER, TFE SEATS, FULL PORT BALL, DUCTILE IRON BODY, ALLOY BALL, CL 150 RF FLG, PFA LINER, TFE SEATS, FULL PORT, GO BALL, DUCTILE IRON BODY/BALL, CL 150 RF FLG, PFA LINER, REDUCED PORT BALL, DUCTILE IRON BODY/BALL, CL 150 RF FLG, PFA LINER, REDUCED PORT, GO	7,9 9
VBF-903 VBF-903G	2" – 6" 8" – 10"	B-FLY, DI BODY, 150#, LUG, PFA DISC, PTFE LINER B-FLY, DI BODY, 150#, LUG, PFA DISC, PTFE LINER, GO	

	MATERIAL	TITANIUM GR 12		GES 2-3-0 **CLA** AV REV 0 07/20/2022
	RATING	LIMITED BY VBA-609 150 PSIG @ 100°F 130 PSIG @ 300°F 0" CORR. ALLOW.		
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NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1, OR 100% FOR CHLORINE FLUID SERVICE PER ASME B31.3, PARA. M341.4.1. ENGINEERING MAY REQUIRE ADDITIONAL MEASURES FOR SPECIAL SERVICES.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 280 PSIG PER ASME B31.3 PARA. 345.4. DRAIN AND BLOW FREE OF LIQUID.

3. STUB ENDS SHALL BE USED FOR FLANGED CONECTIONS. THEY SHALL BE SHORT PATTERN PER ASME B16.9.

4. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.

5. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.

6. CL 300 FLANGES AND GASKETS MAY BE USED FOR MATING TO EQUIPMENT AS NECESSARY.

7. VENT, DRAIN, AND INSTRUMENT VALVE. 1" SIZE IS THE DEFAULT SIZE.

8. INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.

9. VALVES SHALL BE SPECIFIED AND PURCHASED AS FIRE SAFE PER API-607.

10. INSTALL IN HORIZONTAL POSITION WITH COVER UP. REFER TO MANUFACTURERS RECOMMENDATIONS FOR INSTALLATION.

11. TITANIUM B-381 FLANGES ARE NOT LISTED IN ASME B16.5, THE MANUFACTURER SHOULD DESIGN THE FLANGES TO THESE STANDARDS AND TO MEET THE DESIGN CONDITIONS FOR THIS PIPE SPECIFICATION.

12. DO NOT APPLY LUBRICANT TO THE FLANGE FACES OR GASKETS FOR CHLORINE SERVICE

					GES 2-3-0
	MATERIAL	TITANIUM GR 12			**CLA**
	RATING	LIMITED BY VBA-609 150 PSIG @ 100°F 130 PSIG @ 300°F 0" CORR. ALLOW.			AV
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BRANCH CONNECTIONS

BRANCH

24	T															
20	RT	T														
18	RT	RT	T													
16	RT	RT	RT	T												
14	RT	RT	RT	RT	T											
12	RT	RT	RT	RT	RT	T										
10	W	RT	RT	RT	RT	RT	T									
8	W	W	W	RT	RT	RT	RT	T								
6	W	W	W	W	W	RT	RT	RT	T							
4	W	W	W	W	W	W	W	RT	RT	T						
3	W	W	W	W	W	W	W	W	RT	RT	T					
2	W	W	W	W	W	W	W	W	W	(1)	RT	T				
1½	W	W	W	W	W	W	W	W	W	W	(1)	RT	T			
1	W	W	W	W	W	W	W	W	W	W	W	(1)	(1)	T		
¾	W	W	W	W	W	W	W	W	W	W	W	(1)	(1)	(1)	T	
½	W	W	W	W	W	W	W	W	W	W	W	(1)	(1)	(1)	(1)	T
	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.

	MATERIAL	PTFE LINED COMPOSITE		GES 2-3-0 **CLA** AW REV 0 07/20/2022
	RATING	DURCOR® PIPE/FITTINGS 150 PSIG @ -40°F TO 100°F 100 PSIG @ 300°F 0" CORR. ALLOW.		
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CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES			
LEAN BRINE (AFTER DECHLOR) [DCB], CHLORINATED WATER [CLW], HYDROCHLORIC ACID [HCL], SULFURIC ACID [SA], RAW BRINE [SB], CHEMICAL TREATMENT [TRT], WASTE WATER [WW]			
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	1" – 8"	PTFE LINED FLANGED COMPOSITE PIPE SPOOLS PER ASTM F1545, LINER TO BE SINGLE PIECE VIRGIN PTFE, COMPOSITE PIPE WITH ASME B16.5 CLASS CL150 LAPPED FLANGES, RATED FOR FULL VACUUM. NO WELDS ALLOWED IN LINER. VIRGIN PTFE LINERS TO BE SUITABLE FOR FOOD CONTACT. PIPE HOUSING TO EXHIBIT MINIMUM 43,500 PSI AXIAL TENSILE STRENGTH, MAX THERMAL EXPANSION OF 6.7 X 10^{-6} IN/IN/°F, COMPOSITE TO BE EPOXY VINYL ESTER RESIN WITH SURFACING VEIL ON ID/OD AND CONTAIN UV INHIBITORS, GLASS REINFORCEMENTS TO BE ECR GRADE GLASS, VENT HOLES INCLUDED IN PIPE SPOOLS, PUREFLEX® DURCOR®	1-6, 9-13
FITTINGS	1" – 8"	PTFE LINED FLANGED TRANSFER MOLDED COMPOSITE FITTINGS PER ASTM F1545, COMPOSITE HOUSING TO BE PREMIUIM VINYL ESTER RESIN WITH ECR GLASS REINFORCEMENTS, NEITHER CONTACT MOLDED, NOR GLUED FITTINGS ALLOWED, RATED FOR FULL VACUUM, ASME B16.5 CLASS CL150 FLANGES, PUREFLEX® DURCOR®	1,2,5,6, 9-13
INSTRUMENT TEE	1" – 8"	LINE SIZE X 1 INCH BRANCH CONNECTION, PTFE LINED COMPOSITE HOUSING, FIT BETWEEN CLASS 150 DURCOR® FLANGES, SUPPLIED BY MANUFACTURER TO MEET ASME B31.3 COMPLIANCE, PUREFLEX® DURCOR®	1,2,5,6, 9-13
SPACER	1" – 8"	ARMORED PTFE SPACER, TAPER BORE TO MATCH ID OF BUTTERFLY VALVE AND LINED PIPE. USE ONLY WHEN NEEDED TO PREVENT INTEFERENCE BETWEEN VALVE DISC AND LINED PIPE., PUREFLEX® DURCOR®OR EQ.	5,6
FLANGES	1" – 8" 1" – 8"	TO BE SUPPLIED WITH FITTINGS AND PIPE SPOOLS, VINYL ESTER FIBERGLASS COMPOSITE, CL150, ASME B16.5, GUSSETED LAP JOINT FLANGES FOR PIPING SPOOLS, FIXED, INTEGRAL, GUSSETED FLANGES FOR FITTINGS, FLANGE MATERIAL MUST EXHIBIT A MINIMUM OF 50,000 PSI TENSILE STRENGTH, PUREFLEX® DURCOR® BLIND, CLASS 150, VINYL ESTER FIBERGLASS COMPOSITE, PTFE LINED, ASME B16.5, PUREFLEX® DURCOR®	1,2,3,5, 9-14 3,5,9-14
UNIONS	NONE		
BOLTING	ALL	ASTM A193 GR. B7 STUD BOLTS, LUBRICATED OR PTFE-COATED ASTM A194 GR. 2H HVY. NUTS, LUBRICATED OR PTFE-COATED USE NAS1149 WASHERS, OR ANY OPTION, WHICH DOES NOT EXCEED THE POINT-POINT OF HEAVY HEX NUTS. FINISH NUTS REQUIRED ONLY FOR 1" 45 DEGREE ELBOW FITTING	14 14

	MATERIAL	PTFE LINED COMPOSITE		GES 2-3-0 **CLA** AW REV 0 07/20/2022
	RATING	DURCOR® PIPE/FITTINGS 150 PSIG @ -40°F TO 100°F 100 PSIG @ 300°F 0" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Esterens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

GASKETS	ALL ALL	CL 150, 1/8" THK. RING TYPE, 100% EXPANDED PTFE, ASME B16.21, GORE UPG STYLE 800 OR EQ W/ ENGINEERING APPROVAL CL 150, 1/8" THK. FULL FACE, ASME B16.21, STRESS SAVER® STYLE 370 FULL FACE GASKET, PTFE BONDED TO EPDM OR EQ W/ ENGINEERING APPROVAL	8
THREAD LUBE	BOLTS	NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
VALVES			
VCH-323	1" – 6"	CHECK, PISTON, CS BODY, 150#, RF FLG, PFA LINED, PFA/PTFE DISC/SEAT	7
VBF-903 VBF-903G VBF-936 VBF-936G	2" – 6" 8" 2" – 6" 8"	B-FLY, DI BODY, 150#, LUG, PTFE LINER/TRIM B-FLY, DI BODY, 150#, LUG, PTFE LINER/TRIM, GO B-FLY, FRP DURCOR® BODY, 150#, THD LUG, PTFE LINER, PFA LINED DISC B-FLY, FRP DURCOR® BODY, 150#, THD LUG, PTFE LINER, PFA LINED DISC, GO	 16 16
VPL-506 VPL-506G	1" – 4" 6" – 8"	PLUG, DI BODY, 150#, PFA LINED BODY/PLUG, FLG PLUG, DI BODY, 150#, PFA LINED BODY/PLUG, FLG, GO	
VBA-609 VBA-609G VBA-662 VBA-662G VBA-662G	1" – 6" 8" 1" – 4" 6" 8"	BALL, DUCTILE IRON BODY, ALLOY BALL, 150# RF FLG, PFA LINER, REDUCED PORT, SHORT PATTERN BALL, DUCTILE IRON BODY, ALLOY BALL, 150# RF FLG, PFA LINER, REDUCED PORT, SHORT PATTERN, GO BALL, DUCTILE IRON BODY, ALLOY BALL, 150# RF FLG, PFA LINER, FULL PORT, SHORT PATTERN BALL, DUCTILE IRON BODY, ALLOY BALL, 150# RF FLG, PFA LINER, FULL PORT, SHORT PATTERN, GO BALL, DUCTILE IRON BODY, ALLOY BALL, 150# RF FLG, PFA LINER, FULL PORT, LONG PATTERN, GO	

	MATERIAL	PTFE LINED COMPOSITE		GES 2-3-0 **CLA** AW REV 0 07/20/2022
	RATING	DURCOR® PIPE/FITTINGS 150 PSIG @ -40°F TO 100°F 100 PSIG @ 300°F 0" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Esteveus 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

NOTES

1. WELDING IS NOT PERMITTED ON LINED PIPING COMPONENTS.
2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 1.5X MAWP FOR ALL PIPE AND FITTINGS PRIOR TO SHIPMENT FROM MANUFACTURER.
3. PIPING TO BE PURCHASED AS FLANGED SPOOLS PER DESCRIPTION.
4. MANUFACTURER'S GUIDELINES FOR ALLOWABLE PIPE SPAN DISTANCES SHOULD BE FOLLOWED.
5. ALL LINED ASSEMBLIES SHALL HAVE THE LINER/GASKET FACE PROTECTED BY AN END PLATE (E.G. PLYWOOD / PLASTIC CAP) UNTIL FINAL INSTALLATION.
6. LINED PIPE AND FITTING MAY CONTAIN VENT HOLES IN THE METALLIC HOUSINGS. PLUGGING OF THESE HOLES BY PAINT OR OTHER SUBSTANCE SHALL NOT BE ALLOWED.
7. INSTALL IN HORIZONTAL POSITION WITH COVER UP OR IN VERTICAL POSITION WITH UPWARD FLOW.
8. FOR USE WITH LINED PIPE CONNECTIONS TO BARE METAL.
9. APPROVED MANUFACTURERS MUST MAINTAIN A QUALITY SYSTEM IN COMPLIANCE TO CURRENT ISO 9001-WITH DESIGN REQUIREMENTS. APPROVED MANUFACTURERS AND PRODUCT LINES FOR THIS SPECIFICATION ARE: ANDRONACO INDUSTRIES PUREFLEX® DURCOR® PIPE AND FITTINGS
10. PIPE AND PIPING COMPONENTS CONSTRUCTED PER THIS PIPING SPECIFICATION SHALL BE RATED FOR FULL VACUUM SERVICE FROM -40°F TO 300°F. 10KV SPARK TESTING OF ALL PTFE LINERS ON ALL SIZES REQUIRED. ALL PTFE-LINED PIPE AND FITTINGS TO MEET THE QUALIFICATION REQUIREMENTS OF ASTM F1545 AS APPLICABLE TO THE PTFE LINERS. ALL PIPE AND FITTINGS SHALL BE TESTED AND QUALIFIED TO ASSURE A 4X SAFETY FACTOR.
11. PAINTING REQUIREMENTS: NONE
12. PIPE MAY BE INSULATED, VENT COUPLINGS OF A LENGTH GREATER THAN INSULATION THICKNESS RECOMMENDED AT PIPE VENT HOLES. DO NOT INSULATE ANY FLANGED CONNECTIONS IF INTERNAL FLUID TEMPERATURE EXCEEDS 250°F.
13. PIPE MAY BE HEAT TRACED, REFER TO MANUFACTURERS LITERATURE FOR GUIDELINES. MAXIMUM TRACING TEMPERATURE NOT EXCEED 250°F.
14. FLANGES SHOULD BE TORQUED TO THE FINAL VALUES IN THE FOLLOWING TABLE TAKING NOTE IF THE BOLTS ARE COATED, IN THREE INCREMENTS IN A CRISS-CROSS PATTERN UNTIL ATTAINING FULL TORQUE. BOLTS SHALL BE CHECKED AND RE-TORQUED AFTER 24 HOURS OR ONE THERMAL CYCLE:

	MATERIAL	PTFE LINED COMPOSITE		GES 2-3-0 **CLA** AW REV 0 07/20/2022
	RATING	DURCOR® PIPE/FITTINGS 150 PSIG @ -40°F TO 100°F 100 PSIG @ 300°F 0" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

Size (in)	Lubricated ASTM A193 Gr. B7 (ft-lb)	PTFE-coated ASTM A193 Gr. B7 (ft-lb)
1	10 – 15	5 – 10
1-1/2	20 – 25	10 – 15
2	35 – 45	20 – 25
3	40 – 50	25 – 30
4	30 – 40	20 – 25
6	50 – 60	30 – 35
8	80 – 90	50 – 55

15. FOR APPLICATIONS REQUIRING EXTERNAL STATIC DISSIPATION, SPECIFICATION TO REQUIRE EXTERNALLY CONDUCTIVE PIPE HOUSINGS.

16. VBF-936 SHALL BE LIMITED TO 250°F.

BRANCH CONNECTIONS

BRANCH

8	T						
6	RT	T					
4	RT	RT	T				
3	RT	RT	RT	T			
2	RT	RT	RT	RT	T		
1½	RT	RT	RT	RT	RT	T	
1	RT	RT	RT	RT	RT	RT	T
	8	6	4	3	2	1½	1

SYMBOLS

RT – REDUCING TEE

T – TEE

GENERAL			
MATERIAL	FIBERGLASS REINFORCED VINYL ESTER		
RATING	150 PSIG @ 100°F 100 PSIG @ 200°F 0" CORROSION ALLOWANCE		
SERVICES	BRINE CONDENSATE [BCOND], CAUSTIC CONDENSATE [CCOND], CHLORINATED WATER [CLW], COOLING WATER SUPPLY [CWS], COOLING WATER RETURN [CWR], LEAN BRINE (AFTER DECHLOR) [DCB], DEMIN WATER [DMW], DEPLETED BRINE (ANOLYTE) (BEFORE DECHLOR) [DPB], HYDROGEN CONDENSATE [H2C], HYDROCHLORIC ACID [HCL], CLARIFIED WATER [KLW], SODIUM SULFATE [NA2SO4], SALT BRINE [NACLB], SODIUM HYPOCHLORITE [NACLO], SODIUM BISULFATE [NAHSO3], SUPPLY BRINE [SB], SLUDGE [SLD], ULTRA PURE PRINE [UPB], WASH WATER [WAW], WASTE WATER [WW]		
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	1" – 24"	MFR STD SCH, FIBERGLASS REINFORCED VINYL ESTER RESIN PIPE, DERAKANE 411, 20 MIL DOUBLE "C" GLASS RESIN RICH LINER, PE	1, 3, 4, 9, 10, 11, 13, 14, 15, 16
FITTINGS	1" – 24"	CL 150, FULL FACE, SCH TO MATCH PIPE, FIBERGLASS REINFORCED VINYL ESTER RESIN FLANGED FITTINGS, DERAKANE 411, 20 MIL DOUBLE "C" GLASS RESIN RICH LINER, MANUFACTURER'S STANDARD	1, 2, 3, 9, 10, 11, 13, 14, 15, 16
FLANGES	1" – 24" 1" – 24"	CL 150, FULL FACE, SCH TO MATCH PIPE/FITTINGS, ASTM D4024, FIBERGLASS REINFORCED VINYL ESTER, ASME B16.5 CL 150 BOLTING DIMENSIONS AND GASKET SURFACES CL 150, FF BLIND, SCH TO MATCH PIPE/FITTINGS, ASTM D4024, FIBERGLASS REINFORCED VINYL ESTER, ASME B16.5 CL 150 BOLTING DIMENSIONS AND GASKET SURFACES	1, 3, 14 1, 3, 14
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A193 GR B7 STUD BOLTS, TEFLON COATED A194 GR 2H HEAVY NUTS, TEFLON COATED WASHERS REQUIRED UNDER ALL NUTS	17
GASKETS	ALL ALL ALL ALL ALL	CL 150, 1/8" THK, FF OR OPRA, EPTFE W/ CORRUGATED C-276 INSERT, ASME B16.21; VSP FR-PITA OR EQ CL 150, 3/16" THK, FF, VITON, 70 DUROMETER HARDNESS, ASME B16.21 CL 150, 1/8" THK, FF, FILLED PTFE W/ INORGANIC FILLER, ASME B16.21; DURLON 9000 OR EQ CL 150, 1/8" THK, FF, EPDM W/ RAISED INNER RINGS PTFE COATED, ASME B16.21; GARLOCK STRESS SAVER STYLE 370 OR EQ CL 150, 1/8" THK, FF, EXPANDED PTFE, ASME B16.21; GORE UPG STYLE 800 OR EQ	
THREAD LUBE	BOLTS	NONE	

VALVES							
BALL	BUTTERFLY	CHECK	GATE	GLOBE	PLUG	OTHER	NOTES
VBA-609 VBA-662	VBF-903 VBF-907	VCH-301 VCH-322	VGA-238		VPL-506		8

NOTES

1. SPOOL PIECES OF SIZE AND CONFIGURATION THAT CAN BE HYDROSTATICALLY TESTED WILL BE TESTED AT 225 PSIG WITH WATER. DRAIN AND BLOW DRY. ASSEMBLED PIPING SYSTEMS THAT CAN NOT BE HYDROSTATICALLY TESTED WITH WATER WILL BE TESTED BY APPLYING A LOW PRESSURE PNEUMATIC (AIR OR NITROGEN) TEST AT 5 PSIG FOR NO LESS THAN 1 HOUR. LOWER PRESSURE MAY BE USED WHERE REQUIRED BY EQUIPMENT BUT NO LESS THAN 1 PSIG. A LEAK DETECTION AGENT (SUCH AS A SOAP/WATER SOLUTION) SHOULD BE USED ON ALL JOINTS TO AID LEAK DETECTION. ALWAYS OBSERVE SAFETY PRECAUTIONS WHEN TESTING WITH A COMPRESSIBLE FLUID.
2. USE PTFE-LINED INSTRUMENT TEES FOR SAMPLE AND INSTRUMENT CONNECTIONS.
3. HAND LAY-UP OR FILAMENT WOUND FABRICATION ONLY (SOCKET TYPE FITTINGS ARE NOT ALLOWED).
4. WHEN MATING TO EXISTING PIPING, VERIFY WALL THICKNESS WITH NEW PIPING.
5. USE HARD GASKET MATERIAL TO FILL THE VOID SPACE BEYOND THE RING FACE OF A RAISED FACE FLANGE AND USE FULL FACE GASKET FOR SEALING.
6. MANUFACTURERS INSTRUCTIONS ON JOINT ASSEMBLY AND SUPPORT REQUIREMENTS SHALL BE PROVIDED WITH PIPE AND FITTINGS AND SHALL BE STRICTLY FOLLOWED.
7. BRANCH CONNECTIONS SHALL USE FULL SIZE TEES AND REDUCERS. FLANGES SHALL BE USED FOR MATING DIFFERENT MATERIALS.
8. VBA-609 IS THE VENT, DRAIN, AND INSTRUMENT VALVE. 1” IS THE DEFAULT SIZED TO BE USED.
9. THE FRP RESIN WILL BE DERAKANE 411. THE CATALYST WILL BE MEKP. PROMOTION WILL BE PER THE RESIN MANUFACTURER'S GUIDELINES. THE MINIMUM CURED HARDNESS SHALL BE BARCOL 30. A RESIN COAT IS TO BE APPLIED OVER ALL CUT OR RAW FRP EDGES WITH A 10 MIL “C” GLASS VEIL.
10. “C” GLASS SURFACING VEIL SHALL BE 20 MILS THICK.
11. CHOPPED STRAND MAT SHALL BE TYPE E OR E-CR GLASS.
12. THE FABRICATOR IS RESPONSIBLE FOR DETERMINING THAT THE REINFORCEMENT MATERIAL USED IS COMPATIBLE (INCLUDING FINISH AND BINDERS) WITH THE RESINS AND LAMINATING PROCEDURES USED AND WILL YIELD ACCEPTABLE LAMINATE PROPERTIES. SUBSTITUTIONS FROM THE SPECIFIED MATERIALS SHALL BE DISCUSSED WITH WESTLAKE.
13. THE EXTERIOR OF THE PIPE SHALL HAVE A PARAFFIN WAX GEL COAT AND SHALL INCLUDE AN ULTRA-VIOLET LIGHT INHIBITOR AND BE REINFORCED WITH A 10 MIL C-VEIL. COLOR TO BE SPECIFIED BY SERVICE TYPE (SEE TABLE)
14. EACH FABRICATED PIECE SHALL CARRY AN IDENTIFYING DATA SHEET EMBEDDED IN THE OUTER FRP OVER-WRAP THAT IDENTIFIES THE MANUFACTURER, RESIN, ISOMETRIC DRAWING NO., BILL OF MATERIAL NO., AND MARK NO.
15. 100% VISUAL EXAMINATION OF FABRICATION IS REQUIRED INCLUDING FABRICATION, LONGITUDINAL AND MECHANICAL JOINTS. EXTENT OF EXAMINATION PER ASME B31.3 PARA M341.4.
16. THE MANUFACTURER SHALL VERIFY BY CALCULATION THAT THE PIPE PROVIDED BY HIS FABRICATION PROCESS IS CAPABLE OF THE STATED SPEC RATING.
17. BOLTS SHALL BE TORQUED ACCORDING TO GSM-MP-GEN-005 “TORQUEING” USING THE LOWER OF THE GIVEN TORQUE VALUES OR MANUFACTURER’S RECOMMENDED TORQUE VALUES.
18. NOT FOR USE IN SALT SLURRY

BRANCH CONNECTIONS

- BRANCH CONNECTIONS SHALL FOLLOW MANUFACTURERS RECOMMENDATIONS.
- THE FABRICATOR SHALL PROVIDE DRAWINGS (TYPICAL AND ATYPICAL) FOR ALL BRANCH CONNECTIONS OTHER THAN TEES.
- WHERE VIBRATION OR SUBSTANTIAL LOADING IS APPLIED TO A BRANCH CONNECTION THE DESIGNER SHOULD EVALUATE AND SPECIFY A SUITABLE REINFORCEMENT.
- GUSSET REINFORCEMENTS ARE REQUIRED ON ALL BRANCH CONNECTIONS 4" AND SMALLER. THERE SHALL BE A MINIMUM OF FOUR EQUALLY SPACED GUSSETS. (THREE GUSSETS MAY BE USED IF NEEDED TO OPEN ACCESS FOR FLANGE BOLTING).

GEL COAT COLOR BY SERVICE

The color code table is based on Ashland Maxguard Premium Gelcoats. RAL-7035 is the default color.
This is a total service list table; not all services are applicable to this specific pipe specification.

SERVICE	COLOR CODE	Color
WASTE WATER (WW)	RAL-4010	Telemagenta (Hot Pink)
DCB	RAL-5017	Traffic Blue
Na2SO4	RAL-7035	Light Grey
NaCIB	RAL-5017	Traffic Blue
NaHSO3	RAL-7035	Light Grey
SB	RAL-5017	Traffic Blue
SLD	RAL-7035	Light Grey
UPB	RAL-5017	Traffic Blue
WAW	RAL-7035	Light Grey
CLW	RAL-1016	Sulfur Yellow
DCB	RAL-5017	Traffic Blue
H2C	RAL-7035	Light Grey
CCOND	RAL-7035	Light Grey
DMW	RAL-7035	Light Grey
NaCLO	RAL-1016	Sulfur Yellow
BCOND	RAL-7035	Light Grey
CWS / CWR	RAL-6034	Light Green (turquoise)
KW	RAL-1001	Beige
CL	RAL-1016	Sulfur Yellow
CLO	RAL-9003	Signal White
NACLO	RAL-1016	Sulfur Yellow
DCLO	RAL-9003	Signal White
CLW	RAL-1016	Sulfur Yellow
DPB	RAL-1016	Sulfur Yellow
UPB	RAL-5017	Traffic Blue
NACLO	RAL-1016	Sulfur Yellow
CAU	RAL-2011	Deep Orange
CHLORINE CELL GAS	RAL-1016	Sulfur Yellow
ALL OTHER SERVICES	RAL-7035	Light Grey

GENERAL							
MATERIAL	FEP/FRP DUAL LAMINATE PIPING						
RATING	LIMITED BY FLG FEP/FRP 150 PSIG @ 200°F (NPS 1 – 12) 100 PSIG @ 200°F (NPS 14 – 24) 0" CORROSION ALLOWANCE						
SERVICES	COLD CAUSTIC 32% - 50% [CCAU], CHLORINE CELL GAS, DEPLETED BRINE (ANOLYTE) (BEFORE DECHLOR) [DPB], HYDROCHLORIC ACID [HCL], ULTRA PURE BRINE [UPB]						
ITEM	**SIZE**	**DESCRIPTION**					**NOTES**
PIPE	1" – 24"	MFR STD SCH, FEP/FRP DUAL LAMINATE, SMLS UNPIGMENTED FEP LINER WITH MECHANICALLY BONDED FIBERGLASS REINFORCED VINYL ESTER CASING, MAX FLANGED SPOOL LENGTH 20'-0"					1, 2, 12, 14, 15
FITTINGS	1" – 24"	MFR STD SCH, FEP/FRP DUAL LAMINATE, BUTT FUSION WELDED, WELD THROUGH ENTIRE CROSS SECTION OF LINER FOLLOWED BY STANDARD FRP HAND LAYUP, MANUFACTURER'S STANDARD					1, 2, 12, 14, 15
FLANGES	1" – 24"	MFR STD SCH/THICKNESS, FEP/FRP DUAL LAMINATE, ASME B16.5 CL 150 BOLTING DIMENSIONS AND GASKET SURFACES					1, 2, 4, 5, 6, 7, 12, 14, 15, 16
UNIONS	NONE	USE FLANGES					
BOLTING	ALL	A193 GR B7 STUD BOLTS, TEFLON COATED A194 GR 2H HEAVY NUTS, TEFLON COATED WASHERS UNDER ALL NUTS					4, 17
GASKETS	ALL ALL ALL ALL	CL 150, 1/8" THK, FF OR OPRA, EPTFE W/ CORRUGATED C-276 INSERT; VSP FR-PITA OR EQ CL 150, 1/8" THK, FF, FILLED PTFE W/ INORGANIC FILLER; DURALON 9000 OR EQ CL 150, 1/8" THK, FF, EPDM W/ RAISED INNER RINGS PTFE COATED, ASME B16.21; GARLOCK STRESS SAVER STYLE 370 OR EQ CL 150, 1/8" THK, FF, EXPANDED PTFE; GORE UPG STYLE 800 OR EQ					
STRAINERS	ALL	CL 150 FLG, PTFE OR PFA LINED CS/DI, EPDM SEALS, BASKET OR Y-TYPE, ATOMAC ASF, RICHTER SERIES GS, ETHYLENE T-LINE, OR APPROVED EQUAL, VENDOR STANDARD MESH					
TEMPORARY STRAINERS	ALL	CL 150 FLG, CONICAL, 150% OPEN AREA, 316SS W/ SS SCREEN/PLATE					
PIPE/VALVE SUPPORTS	ALL 3" AND UP	FRP CRADLE BONDED TO PIPE AT ALL SUPPORT POINTS PROVIDE INDEPENDENT SUPPORT FOR NON-GEAR OPERATED VALVES, AND IF REQUIRED BY PIPE STRESS ANALYSIS					
VALVES							
BALL	BUTTERFLY	CHECK	GATE	GLOBE	PLUG	OTHER	NOTES
VBA-662	VBF-903	VCH-301 VCH-322			VPL-506		9, 10, 11, 13

NOTES

1. HYDROSTATIC TESTING SHALL BE PERFORMED AT 1.5 TIMES DESIGN PRESSURE. DRAIN AND BLOW DRY.
2. PIPE WALL THICKNESS SHALL BE ADEQUATE FOR THE FULL SPECIFICATION RATING. ALL PIPE SECTIONS SHALL BE FLANGED. PIPING TO BE SHOP FABRICATED. FIELD WELDS BY MANUFACTURER ONLY. FRP TO BE MECHANICALLY BONDED TO THE LINER.
3. MANUFACTURERS INSTRUCTIONS ON JOINT ASSEMBLY AND SUPPORT REQUIREMENTS SHALL BE PROVIDED WITH PIPE AND FITTINGS AND SHALL BE STRICTLY FOLLOWED.
4. CONSULT PIPE SYSTEM MANUFACTURER FOR REQUIRED FLANGE STUD LENGTHS.
5. FIXED FLANGES: FULL FACE FLANGES TO BE FABRICATED ON PIPE SPOOLS BY PIPE MANUFACTURER. PIPE LINER TO BE FLARED OVER FACE OF FLANGE TO INSIDE OF BOLT HOLES.
6. LAP JOINT FLANGE: STUB END WITH LOOSE RING FABRICATED PIPE BY PIPE MANUFACTURER. PIPE LINER TO BE FLARED OVER STUB FACE TO OUTSIDE DIAMETER OF STUB.
7. BLIND FLANGE: FLAT FACED FRP WITH 90 MIL MIN. THICKNESS FEP LINER BONDED TO FACE.
8. INSTRUMENT CONNECTIONS: TEES (INCLUDING VENTS AND DRAINS) MAY BE FABRICATED DIRECTLY INTO PIPE SPOOLS. MINIMUM SIZE IS 1” DIAMETER.
9. VBA-662 IS THE DEFAULT VENT, DRAIN, AND INSTRUMENT VALVE.
10. CHECK VALVES TO BE INSTALLED IN HORIZONTAL POSITION WITH COVER UP. REFER TO MANUFACTURER’S RECOMMENDATIONS FOR INSTALLATION OF VCH-301.
11. CHECK VALVES ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.
12. ALL SPOOLS AND FITTINGS SHALL BE SUITABLY PACKED TO PROVIDE NECESSARY PROTECTION DURING HANDLING, SHIPPING, AND STORAGE. GASKET FACE OF EACH SPOOL OR FITTING SHALL BE PROTECTED BY END PLATE OR OTHER SUITABLE PROTECTIVE MEANS.
13. USE A 0.5” THICK FULL FACE (TO FULLY SUPPORT PLASTIC FRP FLANGE) SOLID ANSI CLASS 150 PTFE SPACER ON EACH SIDE OF BUTTERFLY VALVES, IF THE VALVE DISC CAN INTERFERE WITH THE CONNECTED PIPE FLANGE INSIDE. SPACER TO BE PROVIDED WITH VALVE.
14. MAKE SHOP FABRICATED CONTACT MOLDED FLANGED PIPE SPOOLS WITH CONTACT MOLDED FITTINGS IN ACCORDANCE WITH NBS PS 15-69. MANUFACTURER SHALL SUBMIT COMPUTER FLEXIBILITY ANALYSIS OF THE HEADER PIPING SYSTEM AND DEMONSTRATE THE ADEQUACY OF THE PROPOSED DESIGN FOR THE INTENDED APPLICATION. WALL STRUCTURAL THICKNESS CALCULATIONS SHALL BE BASED ON OPERATING CONDITIONS AND SHALL NOT INCLUDE THE CORROSION LINER. SAFETY FACTOR – 10:1 PRESSURE; 5:1 VACUUM.
15. PERFORM 100% SPARK TESTS OF ALL JOINTS ON ALL DUAL LAM PIPE DURING FABRICATION.
16. BOLTS SHALL BE TORQUED ACCORDING TO GSM-MP-GEN-005 “TORQUEING” USING THE LOWER OF THE GIVEN TORQUE VALUES OR MANUFACTURER’S RECOMMENDED TORQUE VALUES.

BRANCH CONNECTIONS

- BRANCH CONNECTIONS SHALL FOLLOW MANUFACTURER RECOMMENDATIONS.

GEL COAT COLOR BY SERVICE

The color code table is based on Ashland Maxguard Premium Gelcoats. RAL-7035 is the default color.
This is a total service list table; not all services are applicable to this specific pipe specification.

SERVICE	COLOR CODE	Color
WASTE WATER (WW)	RAL-4010	Telemagenta (Hot Pink)
DPB	RAL-5017	Traffic Blue
Na2SO4	RAL-7035	Light Grey
NaCIB	RAL-5017	Traffic Blue
NaHSO3	RAL-7035	Light Grey
SB	RAL-5017	Traffic Blue
SLD	RAL-7035	Light Grey
UPB	RAL-5017	Traffic Blue
WAW	RAL-7035	Light Grey
CLW	RAL-1016	Sulfur Yellow
DCB	RAL-5017	Traffic Blue
H2C	RAL-7035	Light Grey
CCOND	RAL-7035	Light Grey
DMW	RAL-7035	Light Grey
NaCLO	RAL-1016	Sulfur Yellow
BCOND	RAL-7035	Light Grey
CWS / CWR	RAL-6034	Light Green (turquoise)
KW	RAL-1001	Beige
CL	RAL-1016	Sulfur Yellow
CLO	RAL-9003	Signal White
NACLO	RAL-1016	Sulfur Yellow
DCLO	RAL-9003	Signal White
CLW	RAL-1016	Sulfur Yellow
DPB	RAL-1016	Sulfur Yellow
UPB	RAL-5017	Traffic Blue
DCB	RAL-5017	Traffic Blue
NACLO	RAL-1016	Sulfur Yellow
CAU	RAL-2011	Deep Orange
CHLORINE CELL GAS	RAL-1016	Sulfur Yellow
ALL OTHER SERVICES	RAL-7035	Light Grey

	MATERIAL	UNALLOYED TITANIUM GR. 2		GES 2-3-0 **CLA** AXD REV 6 07/20/2022
	RATING	LIMITED BY VCH-301/322 150 PSIG @ 100°F 145 PSIG @ 300°F 0" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D40D...	

CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES

BRINE CONDENSATE [BCOND], CAUSTIC 0 – 20% [CAU], WET CHLORINATE GAS – HIGH [CL], WET CHLORINE OFF GAS [CLO], RECOVERED CHLORINE VAPOR [CLVC], CHLORINATED WATER [CLW], LEAN BRINE (AFTER DECHLOR) [DCB], DEPLETED BRINE (ANYOLYTE) (BEFORE DECHLOR) [DPB], WET CHLORINE GAS – LOW PRESSURE [GCL2], HYDROCHLORIC ACID [HCL], SALT BRINE [NACLB], SODIUM BISULFITE [NAHSO3], ULTRA PURE BRINE [UPB]

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	½" – 1 ½"	SCH 40, B-861/862 GR. 2, UNALLOYED TITANIUM SMLS OR WELDED (100% RT), BE	1,2
	2" – 4"	SCH 10, B-861/862 GR. 2, UNALLOYED TITANIUM SMLS OR WELDED (100% RT), BE	1,2
	6" – 30"	0.25 MIN WALL THK., B-862 GR. 2, UNALLOYED TITANIUM, WELDED (100% RT), BE	1,2
	36" – 40"	0.312 MIN WALL THK., B-862 GR. 2, UNALLOYED TITANIUM, WELDED (100% RT), BE	1,2,7
FITTINGS	½" – 40"	SCH TO MATCH PIPE, B-363, WPT2, BW, SMLS OR WELDED, ASME B16.9	1,2,3,7
	½" – 12"	SCH/CLASS TO MATCH PIPE/FITTINGS, B-381, GR. F-2, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), MSS SP-97	1,2
FLANGES	½"– 24"	CL 150, A-105, LAP JOINT, WITH GR. 7 TITANIUM CLADDING, ASME B16.5	2,4,5,6
	26"– 40"	CL 150, A-105, LAP JOINT, WITH GR. 7 TITANIUM CLADDING, ASME B16.47	2,4,5,6
	½"– 24"	CL 150, A-105, RF BLIND, WITH GR. 7 TITANIUM CLADDING, ASME B16.5	2,4,5,6
	26"– 40"	CL 150, A-105, RF BLIND, WITH GR. 7 TITANIUM CLADDING, ASME B16.47	2,4,5,6
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HVY. NUTS, TEFLON COATED	
GASKETS	ALL	CL 150, 1/8" THK. RING TYPE, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21, DURLON 9000 OR EQ W/ ENGINEERING APPROVAL	4,6
THREAD LUBE	NONE	NONE	
VALVES			
VPL-506	½" – 4"	PLUG, PFA LINED A395 DUCTILE IRON BODY/PLUG, CL 150, RF FLG	10
VPL-506G	6" – 8"	PLUG, PFA LINED A395 DUCTILE IRON BODY/PLUG, CL 150, RF FLG, GO	10
VCH-301	½" – 8"	CHECK, BALL, DI BODY, CL 150, RF FLG, PFA LINED, SOLID PTFE BALL	11
VCH-323	1" – 6"	CHECK, PISTON, CS BODY, CL 150, RF FLG, PFA LINED, PFA/PTFE DISC/SEAT	9,11
VCH-322	3" – 12"	CHECK, WAFER SWING, DI BODY, CL 150, PFA LINED	9,11
VBA-662	½" – 4"	BALL, DUCTILE IRON BODY, ALLOY BALL, CL 150 RF FLG, PFA LINER, TFE SEATS, FULL PORT	
VBA-662G	6"	BALL, DUCTILE IRON BODY, ALLOY BALL, CL 150 RF FLG, PFA LINER, TFE SEATS, FULL PORT, GO	

	MATERIAL	UNALLOYED TITANIUM GR. 2	GES 2-3-0 **CLA** AXD REV 6 07/20/2022
	RATING	LIMITED BY VCH-301/322 150 PSIG @ 100°F 145 PSIG @ 300°F 0" CORR. ALLOW.	

MAINT. APPROVAL	HSE APPROVAL	OPER. APPROVAL	ENG. APPROVAL
DocuSigned by: Matt Martin 1F1037AA1859411...	DocuSigned by: Ryan Estevens 402213A8234D4F3...	DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...

VBA-609 VBA-609G	1" – 6" 8"	BALL, PFA LINED BODY/BALL, CL 150 RF FLG, REDUCED PORT BALL, PFA LINED BODY/BALL, CL 150 RF FLG, REDUCED PORT, GO	
VBF-903 VBF-903G	2" – 6" 8" – 24"	BUTTERFLY, DUCTILE IRON BODY, CL 150, FF FLG, PTFE LINER/TRIM BUTTERFLY, DUCTILE IRON BODY, CL 150, FF FLG, PTFE LINER/TRIM, GO	

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1, OR A MINIMUM OF 100% FOR CATEGORY M FLUID SERVICE PER ASME B31.3, PARA. M341.4.1. ENGINEERING MAY REQUIRE ADDITIONAL TESTING FOR SPECIAL SERVICES.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 310 PSIG PER ASME B31.3 PARA. 345.4. DRAIN AND BLOW FREE OF LIQUID.

3. STUB ENDS SHALL BE USED FOR FLANGED CONECTIONS. THEY SHALL BE SHORT PATTERN PER ASME B16.9.

4. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.

5. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.

6. CL 300 FLANGES AND GASKETS MAY BE USED FOR MATING TO EQUIPMENT AS NECESSARY.

7. DIAMETERS LARGER THAN 36" ARE NOT INCLUDED IN B-861/862. THE LONGITUDINAL SEAM SHALL BE 100% RT TESTED. THE PIPE SHALL COMPLY WITH THE APPLICABLE PARTS OF B-861/862.

8. VENT, DRAIN, AND INSTRUMENT VALVE. 1" SIZE IS THE DEFAULT SIZE.

9. INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.

10. VALVES SHALL BE SPECIFIED AND PURCHASED AS FIRE SAFE PER API-607.

11. INSTALL IN HORIZONTAL POSITION WITH COVER UP. REFER TO MANUFACTURERS RECOMMENDATIONS FOR INSTALLATION.

	MATERIAL	UNALLOYED TITANIUM GR. 2		GES 2-3-0 **CLA** AXD REV 6 07/20/2022
	RATING	LIMITED BY VCH-301/322 150 PSIG @ 100°F 145 PSIG @ 300°F 0" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

BRANCH CONNECTIONS

BRANCH

40	T																	
36	RT	T																
30	RT	RT	T															
24	P	RT	RT	T														
20	P	RT	RT	RT	T													
18	P	RT	RT	RT	RT	T												
16	P	P	RT	RT	RT	RT	T											
14	P	P	RT	RT	RT	RT	RT	T										
12	W	W	W	W	RT	RT	RT	RT	T									
10	W	W	W	W	W	RT	RT	RT	RT	T								
8	W	W	W	W	W	W	RT	RT	RT	RT	T							
6	W	W	W	W	W	W	W	W	RT	RT	RT	T						
4	W	W	W	W	W	W	W	W	W	W	RT	RT	T					
3	W	W	W	W	W	W	W	W	W	W	W	RT	RT	T				
2	W	W	W	W	W	W	W	W	W	W	W	W	(1)	RT	T			
1½	W	W	W	W	W	W	W	W	W	W	W	W	W	(1)	RT	T		
1	W	W	W	W	W	W	W	W	W	W	W	W	W	W	(1)	(1)	T	
¾	W	W	W	W	W	W	W	W	W	W	W	W	W	W	(1)	(1)	(1)	T
½	W	W	W	W	W	W	W	W	W	W	W	W	W	W	(1)	(1)	(1)	(1)	T
	40	36	30	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

P – BRANCH WELD WITH REINFORCING PAD (PAD THICKNESS EQUALS RUN PIPE THICKNESS, PAD WIDTH EQUALS ½ BRANCH OD.)

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.

GENERAL			
MATERIAL	FRP (HETRON 197 OR EQ.)		
RATING	LIMITED BY FRP PIPE/FLANGES 25 PSIG @ 205°F 3 PSIG VACUUM @ 205°F 14.7 PSIG VACUUM THROUGH 14” 0” CORROSION ALLOWANCE		
SERVICES	WET CHLORINATE GAS – HIGH [CL], WET CHLORINE OFF GAS [CLO], CHLORINATED WATER [CLW], DRY CHLORINE OFF GAS [DCLO], SODIUM HYPOCHLORITE [NACLO]		
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	1½” – 42”	MFR STD SCH, FIBERGLASS REINFORCED PLASTIC, HAND LAY-UP ALL MAT REINFORCEMENT, 1/2" CORROSION BARRIER, AND A 20 MIL DOUBLE NEXUS RESIN RICH LINER	7, 8, 9, 10, 12, 14, 15, 16, 17
FITTINGS	1½” – 42”	MFR STD SCH, FIBERGLASS REINFORCED VINYL ESTER PLASTIC, HAND LAY-UP ALL MAT REINFORCEMENT, 1/2" CORROSION BARRIER, AND A 20 MIL DOUBLE NEXUS RESIN RICH LINER, BUTT-AND-STRAP TYPE, PLAIN-END FITTINGS, MANUFACTURER’S STANDARD	7, 8, 9, 10, 12, 14, 15, 16, 17
FLANGES	1½” – 24”	MFR STD SCH/THICKNESS, FIBERGLASS REINFORCED VINYL ESTER PLASTIC, LAP JOINT STUB END TYPE, ASME B16.5 CL 150 BOLTING DIMENSIONS AND GASKET SURFACES	3, 4, 6, 14
	26” – 42”	MFR STD SCH/THICKNESS, FIBERGLASS REINFORCED VINYL ESTER PLASTIC, LAP JOINT STUB END TYPE, ASME B16.47 CL 150 SERIES A BOLTING DIMENSIONS AND GASKET SURFACES	3, 4, 6, 14
	1½” – 24”	MFR STD SCH/THICKNESS, FIBERGLASS REINFORCED VINYL ESTER PLASTIC, RF BLIND, ASME B16.5 CL 150 BOLTING DIMENSIONS AND GASKET SURFACES	3, 6, 14
	26” – 42”	MFR STD SCH/THICKNESS, FIBERGLASS REINFORCED VINYL ESTER PLASTIC, RF BLIND, ASME B16.47 CL 150 SERIES A BOLTING DIMENSIONS AND GASKET SURFACES	3, 6, 14
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A193 GR B7 STUD BOLTS, TEFLON COATED A194 GR 2H HEAVY NUTS, TEFLON COATED WASHERS UNDER ALL NUTS	2
GASKETS	ALL	CL 150, 1/8” THK, FF OR OPRA, EPTFE W/ CORRUGATED C-276 INSERT; VSP FR-PITA OR EQ	
	ALL	CL 150, 1/8” THK, FF, FILLED PTFE W/ INORGANIC FILLER; DURALON 9000 OR EQ	
	ALL	CL 150, 1/8” THK, FF, EPDM W/ RAISED INNER RINGS PTFE COATED, ASME B16.21; GARLOCK STRESS SAVER STYLE 370 OR EQ	
	ALL	CL 150, 1/8” THK, FF, EXPANDED PTFE; GORE UPG STYLE 800 OR EQ	
PIPE CRADLES	ALL	FRP SADDLES EQUAL IN THICKNESS TO PIPE AND MINIMUM OF 9” LONG FOR SIZES 1½” – 4”, 12” LONG FOR SIZES 6” – 12”, AND ONE PIPE DIAMETER LONG FOR 14” – 42”. ATTACH ALL SADDLES TO PIPE WITH FIBERGLASS BONDING ADHESIVE	

VALVES							
BALL	BUTTERFLY	CHECK	GATE	GLOBE	PLUG	OTHER	NOTES
VBA-625 VBA-626 VBA-662	VBF-903 VBF-915				VPL-506 VPL-571		1

NOTES

1. ALL VALVES SHALL BE PREPARED FOR CHLORINE SERVICE. NOT ALL VALVES ARE RATED FOR FULL VACUUM, IF VALVES ARE TO BE INSTALLED IN VACCUUM SERVICE VERIFY PRESSURE/TEMPERATURE RATINGS WITH OEM AND ENGINEERING.
2. BOLTS SHALL BE TORQUED TO MANUFACTURERS SPECIFICATIONS AND RE-CHECKED AFTER START-UP.
3. OTHER THAN THE DIMENSIONS SPECIFIED SPECIFICALLY HERE THE FLANGE ASSEMBLY IS TO BE RATED AT 50 PSIG. THE FLANGE ASSEMBLY SHALL BE AN INTEGRALLY LAMINATED STUB-END FORMED BY CUSTOM CONTACT MOLDING WITH FLOATING BACKUP FLANGES. NON-INTEGRAL LAP FLANGES/COLLARS ARE NOT ACCEPTABLE.
4. FLAT FACE FLANGES MAY BE SPECIFIED WHERE REQUIRED TO MATE TO EQUIPMENT WITH FLAT-FACE FLANGES OR WHERE OTHERWISE DEEMED PREFERABLE OVER LAP-JOINT TYPE FLANGES. FLAT FACE FLANGES SHALL NOT BE BOLTED TO FLANGES WITH RAISED FACE DIMENSION GASKET SURFACES WITH OUT ENGINEERING THE NECESSARY INCREASE IN FLANGE THICKNESS.
5. IF ORIFICE TAPS ARE NEEDED CONSIDER USING ENGINEERING APPROVED SPACER INSERTS WITH BUILT-IN ORIFICE TAPS. ANY SPACER INSERTS USED MUST MEET THE MINIMUM & MAXIMUM PRESSURE & TEMPERATURE LIMITS DEFINED IN THIS STANDARD.
6. THE BACKUP FLANGES SHALL BE 2205 DUPLEX S.S. BACKUP FLANGES CAN ALSO BE HOT DIP GALVANIZED, DUCTILE IRON OR CARBON STEEL IN AREAS WHERE METALLIC BACKUP FLANGES ARE ACCEPTABLE AND 2205 DUPLEX IS NOT AVAILABLE. WHERE METALLIC BACKUP FLANGES ARE NOT ACCEPTABLE (SUCH AS FOR IMPROVED ELECTRICAL ISOLATION IN THE CELL ROOM), FULL FACE FRP FLANGES MAY BE USED IN THOSE AREAS.
7. THE FRP RESIN WILL BE HERTON 197. THE CATALYST WILL BE BPO / DMA. PROMOTION WILL BE PER THE RESIN MANUFACTURER'S GUIDELINES. THE MINIMUM CURED HARDNESS SHALL BE BARCOL 40. A RESIN COAT IS TO BE APPLIED OVER ALL CUT OR RAW FRP EDGES WITH A 10 MIL C-GLASS VEIL.
8. NEXUS SURFACING VEIL SHALL BE 20 MILS THICK. THE KNOWN MANUFACTURER/PRODUCTS; PFG NEXUS STYLE 100-10, APERTURE, 1.3 OZ.
9. CHOPPED STRAND MAT SHALL BE TYPE E GLASS FIBER, 1½ OZ. /FT2. APPROVED PRODUCT: AXIALL MPM MAT, OWENS CORNING ADVANTEX M723A.
10. WOVEN ROVING SHALL BE TYPE E GLASS, 24 OUNCES PER SQUARE YARD. APPROVED: AXIALL HYBON HWR HTX-240.
11. THE FABRICATOR IS RESPONSIBLE FOR DETERMINING THAT THE REINFORCEMENT MATERIAL USED IS COMPATIBLE (INCLUDING FINISH AND BINDERS) WITH THE RESINS AND LAMINATING PROCEDURES USED AND WILL YIELD ACCEPTABLE LAMINATE PROPERTIES. SUBSTITUTIONS FROM THE SPECIFIED MATERIALS (C GLASS OR E GLASS) SHALL BE DISCUSSED WITH WESTLAKE.
12. THE EXTERIOR OF THE PIPE SHALL HAVE A PARAFFIN WAX GEL COAT AND SHALL INCLUDE AN ULTRA-VIOLET LIGHT INHIBITOR AND BE REINFORCED WITH A 10 MIL C-VEIL.

13. UNLESS SPECIFICALLY AUTHORIZED, GLASS REINFORCEMENT SHALL NOT BE APPLIED BY MEANS OF A CHOPPER GUN. SIMILARLY, ANY GLASS CLOTHS OR MATS OTHER THAN THOSE INDICATED ABOVE (SUCH AS COMBINATION MATS OR FABMATS) ARE PROHIBITED UNLESS APPROVED BEFORE FABRICATION.
14. EACH FABRICATED PIECE SHALL CARRY AN IDENTIFYING DATA SHEET EMBEDDED IN THE OUTER FRP OVER-WRAP THAT IDENTIFIES THE MANUFACTURER, RESIN, ISOMETRIC DRAWING NO., BILL OF MATERIAL NO., AND MARK NO.
15. SPOOL PIECES OF SIZE AND CONFIGURATION THAT CAN BE HYDROSTATICALLY TESTED WILL BE TESTED AT 38 PSIG WITH WATER. ASSEMBLED PIPING SYSTEMS THAT CAN NOT BE HYDROSTATICALLY TESTED WITH WATER WILL BE TESTED BY APPLYING A LOW PRESSURE PNEUMATIC (AIR OR NITROGEN) TEST AT 5 PSIG FOR NO LESS THAN 1 HOUR. LOWER PRESSURE MAY BE USED WHERE REQUIRED BY EQUIPMENT BUT NO LESS THAN 1 PSIG. A LEAK DETECTION AGENT (SUCH AS A SOAP/WATER SOLUTION) SHOULD BE USED ON ALL JOINTS TO AID LEAK DETECTION. ALWAYS OBSERVE SAFETY PRECAUTIONS WHEN TESTING WITH A COMPRESSIBLE FLUID.
16. 100% VISUAL EXAMINATION OF FABRICATION IS REQUIRED INCLUDING FABRICATION, LONGITUDINAL AND MECHANICAL JOINTS. EXTENT OF EXAMINATION PER ASME B31.3 PARA M341.4.
17. THE MANUFACTURER SHALL VERIFY BY CALCULATION THAT THE PIPE PROVIDED BY HIS FABRICATION PROCESS IS CAPABLE OF THE STATED VACUUM RATING.

BRANCH CONNECTIONS

- BRANCH CONNECTIONS SHALL FOLLOW MANUFACTURERS RECOMMENDATIONS.
- THE FABRICATOR SHALL PROVIDE DRAWINGS (TYPICAL AND ATYPICAL) FOR ALL BRANCH CONNECTIONS OTHER THAN TEES.
- WHERE VIBRATION OR SUBSTANTIAL LOADING IS APPLIED TO A BRANCH CONNECTION THE DESIGNER SHOULD EVALUATE AND SPECIFY A SUITABLE REINFORCEMENT.
- GUSSET REINFORCEMENTS ARE REQUIRED ON ALL BRANCH CONNECTIONS 4” AND SMALLER.
- THERE SHALL BE A MINIMUM OF FOUR EQUALLY SPACED GUSSETS. (THREE GUSSETS MAY BE USED IF NEEDED TO OPEN ACCESS FOR FLANGE BOLTING).

GEL COAT COLOR BY SERVICE

The color code table is based on Ashland Maxguard Premium Gelcoats. RAL-7035 is the default color.

This is a total service list table; not all services are applicable to this specific pipe specification.

SERVICE	COLOR CODE	Color
WASTE WATER (WW)	RAL-4010	Telemagenta (Hot Pink)
DCB	RAL-5017	Traffic Blue
Na2SO4	RAL-7035	Light Grey
NaCIB	RAL-5017	Traffic Blue
NaHSO3	RAL-7035	Light Grey
SB	RAL-5017	Traffic Blue
SLD	RAL-7035	Light Grey
UPB	RAL-5017	Traffic Blue
WAW	RAL-7035	Light Grey
CLW	RAL-1016	Sulfur Yellow
DCB	RAL-5017	Traffic Blue
H2C	RAL-7035	Light Grey
CCOND	RAL-7035	Light Grey
DMW	RAL-7035	Light Grey
NaCLO	RAL-1016	Sulfur Yellow
BCOND	RAL-7035	Light Grey
CWS / CWR	RAL-6034	Light Green (turquoise)
KW	RAL-1001	Beige
CL	RAL-1016	Sulfur Yellow
CLO	RAL-9003	Signal White
NACLO	RAL-1016	Sulfur Yellow
DCLO	RAL-9003	Signal White
CLW	RAL-1016	Sulfur Yellow
DPB	RAL-1016	Sulfur Yellow
UPB	RAL-5017	Traffic Blue
NACLO	RAL-1016	Sulfur Yellow
CAU	RAL-2011	Deep Orange
CHLORINE CELL GAS	RAL-1016	Sulfur Yellow
ALL OTHER SERVICES	RAL-7035	Light Grey

	MATERIAL	CARBON STEEL		GES 2-3-0 **CLA** AXF REV 5 07/20/2022
	RATING	LIMITED BY VBA-662 230 PSIG @ 100°F 230 PSIG @ 150°F 1/8" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES

HYDROGEN SULFATE [H2SO4], SULFURIC ACID [SA]

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	1" – 6"	SCH 80, A-106 GR. B SMLS, BE	1,2
FITTINGS	1" – 6" 1" – 6"	SCH 80, A-234 GR. WPB, BE, ASME B16.9 SCH 80, A-105, INTEGRALLY REINFORCED OUTLET CONNECTION (O'LET), MSS SP-97	1,2,6 1,2
FLANGES	1" – 6" 1" – 6"	CL 150, A-105, SCH 80, RF WN, ASME B16.5 CL 150, A-105, RF BLIND, ASME B16.5	1,2,3,4,5,6 3
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HEAVY NUTS, TEFLON COATED	
GASKETS	ALL	CL 150, 1/8" THK. RING TYPE, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21, DURLON 9000 OR EQ W/ ENGINEERING APPROVAL	3,5
THREAD LUBE	BOLTS	NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
TEMPORARY STRAINERS	ALL	CL 150, CONICAL, 150% OPEN AREA, SS SCREEN/PLATE	
VALVES			
VCH-301 VCH-302	1" – 6" 3" – 6"	CHECK, BALL, DI BODY, CL 150, RF FLG, PFA LINED, SOLID PTFE BALL CHECK, WAFER SWING, DI BODY, CL 150, PFA LINED	9 9,10
VPL-506 VPL-506G	1" – 4" 6"	PLUG, PFA LINED A395 DI BODY/PLUG, CL 150, RF FLG PLUG, PFA LINED A395 DI BODY/PLUG, CL 150, RF FLG, GO	7,8 8
VBA-662	1" – 6"	BALL, PFA LINED A395 DI BODY, ONE-PIECE PFA LINED ALLOY BALL/STEM, CL 150 RF FLG, FULL PORT	7,8

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1, OR A MINIMUM OF 100% FOR CATEGORY M FLUID SERVICE PER ASME B31.3, PARA. M341.4.1. ENGINEERING MAY REQUIRE HIGHER PERCENTAGES FOR SPECIAL SERVICES.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 345 PSIG PER ASME B31.3. DRAIN AND BLOW DRY FREE OF LIQUID. BLOW DRY WITH NITROGEN TO A DEW POINT OF 0°F.

3. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.

	MATERIAL	CARBON STEEL		GES 2-3-0 **CLA** AXF REV 5 07/20/2022
	RATING	LIMITED BY VBA-662 230 PSIG @ 100°F 230 PSIG @ 150°F 1/8" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

4. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.
5. CL 300 FLANGES AND GASKETS MAY BE USED FOR MATING TO EQUIPMENT AS NECESSARY.
6. SLIP-ON FLANGES AND SW FITTINGS ARE NOT ALLOWED.
7. VENT, DRAIN, AND INSTRUMENT CONNECTIONS SHALL BE 1" FLANGED CONNECTIONS. PROVIDE DRAINS AT LOW POINTS IN THE PIPING.
8. VALVES SHALL BE SPECIFIED AND PURCHASED AS FIRE SAFE PER API-607.
9. INSTALL IN HORIZONTAL POSITION WITH COVER UP.
10. INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.

BRANCH CONNECTIONS

BRANCH

6	T					
4	(1)	T				
3	(1)	(1)	T			
2	W	(1)	(1)	T		
1½	W	W	(1)	(1)	T	
1	W	W	W	(1)	(1)	T
	6	4	3	2	1½	1

SYMBOLS

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPE DIMENSIONS

GENERAL							
MATERIAL	PP/FRP DUAL LAMINATE PIPING						
RATING	LIMITED BY FLG PP/FRP 150 PSIG @ 200°F (NPS 1 – 12) 100 PSIG @ 200°F (NPS 14 – 24) 0" CORROSION ALLOWANCE						
SERVICES	CATHOLYTE [CAT], CAUSTIC 0 – 20% [CAU], CAUSTIC CONDENSATE [CCOND], HYDROGEN GAS [H2], HYDROCHLORIC ACID [HCL], SODIUM HYPOCHLORITE [NACLO]						
ITEM	**SIZE**	**DESCRIPTION**					**NOTES**
PIPE	1" – 24"	MFR STD SCH, POLYPROPYLENE (PP)/FRP DUAL LAMINATE, SMLS PP LINER WITH MECHANICALLY BONDED FIBERGLASS REINFORCED VINYL ESTER CASING, MAX FLANGED SPOOL LENGTH 20'-0"					1, 2, 12, 14, 15, 16
FITTINGS	1" – 24"	MFR STD SCH, PP/FRP DUAL LAMINATE, BUTT FUSION WELDED, WELD THROUGH ENTIRE CROSS SECTION OF LINER FOLLOWED BY STANDARD FRP HAND LAYUP, MANUFACTURER'S STANDARD					1, 2, 12, 14, 15, 16
FLANGES	1" – 24"	MFR STD SCH/THICKNESS, PP/FRP DUAL LAMINATE, ASME B16.5 CL 150 BOLTING DIMENSIONS AND GASKET SURFACES					1, 2, 4, 5, 6, 7, 12, 14, 15, 16
UNIONS	NONE	USE FLANGES					
BOLTING	ALL	A193 GR B7 STUD BOLTS, TEFLON COATED A194 GR 2H HEAVY NUTS, TEFLON COATED WASHERS UNDER ALL NUTS					4, 17
GASKETS	ALL ALL ALL ALL	CL 150, 1/8" THK, FF OR OPRA, EPTFE W/ CORRUGATED C-276 INSERT; VSP FR-PITA OR EQ CL 150, 1/8" THK, FF, FILLED PTFE W/ INORGANIC FILLER; DURALON 9000 OR EQ CL 150, 1/8" THK, FF, EPDM W/ RAISED INNER RINGS PTFE COATED, ASME B16.21; GARLOCK STRESS SAVER STYLE 370 OR EQ CL 150, 1/8" THK, FF, EXPANDED PTFE; GORE UPG STYLE 800 OR EQ					
STRAINERS	ALL	CL 150 FLG, PTFE OR PFA LINED CS/DI, EPDM SEALS, BASKET OR Y-TYPE, ATOMAC ASF, RICHTER SERIES GS, ETHYLENE T-LINE, OR APPROVED EQUAL, VENDOR STANDARD MESH					
TEMPORARY STRAINERS	ALL	CL 150 FLG, CONICAL, 150% OPEN AREA, 316SS W/ SS SCREEN/PLATE					
SUPPORTS	PIPE (ALL) VALVES (≥3")	FRP CRADLE BONDED TO PIPE AT ALL SUPPORT POINTS PROVIDE INDEPENDENT SUPPORT FOR NON-GEAR OPERATED VALVES, AND IF REQUIRED BY PIPE STRESS ANALYSIS					

VALVES							
BALL	BUTTERFLY	CHECK	GATE	GLOBE	PLUG	OTHER	NOTES
VBA-662	VBF-903	VCH-301 VCH-322			VPL-506		10, 11, 13

NOTES

1. HYDROSTATIC TESTING SHALL BE PERFORMED AT 1.5 TIMES DESIGN PRESSURE. DRAIN AND BLOW DRY.

2. POLYPROPYLENE (PP-H) TO BE TYPE HOMOPOLYMER [ER ASTM F-1545. PIPE WALL THICKNESS SHALL BE ADEQUATE FOR THE FULL SPECIFICATION RATING. ALL PIPE SECTIONS SHALL BE FLANGED. PIPING TO BE SHOP FABRICATED. FIELD WELDS BY MANUFACTURER ONLY. FRP TO BE MECHANICALLY BONDED TO THE LINER.
3. MANUFACTURERS INSTRUCTIONS ON JOINT ASSEMBLY AND SUPPORT REQUIREMENTS SHALL BE PROVIDED WITH PIPE AND FITTINGS AND SHALL BE STRICTLY FOLLOWED.
4. CONSULT PIPE SYSTEM MANUFACTURER FOR REQUIRED FLANGE STUD LENGTHS.
5. FIXED FLANGES: FULL FACE FLANGES TO BE FABRICATED ON PIPE SPOOLS BY PIPE MANUFACTURER. PIPE LINER TO BE FLARED OVER FACE OF FLANGE TO INSIDE OF BOLT HOLES.
6. LAP JOINT FLANGE: STUB END WITH LOOSE RING FABRICATED BY PIPE MANUFACTURER. PIPE LINER TO BE FLARED OVER STUB FACE TO OUTSIDE DIAMETER OF STUB.
7. BLIND FLANGE: FLAT FACED FRP WITH 90 MIL MIN. THICKNESS PP LINER BONDED TO FACE.
8. INSTRUMENT CONNECTIONS: TEES (INCLUDING VENTS AND DRAINS) MAY BE FABRICATED DIRECTLY INTO PIPE SPOOLS. MINIMUM SIZE IS 1” DIAMETER.
9. DEFAULT VENT, DRAIN, AND INSTRUMENT VALVE.
10. INSTALL IN HORIZONTAL POSITION WITH COVER UP. REFER TO MANUFACTURER’S RECOMMENDATIONS FOR INSTALLATION OF VCH-301.
11. INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.
12. ALL SPOOLS AND FITTINGS SHALL BE SUITABLY PACKED TO PROVIDE NECESSARY PROTECTION DURING HANDLING, SHIPPING, AND STORAGE. GASKET FACE OF EACH SPOOL OR FITTING SHALL BE PROTECTED BY END PLATE OR OTHER SUITABLE PROTECTIVE MEANS.
13. USE A 0.5” THICK FULL FACE (TO FULLY SUPPORT PLASTIC FRP FLANGE) SOLID ANSI CLASS 150 PTFE SPACER ON EACH SIDE OF BUTTERFLY VALVES, IF THE VALVE DISC CAN INTERFERE WITH THE CONNECTED PIPE FLANGE INSIDE. SPACER TO BE PROVIDED WITH VALVE.
14. MAKE SHOP FABRICATED CONTACT MOLDED FLANGED PIPE SPOOLS WITH CONTACT MOLDED FITTINGS IN ACCORDANCE WITH NBS PS 15-69. MANUFACTURER SHALL SUBMIT COMPUTER FLEXIBILITY ANALYSIS OF THE HEADER PIPING SYSTEM AND DEMONSTRATE THE ADEQUACY OF THE PROPOSED DESIGN FOR THE INTENDED APPLICATION. WALL STRUCTURAL THICKNESS CALCULATIONS SHALL BE BASED ON OPERATING CONDITIONS AND SHALL NOT INCLUDE THE CORROSION LINER. SAFETY FACTOR – 10:1 PRESSURE; 5:1 VACUUM.
15. PERFORM 100% SPARK TESTS OF ALL JOINTS ON ALL DUAL LAM PIPE DURING FABRICATION.
16. FOR 1” – 12” FRP THICKNESS SHALL BE DESIGNED FOR 150 PSI. FOR 14” – 24” FRP THICKNESS SHALL BE DESIGNED FOR 100 PSI.
17. BOLTS SHALL BE TORQUED ACCORDING TO GSM-MP-GEN-005 “TORQUEING” USING THE LOWER OF THE GIVEN TORQUE VALUES OR MANUFACTURER’S RECOMMENDED TORQUE VALUES.

PIPE SIZE (IN)	MINIMUM LINER THICKNESS (IN)
1” – 3”	0.142”
4” – 6”	0.200”
8”	0.193”
10” – 24”	0.240”

BRANCH CONNECTIONS

- BRANCH CONNECTIONS SHALL FOLLOW MANUFACTURER RECOMMENDATIONS.

GEL COAT COLOR BY SERVICE

The color code table is based on Ashland Maxguard Premium Gelcoats. RAL-7035 is the default color.
This is a total service list table; not all services are applicable to this specific pipe specification.

SERVICE	COLOR CODE	COLOR
WASTE WATER (WW)	RAL-4010	TELEMAGENTA (HOT PINK)
DCB	RAL-5017	TRAFFIC BLUE
NA2SO4	RAL-7035	LIGHT GREY
NACIB	RAL-5017	TRAFFIC BLUE
NAHSO3	RAL-7035	LIGHT GREY
SB	RAL-5017	TRAFFIC BLUE
SLD	RAL-7035	LIGHT GREY
UPB	RAL-5017	TRAFFIC BLUE
WAW	RAL-7035	LIGHT GREY
CLW	RAL-1016	SULFUR YELLOW
DCB	RAL-5017	TRAFFIC BLUE
H2C	RAL-7035	LIGHT GREY
CCOND	RAL-7035	LIGHT GREY
DMW	RAL-7035	LIGHT GREY
NACLO	RAL-1016	SULFUR YELLOW
BCOND	RAL-7035	LIGHT GREY
CWS / CWR	RAL-6034	LIGHT GREEN (TURQUOISE)
KW	RAL-1001	BEIGE
CL	RAL-1016	SULFUR YELLOW
CLO	RAL-9003	SIGNAL WHITE
DCLO	RAL-9003	SIGNAL WHITE
DPB	RAL-1016	SULFUR YELLOW
UPB	RAL-5017	TRAFFIC BLUE
CAU	RAL-2011	DEEP ORANGE
CHLORINE CELL GAS	RAL-1016	SULFUR YELLOW
ALL OTHER SERVICES	RAL-7035	LIGHT GREY

	MATERIAL	UNALLOYED TITANIUM		GES 2-3-0 **CLA** AZ REV 1 07/20/2022
	RATING	150 PSIG @ 100°F 150 PSIG @ 250°F 1/16" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA61D49D...	

CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

**** SHALL ONLY BE USED AS A REFERENCE FOR EXISITING PIPING. DO NOT USE FOR NEW CONSTRUCTION.****

SERVICES

LEAN BRINE (AFTER DECHLOR) [DCB], SODIUM SULFATE BRINE [NA2SO4B], SODIUM SULFATE CRYSTAL < 120°C [NA2SO4C], SODIUM SULFATE SLURRY [NA2SO4S], SALT BRINE [NACLB], SALT CRYSTAL [NACLC], SALT SLURRY [NACLS], WASH WATER [WAW]

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	½" – 8" 10" – 12"	SCH 10S, B-861 GR. 2, UNALLOYED TITANIUM, SMLS, BE 0.16" MIN WALL, B-862 GR. 2, UNALLOYED TITANIUM, WELDED, BE, 100% R.T.	1,2 1,2
FITTINGS	½" – 12" ½" – 12"	SCH TO MATCH PIPE, B-363 WPT2, UNALLOYED TITANIUM, SMLS/WELDED, BW, 100% R.T. (MATCH PIPE), ASME B16.9 SCH/CLASS TO MATCH PIPE/FITTINGS, B-381, GR. F2, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), MSS SP-97	1,2,3 1,2
FLANGES	½" – 12" ½" – 12"	CL 150, A-105, LAP JOINT, ASME B16.5 CL 150, A-105 W/ GRADE 7 (Ti+Pd) LINING, RF BLIND, ASME B16.5	1,2,4,5,6 4
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HVY. NUTS, TEFLON COATED	
GASKETS	ALL	CL 150, 1/8" THK. SPIRAL WOUND, NICKEL 200 WINDINGS WITH GRAPHITE FILLER, CS OUTER RING, ANTI-BUCKLING, ASME B16.20; FLEXITALLIC STYLE CGI, VSP AB-326, OR EQ W/ ENGINEERING APPROVAL	4,6
THREAD LUBE	BOLTS	NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
VALVES			
VPL-588 VPL-588G	1" – 4" 6" – 8"	PLUG, TITANIUM GR. 2 BODY/PLUG, CL 150, RF FLG, PTFE SLEEVE PLUG, TITANIUM GR. 2 BODY/PLUG, CL 150, RF FLG, PTFE SLEEVE, GO	8 8
VBA-699 VBA-699G	1" – 4" 6"	BALL, TITANIUM GR. 2 BODY/BALL/STEM, CL 150 RF FLG, PTFE SEATS, FULL PORT BALL, TITANIUM GR. 2 BODY/BALL/STEM, CL 150 RF FLG, PTFE SEATS, FULL PORT, GO	7,8 7,8

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1. ENGINEERING MAY REQUIRE ADDITIONAL TESTING FOR SPECIAL SERVICES.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 225 PSIG PER ASME B31.3 PARA. 345.4. DRAIN AND BLOW FREE OF LIQUID.

3. STUB ENDS SHALL BE USED FOR FLANGED CONECTIONS. THEY SHALL BE SHORT PATTERN PER ASME B16.9.

	MATERIAL	UNALLOYED TITANIUM		GES 2-3-0 **CLA** AZ REV 1 07/20/2022
	RATING	150 PSIG @ 100°F 150 PSIG @ 250°F 1/16" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

4. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.

5. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.

6. CL 300 FLANGES AND GASKETS MAY BE USED FOR MATING TO EQUIPMENT AS NECESSARY.

7. VENT, DRAIN, AND INSTRUMENT VALVE. ¾" SIZE IS THE DEFAULT SIZE, BUT ½" AND 1" MAY BE USED IF REQUIRED.

8. VALVES SHALL BE SPECIFIED AND PURCHASED AS FIRE SAFE PER API-607.

BRANCH CONNECTIONS

BRANCH

12	T									
10	RT	T								
8	P	RT	T							
6	P	P	RT	T						
4	P	P	P	RT	T					
3	P	P	P	P	RT	T				
2	W	W	W	W	RT	RT	T			
1½	W	W	W	W	W	RT	RT	T		
1	W	W	W	W	W	W	(1)	(1)	T	
¾	W	W	W	W	W	W	W	(1)	(1)	T
½	W	W	W	W	W	W	W	(1)	(1)	T
	12	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

P – BRANCH WELD WITH REINFORCING PAD (PAD THICKNESS EQUALS RUN PIPE THICKNESS, PAD WIDTH EQUALS ½ BRANCH OD.)

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.

	MATERIAL	CARBON STEEL		GES 2-3-0 **CLA** B REV 14 07/20/2022
	RATING	ASME B16.5, CLASS 300, M.G. 1.1 740 PSIG @ 100°F 605 PSIG @ 500°F 1/16" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

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SERVICES

BOILER BLOW DOWN [BD], BOILER FEED WATER [BFW], REFRIGERATION GAS [FRG], REFRIGERATION LIQUID [FRL], NATURAL GAS [NG], SEAL OIL [LO], 180# STEAM [S180], 180# STEAM CONDENSATE [SC180], VENT [VE], HIGH NITROGEN PRESSURE [N]

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	½" – 1½" 2" – 16" 18" – 24"	SCH 80, A-106 GR. B, SMLS, PE SCH 40, A-106 GR. B, SMLS, BE SCH 40, A-333 GR. 6, SMLS, BE	1,2 1,2 1,2,14
FITTINGS	½" – 1½" ½" – 16" 18" – 24" ½" – 10"	CL 3000, A-105, SW, ASME B16.11 SCH TO MATCH PIPE, A-234 GR. WPB, SMLS, BE, ASME B16.9 SCH TO MATCH PIPE, A-420 GR. WPL6, SMLS, BE, ASME B16.9 SCH/CLASS TO MATCH PIPE, A-105, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), MSS SP-97	1,2 1,2 1,2,14 1,2
FLANGES	½" – 1½" ½" – 24" ½" – 24" 2" – 24"	CL 300, A-105, SCH TO MATCH PIPE, RF SW, ASME B16.5 CL 300, A-105, SCH TO MATCH PIPE, RF WN, ASME B16.5 CL 300, A-105, RF BLIND, ASME B16.5 CL 300, A-105, SCH TO MATCH PIPE, RF ORIFICE FLANGE, ASME B16.36, ½" SW TAPS	1,2,5,6 1,2,5,6 5
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HVY. NUTS, TEFLON COATED	13 13
GASKETS	ALL ALL	CL 300, 1/8" THK. RING TYPE, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21, DURLON 9000 OR EQ W/ ENGINEERING APPROVAL CL 300, 1/8" THK. SPIRAL WOUND, 304SS WINDINGS WITH GRAPHITE FILLER, CS OUTER RING, ANTI-BUCKLING, ASME B16.20; FLEXITALLIC STYLE CGI, VSP AB-326, OR EQ W/ ENGINEERING APPROVAL	5 5,12
THREAD LUBE	PIPE BOLTS	TFE TAPE (≤400°F), MOLYCOTE G OR EQ (>400°F) NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
TEMPORARY STRAINERS	ALL	CL 300, CONICAL, 150% OPEN AREA, SS SCREEN/PLATE	
"Y" STRAINERS	½" – 1½" 2" – 12"	CL 300, SW, A-216, 0.020" PERF. SS SCREEN CL 300, RF FLG, A-216, 0.020" PERF. SS SCREEN	

	MATERIAL	CARBON STEEL		GES 2-3-0 **CLA** B REV 14 07/20/2022
	RATING	ASME B16.5, CLASS 300, M.G. 1.1 740 PSIG @ 100°F 605 PSIG @ 500°F 1/16" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

VALVES			
VGA-106	2" – 8"	GATE, CS, CL 300, RF FLG, TRIM #8	
VGA-106A	½" – 1½"	GATE, CS, CL 800, RF FLG, TRIM #8, RED. PORT	
VGA-106G	10" – 24"	GATE, CS, CL 300, RF FLG, TRIM #8, GO	
VGA-112	½" – 1½"	GATE, CS, CL 800, SW, TRIM #8	7
VGL-208	2" – 6"	GLOBE, CS, CL 300, RF FLG, TRIM #8	
VGL-208G	8" – 24"	GLOBE, CS, CL 300, RF FLG, TRIM #8, GO	
VGL-318	½" – 1½"	GLOBE, CS, CL 300, RF FLG, TRIM #8	
VCH-306	2" – 24"	CHECK, WAFER, CS, CL 300, RF FLG, TRIM #10	8,9,10,11
VCH-307	2" – 24"	CHECK, SWING, CS, CL 300, RF FLG, TRIM #8	8,9
VCH-425	½" – 1½"	CHECK, PISTON, CS, CL 300, RF FLG, TRIM #8	8

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1, OR A MINIMUM OF 100% FOR CATEGORY M FLUID SERVICE PER ASME B31.3, PARA. M341.4.1. ENGINEERING MAY REQUIRE HIGHER PERCENTAGES FOR SPECIAL SERVICES.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 1125 PSIG PER ASME B31.3. HYDROTEST PRESSURE DETERMINED BY ASME B16.5, PARA. 2.6.

3. PIPING IN CATEGORY D FLUID SERVICE MAY BE SUBJECT TO AN INITIAL SERVICE LEAK TEST IN ACCORDANCE WITH ASME B31.3 PARA. 345.7, IN LIEU OF THE HYDROSTATIC LEAK TEST.

4. ALL BURIED PIPING SHALL BE COATED AND WRAPPED IN ACCORDANCE WITH GES 2-2-1.

5. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.

6. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.

7. VENT, DRAIN, AND INSTRUMENT VALVE. ¾" SIZE IS THE DEFAULT SIZE, BUT ½" AND 1" MAY BE USED IF REQUIRED.

8. INSTALL IN HORIZONTAL POSITION WITH COVER UP.

9. INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.

10. VCH-306 DIMENSIONS ARE NOT STANDARD. VALVES MUST BE SELECTED BEFORE DRAWING COMPLETION OR FABRICATION.

11. DOWNSTREAM CLEARANCE MUST BE CHECKED FOR VCH-306.

	MATERIAL CARBON STEEL		GES 2-3-0 **CLA** B
	RATING ASME B16.5, CLASS 300, M.G. 1.1 740 PSIG @ 100°F 605 PSIG @ 500°F 1/16" CORR. ALLOW.		REV 14 07/20/2022
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...

12. THIS GASKET IS TO BE USED IN STEAM SERVICE ONLY.

13. DO NOT USE TEFLON COATED STUDS OR BOLTS IN STEAM SERVICE.

14. IMPACT TESTED MATERIAL USED DUE TO WALL THICKNESS.

BRANCH CONNECTIONS

BRANCH

24	T														
20	RT	T													
18	P	RT	T												
16	P	P	RT	T											
14	P	P	P	RT	T										
12	P	P	P	P	RT	T									
10	P	P	P	P	P	RT	T								
8	W	W	W	W	W	W	RT	T							
6	W	W	W	W	W	W	W	RT	T						
4	W	W	W	W	W	W	W	W	RT	T					
3	W	W	W	W	W	W	W	W	W	(1)	T				
2	W	W	W	W	W	W	W	W	W	(1)	(1)	T			
1½	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T		
1	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T	
¾	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	T
½	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	(1)	T
	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

O – OLET (MATCH END TYPE AND CLASS/SCHEDULE OF DESIGN PER PIPE SPEC)

P – BRANCH WELD WITH REINFORCING PAD (PAD THICKNESS EQUALS RUN PIPE THICKNESS PAD WIDTH EQUALS ½ BRANCH OD.)

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.

	MATERIAL	304L STAINLESS STEEL		GES 2-3-0 **CLA** BA REV 1 07/20/2022
	RATING	ASME B16.5, CLASS 300, M.G. 2.3 600 PSIG @ 100°F 420 PSIG @ 400°F 0.04" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

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SERVICES

AMMONIA VAPOR [AM], BRINE CONDENSATE [BCOND]

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	½" – 2" ½" – 2" 3" – 16" 18" – 24"	SCH 80S, A-312 TP-304L, SMLS, PExTE OR TE SCH 40S, A-312 TP-304L, SMLS, PE SCH 40S, A-312 TP-304L, SMLS, BE SCH 40, A-312 TP-304L, SMLS, BE	1,2,3 1,2 1,2 1,2
FITTINGS	½" – 2" ½" – 2" 3" – 24" ½" - 8"	CL 3000, A-182, GR. F304L, THD, ASME B16.11 CL 3000, A-182, GR. F304L, SW, ASME B16.11 SCH TO MATCH PIPE, A-403, WP-304L-S, BW, ASME B16.9 SCH/CLASS TO MATCH PIPE/FITTINGS, A-182, GR. F304L, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), MSS SP-97	2,3 1,2 1,2 1,2
FLANGES	½" – 2" 3" – 24" ½" – 24" 2" – 24"	CL 300, A-182, GR. F304L, SCH TO MATCH PIPE, RF SW, ASME B16.5 CL 300, A-182, GR. F304L, SCH TO MATCH PIPE, RF WN, ASME B16.5 CL 300, A-182, GR. F304L, RF BLIND, ASME B16.5 CL 300, A-182, GR. F304L, SCH TO MATCH PIPE, RF ORIFICE FLANGE, ASME B16.36, ½" SW TAPS	1,2,4 1,2,4 1,2
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HVY. NUTS, TEFLON COATED	
GASKETS	ALL	CL 300, 1/8" THK. RING TYPE, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21, DURLON 9000 OR EQ W/ ENGINEERING APPROVAL	
THREAD LUBE	PIPE BOLTS	TFE TAPE NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
TEMPORARY STRAINERS	ALL	CL 300, CONICAL, 150% OPEN AREA, 304/316 SS SCREEN/PLATE	
"Y" STRAINERS	½" – 2" 3" – 8"	CL 600, SW, A-351, GR. CF8M, 0.020" PERF. SS SCREEN CL 300, RF FLG, A-351, GR. CF8M, 0.020" PERF. SS SCREEN	

	MATERIAL	304L STAINLESS STEEL		GES 2-3-0 **CLA** BA REV 1 07/20/2022
	RATING	ASME B16.5, CLASS 300, M.G. 2.3 600 PSIG @ 100°F 420 PSIG @ 400°F 0.04" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Esteveens 402213A8234D4E3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

VALVES			
VGL-244 VGL-246 VGL-246G	½" – 2" 3" – 6" 8" – 24"	GLOBE, 316 SS, CL 300, SW, TRIM #10 GLOBE, 316 SS, CL 300, RF FLG, TRIM #10 GLOBE, 316 SS, CL 300, RF FLG, TRIM #10, GO	
VBF-934 VBF-934G	3" – 4" 6" – 24"	B-FLY, 316 SS, CL 300, SINGLE FLG LUG, SS DISC, PTFE SEAT, GRAPHITE SEAL B-FLY, 316 SS, CL 300, SINGLE FLG LUG, SS DISC, PTFE SEAT, GRAPHITE SEAL, GO	6 6
VCH-352 VCH-353	½" – 2" 3" – 12"	CHECK, SWING, 316 SS, CL 300, SW, TRIM #10 CHECK, SWING, 316 SS, CL 300, RF FLG, TRIM #10	7 7
VPL-560 VPL-560G	½" – 4" 6" – 8"	PLUG, 316 SS BODY/PLUG, TUFLINE-600 SLEEVE, CL 300, RF FLG, SHORT PLUG, 316 SS BODY/PLUG, TUFLINE-600 SLEEVE, CL 300, RF FLG, SHORT, GO	5,6 6

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1. ENGINEERING MAY REQUIRE HIGHER PERCENTAGES FOR SPECIAL SERVICES.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 900 PSIG PER ASME B31.3 PARA 345.4. DRAIN AND BLOW FREE OF LIQUID.

3. THREADED COMPONENTS SHALL ONLY BE USED IN VENT, DRAIN, AND INSTRUMENT CONNECTIONS.

4. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.

5. VENT, DRAIN, AND INSTRUMENT VALVES. ¾" SIZE IS THE DEFAULT SIZE.

6. VALVES SHALL BE SPECIFIED AND PURCHASED AS FIRE SAFE PER API 607 AND FURNISHED WITH A LOCKING DEVICE.

7. INSTALL IN HORIZONTAL POSITION WITH COVER UP OR IN VERTICAL POSITION WITH UPWARD FLOW.

8. MILL TEST REPORTS, MANUFACTURER'S PARTIAL DATA REPORTS, AND CERTIFICATES OF COMPLIANCE WITH ASTM AND ANSI STANDARDS SHALL BE SUBMITTED IN ACCORDANCE WITH ANSI/ASME BPV-1.

	MATERIAL	304L STAINLESS STEEL		GES 2-3-0 **CLA** BA REV 1 07/20/2022
	RATING	ASME B16.5, CLASS 300, M.G. 2.3 600 PSIG @ 100°F 420 PSIG @ 400°F 0.04" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4E3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

BRANCH CONNECTIONS

BRANCH

24	T														
20	RT	T													
18	P	RT	T												
16	P	P	RT	T											
14	P	P	P	RT	T										
12	P	P	P	P	RT	T									
10	P	P	P	P	P	RT	T								
8	W	W	W	W	W	RT	RT	T							
6	W	W	W	W	W	W	RT	RT	T						
4	W	W	W	W	W	W	W	RT	RT	T					
3	W	W	W	W	W	W	W	W	RT	(1)	T				
2	W	W	W	W	W	W	W	W	W	(1)	(1)	T			
1½	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T		
1	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T	
¾	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	T
½	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	(1)	T
	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

O – OLET (MATCH END TYPE AND CLASS/SCHEDULE OF DESIGN PER PIPE SPEC)

P – BRANCH WELD WITH REINFORCING PAD (PAD THICKNESS EQUALS RUN PIPE THICKNESS, PAD WIDTH EQUALS ½ BRANCH OD.)

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.

	MATERIAL	CARBON STEEL (LOW TEMP)	GES 2-3-0 **CLA** BCM
	RATING	LIMITED BY VBA-630 & VCH-461 600 PSIG @ -50°F TO 100°F 490 PSIG @ 300°F 1/8" CORR. ALLOW. CI PAMPHLET 6 SERVICE CLASS V IS LIMITED TO 300 PSIG @ 300°F	
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**** SHALL ONLY BE USED AS A REFERENCE FOR EXISITING PIPING. DO NOT USE FOR NEW CONSTRUCTION.****

SERVICES

WET CHLORINE GAS – HIGH [CL], DRY CHLORINE LIQUID [DCL], UTILITY VENT SYSTEM [UVS]

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	½" - ¾" 1" – 10"	SCH 160, A-333 GR. 6, SMLS, BE SCH 80, A-333 GR. 6, SMLS, BE	1,2,5 1,2,5,6
FITTINGS	½" – 10" ½" – 6"	SCH TO MATCH PIPE, A-420 GR. WPL6, BE, ASME B16.9 BRANCH, SCH TO MATCH PIPE/FITTINGS, A-350 GR. LF2 CL. 1, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), BE, MSS SP-97	1,2,5,6 1,2,5
FLANGES	½" – 10" ½" – 10"	CL 300, A-350 GR. LF2 CL. 1, SCH TO MATCH PIPE, RF WN, ASME B16.5 CL 300, A-350 GR. LF2 CL. 1, RF BLIND, ASME B16.5	1,2,5,6 5
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-320 GR. L7 STUD BOLTS, GREEN TEFLON COATED A-194 GR. 7L HVY. NUTS, GREEN TEFLON COATED	 16
GASKETS	ALL	CL 300, 1/8" THK. RING TYPE, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21, DURLON 9000 OR EQ W/ ENGINEERING APPROVAL	18
THREAD LUBE	BOLTS	NONFLAMMABLE LUBRICANT RATED FOR OXYGEN/CHLORINE SERVICE; FLUOROLUBE OR EQ W/ ENGINEERING APPROVAL	
VALVES			
VGL-295	½" – 10"	GLOBE, A352-LCC OR A350-LF2 BODY, CL 300, RF FLG, BELLOWS SEAL	5,6,9,17
VCH-319 VCH-461	2" – 10" ½" – 2"	CHECK SWING, A352-LCB BODY, CL 300, RF, API TRIM #9 CHECK PISTON, B564 MONEL BODY, CL 300, RF, API TRIM #9	5,9,12,13, 17 2,5,9,12, 17
VPL-558	½" – 1"	PLUG, A352-LCB BODY, MONEL PLUG, CL 300, RF FLG, PTFE SLEEVE	5,9,10,11, 16,17
VBA-630	½" – 6"	BALL, A494 GR. M35-1 (MONEL) ANNEALED BODY & TRIM, CL 300, RF FLG, PARAFLON SEATS, SHORT	2,5,9,17
VBF-933 VBF-933G	3" – 4" 6" – 10"	BUTTERFLY, A352-LCB BODY & DISC, CL 300, RF FLG, HF SEAT, MONEL + GRAPHITE SEAL RING, SHORT BUTTERFLY, A352-LCB BODY & DISC, CL 300, RF FLG, HF SEAT, MONEL + GRAPHITE SEAL RING, SHORT, w/GO	5,9,16,17 5,9,16,17

	MATERIAL	CARBON STEEL (LOW TEMP)		GES 2-3-0 **CLA** BCM REV 1 07/20/2022
	RATING	LIMITED BY VBA-630 & VCH-461 600 PSIG @ -50°F TO 100°F 490 PSIG @ 300°F 1/8" CORR. ALLOW. CI PAMPHLET 6 SERVICE CLASS V IS LIMITED TO 300 PSIG @ 300°F		
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NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT 100% FOR CHLORINE FLUID SERVICE PER ASME B31.3, PARA. M341.4.1.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 900 PSIG. HYDROTEST PRESSURE DETERMINED BY ASME B31.3, SECT 345.4. DRAIN AND BLOW FREE OF LIQUID. WESTLAKE PERSONNEL TO DRY BY BLOWING WITH MINIMUM (-)40ºF DEWPOINT AIR OR NITROGEN UNTIL DEWPOINT LEAVING IS SAME AS DEWPOINT ENTERING. BALL VALVES AND PLUG VALVES SHOULD BE HALF OPEN TO DRY THE BODY CAVITY. SEE ALSO NOTE 17.

3. PURGE GAS / DRYING GAS / INERTING GAS MUST BE OIL FREE.

4. WELDING SHALL BE PER ASME CODE SECTION IX, LATEST EDITION. WPS SHOULD BE SUITABLE FOR LOW TEMPERATURE SERVICE.

5. ALL PIPING AND VALVES MUST CONFORM TO CHLORINE INSTITUTE PAMPHLET 6.

6. FOR PIPING SYSTEMS 8 INCH AND LARGER, CONSULT THE CHLORINE INSTITUTE PAMPHLET 6 AND WESTLAKE ENGINEERING REPRESENTATIVE FOR APPROVAL.

7. FLANGED CONNECTIONS ARE PREFERRED FOR CHLORINE SERVICE INCLUDING VENTS AND DRAINS. THREADED CONNECTIONS ARE NOT PERMITTED.

8. SEVERAL VALVE MANUFACTURERS MAKE EQUIVALENT CHLORINE SERVICE VALVES. THESE "OR EQUAL" VALVES MAY BE USED IF CHECKED AND APPROVED BY A WESTLAKE ENGINEERING REPRESENTATIVE. (CHECK FACE TO FACE DIMENSIONS)

9. ALL VALVES AND INSTRUMENTS ARE TO BE PREPARED, DOUBLE BAGGED, AND TAGGED FOR CHLORINE SERVICE. VALVES SHALL BE CLEANED AND PACKAGED AS PER REQUIREMENTS OF CHLORINE INSTITUTE PAMPHLET 6.

10. TO BE USED ONLY WITH APPROVAL FROM OPERATIONS. VGL-295 IS THE PREFERRED VALVE.

11. TO BE USED ONLY IN THE CHLORINE LOADING RACK.

12. INSTALL IN HORIZONTAL POSITION WITH COVER UP.

13. INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.

14. USE OF WEAR PADS (DYNAGARD OR EQ.) ARE REQUIRED AT ALL STRUCTURAL STEEL/CONCRETE SUPPORT POINTS. IF BOLT-ON PIPE SHOES ARE NEEDED AS A SUBSTITUTE, THEY SHALL BE GALVANIZED AND BE PROVIDED WITH A BUILT-IN NON- METALLIC CONTACT PLATE BETWEEN THE PIPE AND THE SUPPORT.

	MATERIAL	CARBON STEEL (LOW TEMP)		GES 2-3-0 **CLA** BCM REV 1 07/20/2022
	RATING	LIMITED BY VBA-630 & VCH-461 600 PSIG @ -50°F TO 100°F 490 PSIG @ 300°F 1/8" CORR. ALLOW. CI PAMPHLET 6 SERVICE CLASS V IS LIMITED TO 300 PSIG @ 300°F		
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15. WHEN CONNECTING OTHER PIPING SYSTEMS TO CL2 SPECIFIED PIPING, IT IS REQUIRED TO HAVE A PRIMARY ISOLATION VALVE, A BLEED VALVE, AND A SECONDARY ISOLATION VALVE. THE PRIMARY ISOLATION VALVE AND BLEED VALVE MUST BE OF THE AFFECTED CL2 PIPING SPECIFICATION. THE PIPE SPECIFICATION BREAK WILL BE AT THE SECONDARY ISOLATION VALVE.

16. LOW TEMPERATURE REQUIREMENTS AS DEFINED IN A320 FOR GR. 7L APPLY PER A194,S3.

17. HYDRO TEST PRESSURE PER B16.5 (FLANGES) OR B31.3 (PIPING/PIPING COMPONENTS) MAY BE HIGHER THAN THE MANUFACTURER'S VALVE RATINGS IN SOME CASES. VERIFY MANUFACTURER VALVE RATING BEFORE HYDROTEST. VBA-630 and VCH-461 ARE LIMITED BY MATERIAL GROUP 3.4 to 600 PSI/100F, MAX HYDRO = 900 PSI. IF INCLUDED IN HYDROTESTING, VALVES SHOULD BE LEFT PARTIALLY OPEN DURING HYDROTEST.

18. DO NOT APPLY LUBRICANT TO THE FLANGE FACES OR GASKETS FOR CHLORINE SERVICE

BRANCH CONNECTIONS

BRANCH

10	T								
8	RT	T							
6	RT	RT	T						
4	W	RT	RT	T					
3	W	W	RT	(1)	T				
2	W	W	W	(1)	(1)	T			
1½	W	W	W	W	(1)	(1)	T		
1	W	W	W	W	W	(1)	(1)	T	
¾	W	W	W	W	W	(1)	(1)	(1)	T
½	W	W	W	W	W	(1)	(1)	(1)	(1)	T
	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.

	MATERIAL	MONEL TUBING		GES 2-3-0 **CLA** BCT REV 0 07/20/2022
	RATING	LIMITED BY VBA-680 2300 PSIG @ 70°F 1000 PSIG @ 300°F 0" CORR. ALLOW.		
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SERVICES

HYDROCHLORIC ACID [HCL], HYDROGEN [H2], CHLORINE, NITROGEN [N] – INSTRUMENT SENSING LINES

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	¼" – ½"	0.035" WALL, B-165 (UNS N04400) FULLY ANNEALED, 75 Rb MAX HARDNESS	
FITTINGS	NONE		
FLANGES	NONE		
UNIONS	NONE		
BOLTING	NONE		
GASKETS	NONE		
THREAD LUBE	NONE		
TEMPORARY STRAINERS	NONE		
"Y" STRAINERS	NONE		
VALVES			
VBA-680	¼" – ½"	BALL, MONEL BODY/BALL/STEM, COMPRESSION FITTING ENDS, PTFE SEAT, 5000 PSIG	
VNE-05	¼" – ½"	NEEDLE, MONEL BODY/STEM, 1500#, COMPRESSION FITTING ENDS, PFA PACKING	

NOTES

1. WELDING NOT ALLOWED FOR THIS PIPING SPECIFICATION.
2. INSTRUMENTATION IMPULSE SENSE LINES.
3. NOT TO BE USED IN GAS/VAPOR SERVICE.

	MATERIAL	STAINLESS STEEL, 316L	GES 2-3-0 **CLA** BH
	RATING	ASME B16.5, CLASS 300, M.G. 2.3 600 PSIG @ 100°F 395 PSIG @ 500°F 0.030" CORR. ALLOW.	
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SERVICES			
DEMINERALIZED WATER [DMW], LUBE OIL [LO], WASTE WATER [WW], BRINE SLUDGE [SLD], COLD CAUSTIC AFTER CAUSTIC EVAP [CCAU]			
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	½" – 1½" 2" – 6" 8" – 16"	SCH 40S, A-312 TP-316L, SMLS, PE SCH 40S, A-312 TP-316L, SMLS, BE SCH 40S, A-312 TP-316L, SMLS OR EFW 100% RT, BE	1,2 1,2 1,2
FITTINGS	½" – 1½" 2" – 16" ½" – 10"	CL 3000, A-182, GR. F316L, SW, ASME B16.11 SCH TO MATCH PIPE, A-403, WP-316L, BW, ASME B16.9 SCH/CLASS TO MATCH PIPE/FITTINGS, A-182, GR. F316L, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), MSS SP-97	1,2 1,2,3 1,2
FLANGES	½" – 1½" 2" – 16" 2" – 16" ½" – 16" 2" – 16"	CL 300, A-182, GR. F316L, SCH 40S, RFSW, ASME B16.5 CL 300, A-105, LAP JOINT, ASME B16.5 CL 300, A-182, GR. F316L, RF SO, ASME B16.5 CL 300, A-182, GR. F316L, RF BLIND, ASME B16.5 CL 300, A-182, GR. F316L, SCH TO MATCH PIPE, RF ORIFICE FLANGE, ASME B16.36, ½" SW TAPS	1,2,4,5,6 1,2,4,5,6 1,2,4,5 6,7 4
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HVY. NUTS, TEFLON COATED	
GASKETS	ALL	CL 300, 1/8" THK. RING TYPE, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21, DURLON 9000 OR EQ W/ ENGINEERING APPROVAL	4,6
THREAD LUBE	PIPE BOLTS	TFE TAPE (≤400°F), MOLYCOTE G OR EQ (>400°F) NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
TEMPORARY STRAINERS	ALL	CL 300, CONICAL, 150% OPEN AREA, 304/316 SS SCREEN/PLATE	
"Y" STRAINERS	½" – 1½" 2" – 16"	CL 600, SW, A351, GR. CF3M, 0.020" PERF. SS SCREEN CL 300, RF FLG, A351, GR. CF8M, 0.020" PERF. SS SCREEN	
VALVES			
VGA-122 VGA-167 VGA-132 VGA-132G	½" – 1½" ½" – 1½" ½" – 8" 10" – 16"	GATE, 316L SS, CL 800, SW, TRIM #10 GATE, EXTENDED BODY, 316L SS, CL 800, MSWxFNPT, TRIM #12 GATE, 316 SS, CL 300, RF FLG, TRIM #10 GATE, 316 SS, CL 300, RF FLG, TRIM #10, GO	 7
VGL-245 VGL-246 VGL-246G	½" – 1½" ½" – 6" 8" – 16"	GLOBE, 316L SS, CL 300, SW, TRIM #10 GLOBE, 316L SS, CL 300, RF FLG, TRIM #10 GLOBE, 316L SS, CL 300, RF FLG, TRIM #10, GO	
VPL-568 VPL-560	½" – 1" ½" – 4"	PLUG, 316 SS BODY/PLUG, CL 300, THRD, PTFE SLEEVE PLUG, 316 SS BODY/PLUG, CL 300, RF FLG, TUFLINE-600 SLEEVE	8 8

	MATERIAL	STAINLESS STEEL, 316L	GES 2-3-0 **CLA** BH REV 4 07/20/2022
	RATING	ASME B16.5, CLASS 300, M.G. 2.3 600 PSIG @ 100°F 395 PSIG @ 500°F 0.030" CORR. ALLOW.	

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VPL-560G	6" – 8"	PLUG, 316 SS BODY/PLUG, CL 300, RF FLG, TUFLINE-600 SLEEVE, GO	8
VPL-561	½" – 8"	PLUG, 316 SS BODY/PLUG, CL 300, RF FLG, PTFE SLEEVE	8
VPL-561G	10" – 16"	PLUG, 316 SS BODY/PLUG, CL 300, RF FLG, PTFE SLEEVE, GO	8
VCH-346	½" – 1½"	CHECK, SWING, 316 SS, CL 300, SW, 316SS DISC/SEAT	9
VCH-345	½" – 8"	CHECK, SWING, 316 SS, CL 300, RF FLG, TRIM #10	9
VCH-345G	10" – 16"	CHECK, SWING, 316 SS, CL 300, RF FLG, TRIM #10, GO	9
VBA-610	½" – 1½"	BALL, 316 SS BODY, CL 2000, THRD, TRIM #10, RED. PORT	8
VBA-641	½" – 6"	BALL, 316 SS BODY, CL 300, RF FLG, TRIM #10, STD. PORT	8
VBA-641G	8" – 12"	BALL, 316 SS BODY, CL 300, RF FLG, TRIM #10, STD. PORT, GO	8
VBF-925	3" – 4"	B-FLY, 316 SS, CL 300, THD LUG, SS DISC/SEAL	8
VBF-925G	6" – 18"	B-FLY, 316 SS, CL 300, THD LUG, SS DISC/SEAL, GO	8

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1. ENGINEERING MAY REQUIRE HIGHER PERCENTAGES FOR SPECIAL SERVICES.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 345 PSIG PER ASME B31.3. HYDROTEST PRESSURE DETERMINED BY ASME B16.5, PARA. 2.6.

3. STUB ENDS SHALL BE USED FOR FLANGED CONECTIONS. THEY SHALL BE SHORT PATTERN PER ASME B16.9.

4. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.

5. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.

6. SLIP-ON FLANGES SHALL NOT BE USED DIRECTLY ON FITTINGS UNLESS SO INDICATED ON THE DESIGN DRAWINGS.

7. VENT, DRAIN, AND INSTRUMENT VALVE. ¾" SIZE IS THE DEFAULT SIZE, BUT ½" AND 1" MAY BE USED AS REQUIRED.

8. BUTTERFLY VALVES SHALL BE LIMITED TO 300°F PER API 609. BALL VALVES SHALL BE LIMITED TO 300°F. PLUG VALVES SHALL BE LIMITED TO 400°F. HIGHER TEMPERATURE ALLOWED ONLY WITH ENGINEERING APPROVAL OF DESIGNATED MAKE/MODEL.

9. INSTALL IN HORIZONTAL POSITION WITH COVER UP (SWING) OR HINGE PIN VERTICAL (DUAL PLATE). INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.

10. PIPING IN CATEGORY D FLUID SERVIDE MAY BE SUBJECT TO AN INITIAL SERVICE LEAK TEST IN ACCORDANCE WITH ASME B31.3 PARA. 345.7, IN LIEU OF THE HYDROSTATIC LEAK TEST.

	MATERIAL	STAINLESS STEEL, 316L		GES 2-3-0 **CLA** BH REV 4 07/20/2022
	RATING	ASME B16.5, CLASS 300, M.G. 2.3 600 PSIG @ 100°F 395 PSIG @ 500°F 0.030" CORR. ALLOW.		
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BRANCH CONNECTIONS

BRANCH

16	T												
14	RT	T											
12	RT	RT	T										
10	RT	RT	RT	T									
8	RT	RT	RT	RT	T								
6	W	W	RT	RT	RT	T							
4	W	W	W	W	RT	RT	T						
3	W	W	W	W	W	RT	(1)	T					
2	O	O	O	O	O	O	(1)	(1)	T				
1½	O	O	O	O	O	O	O	(1)	(1)	T			
1	O	O	O	O	O	O	O	O	(1)	(1)	T		
¾	O	O	O	O	O	O	O	O	(1)	(1)	(1)	T	
½	O	O	O	O	O	O	O	O	(1)	(1)	(1)	(1)	T
	16	14	12	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

O – OLET (MATCH END TYPE AND CLASS/SCHEDULE OF DESIGN PER PIPE SPEC)

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.

	MATERIAL	316SS TUBING	GES 2-3-0 **CLA** BHA REV 0 07/20/2022
	RATING	ASME B16.34, CLASS 300, M.G. 2.2 720 PSIG @ 100°F 560 PSIG @ 300°F 0.030" CORR. ALLOW.	
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SERVICES			
DEMIN WATER [DMW], REFRIGERATION / OIL MIXTURE [FO], REFRIGERATION GAS [FRG], INSTRUMENT AIR [IA], INSTRUMENT SENSING LINES			
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
TUBING	¼" – ½" ¾" – 1"	0.049" WALL, A-269 TP-316, ANNEALED, BEND TUBING, SMLS OR WELDED, PE 0.065" WALL, A-269 TB-316, ANNEALED, BEND TUBING, SMLS OR WELDED, PE	1
FITTINGS	¼" – 1"	TYPE 316SS, A-276 & A-182 COMPRESSION TYPE FITTINGS, SWAGELOK ENDS (ADVANCED-GEOMETRY BACK FERRULE DESIGN)	
FLANGES	NONE		
UNIONS	NONE		
BOLTING	NONE		
GASKETS	NONE		
THREAD LUBE	NONE		
TEMPORARY STRAINERS	NONE		
"Y" STRAINERS	NONE		
BRANCH CONNECTIONS	¼" – 1"	USE COMPRESSION FITITNGS AS NECESSARY	
VALVES			
VCH-440	3/8" – ½"	CHECK, POPPET, 316SS, 6000#, SWAGELOK ENDS	
VPL-568	½" – 1"	PLUG, 316SS BODY/PLUG, PTFE SLEEVE, 300#, FNPT	
VBA-645	¼" – 1"	BALL, 316SS BODY/TRIM, REINFORCED PTFE SEATS, 2200#, SWAGELOK ENDS	
VNE-02	3/8" – ½"	NEEDLE, 316SS, 6000#, SWAGELOK ENDS	

	MATERIAL	316SS TUBING		GES 2-3-0 **CLA** BHA REV 0 07/20/2022
	RATING	ASME B16.34, CLASS 300, M.G. 2.2 720 PSIG @ 100°F 560 PSIG @ 300°F 0.030" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

NOTES

1. WELDING NOT ALLOWED FOR THIS PIPING SPECIFICATION.

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 1100 PSIG PER ASME B31.3. HYDROTEST PRESSURE DETERMINED BY ASME B16.5, PARA. 2.6.

	MATERIAL	HASTELLOY C-276 TUBING		GES 2-3-0 **CLA** BHT REV 0 07/20/2022
	RATING	SEE RATING TABLE IN NOTES 1500 PSIG @ 100°F 330 PSIG @ 350°F 0" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Esteveins 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES

DRY CHLORINE GAS [DCG], INSTRUMENT SENSING LINES

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	¼" – ¾"	0.035" WALL, B-622/626 UNS N10276, SOLUTION ANNEALED, TUBING, SMLS OR WELDED, PE	1,2
FITTINGS	¼" – ¾"	HASTELLOY C276, B-574 & B-564 COMPRESSION TYPE FITTINGS, SWAGELOK ENDS (ADVANCED-GEOMETRY BACK FERRULE DESIGN)	1,2
FLANGES	NONE		
UNIONS	NONE		
BOLTING	NONE		
GASKETS	NONE		
THREAD LUBE	NONE		
TEMPORARY STRAINERS	NONE		
"Y" STRAINERS	NONE		
BRANCH CONNECTIONS	¼" – ¾"	USE COMPRESSION FITTINGS AS NECESSARY	
VALVES			
VCH-462	¼" – ¾"	CHECK, POPPET, HASTELLOY C276, 3000#, SWAGELOK ENDS	3
VBA-701	¼" – ¾"	BALL, HASTELLOY C276 BODY/TRIM, REINFORCED PTFE SEATS, 2200#, SWAGELOK ENDS	
VNE-05	¼" – ½"	NEEDLE, HASTELLOY C276 BODY/STEM, 6000#, SWAGELOK ENDS	

	MATERIAL	HASTELLOY C-276 TUBING		GES 2-3-0 **CLA** BHT REV 0 07/20/2022
	RATING	SEE RATING TABLE IN NOTES 1500 PSIG @ 100°F 330 PSIG @ 350°F 0" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

NOTES

1. WELDING NOT ALLOWED FOR THIS PIPING SPECIFICATION.

2. CHECK VALVES SHALL BE LIMITED TO 375°F. HIGHER TEMPERATURES ALLOWED WITH ENGINEERING APPROVAL OF DESIGNATED MAKE/MODEL.

3. VERIFY PRESSURE RATING OF TUBING AND VALVES AT INTERMEDIATE SYSTEM DESIGN TEMPERATURES.

DESIGN TEMPERATURE (°F)	DESIGN PRESSURE (PSIG)
-20 – 100	1500
200	1500
300	800
400	330

	MATERIAL	NICKEL 200		GES 2-3-0 **CLA** BS REV 0 07/20/2022
	RATING	LIMITED BY VPL-513-3 370 PSIG @ 100°F 350 PSIG @ 400°F 0.03" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Esteveus 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES

COLD CAUSTIC AFTER CAUSTIC EVAP [CCAU]

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	½" – ¾" 1" – 12"	SCH 80S, B-161 (UNS N02200), ANNEALED, SMLS, PE SCH 40S, B-161 (UNS N02200), ANNEALED, SMLS, BE	1,2 1,2
FITTINGS	½" – ¾" 1" – 12" ½" – 10"	CL 3000, B-366 OR B-564 (UNS N02200), ANNEALED, SMLS, SW, ASME B16.11 SCH TO MATCH PIPE, B-366 (UNS N02200) GR. WPN, SMLS, BE, ASME B16.9 SCH/CLASS TO MATCH PIPE/FITTINGS, B-564 (UNS N02200), ANNEALED, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), MSS SP-97	1,2 1,2,3 1,2
FLANGES	½" – ¾" 1" – 12" ½" – 12" 2" – 12"	CL 300, B-564 (UNS N02200), SCH TO MATCH PIPE, RF SW, ASME B16.5 CL 300, A-105 GALVANIZED, LAP JOINT, ASME B16.5 CL 300, B-564 (UNS N02200), RF BLIND, ASME B16.5 CL 300, B-564 (UNS N02200), SCH TO MATCH PIPE, RF ORIFICE FLANGE, ASME B16.36, ½" THD TAPS	2,4 2,4,5 2,4 2
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HEAVY NUTS, TEFLON COATED	
GASKETS	ALL	CL 300, 1/8" THK. SPIRAL WOUND, NICKEL 200 WINDINGS WITH PTFE FILLER, 304SS OUTER RING, ANTI-BUCKLING, ASME B16.20; FLEXITALLIC STYLE CGI, VSP AB-326, OR EQ W/ ENGINEERING APPROVAL	4
THREAD LUBE	BOLTS	NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
VALVES			
VGA-105-3	½" – 12"	GATE, A494-CZ100 (NICKEL 200) BODY/TRIM, 300#, RF FLG	6
VCH-317-3	½" – 12"	CHECK, SWING, A494-CZ100 (NICKEL 200) BODY/TRIM, 300#, RF FLG	8
VPL-513-3 VPL-513G-3	½" – 3" 4" – 6"	PLUG, NICKEL BODY/PLUG, 300#, RF FLG, PTFE SLEEVE PLUG, NICKEL BODY/PLUG, 300#, RF FLG, PTFE SLEEVE, GO	7 7

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1, OR A MINIMUM OF 100% FOR CATEGORY M FLUID SERVICE PER ASME B31.3, PARA. M341.4.1. ENGINEERING MAY REQUIRE HIGHER PERCENTAGES FOR SPECIAL SERVICES.

	MATERIAL	NICKEL 200		GES 2-3-0 **CLA** BS REV 0 07/20/2022
	RATING	LIMITED BY VPL-513-3 370 PSIG @ 100°F 350 PSIG @ 400°F 0.03" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 555 PSIG PER ASME B31.3. HYDROTEST PRESSURE DETERMINED BY ASME B31.3, PARA. 345.4.2. DRAIN AND ELBOW FREE OF LIQUID.

3. STUB ENDS SHALL BE USED FOR FLANGED CONNECTIONS. THEY SHALL BE SHORT PATTERN PER ASME B16.9.

4. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.

5. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EEQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.

6. VENT, DRAIN, AND INSTRUMENT VALVE. ¾" SIZE IS THE DEFAULT SIZE, BUT ½" AND 1" MAY BE USED IF REQUIRED.

7. VALVES SHALL BE SPECIFIED AND PURCHASED AS FIRE SAFE PER API-607.

8. INSTALL IN HORIZONTAL POSITION WITH COVER UP OR IN VERTICAL POSITION WITH UPWARD FLOW.

BRANCH CONNECTIONS

BRANCH

12	T										
10	RT	T									
8	RT	RT	T								
6	RT	RT	RT	T							
4	W	W	RT	RT	T						
3	W	W	W	RT	(1)	T					
2	W	W	W	W	(1)	(1)	T				
1½	W	W	W	W	W	(1)	(1)	T			
1	W	W	W	W	W	W	(1)	(1)	T		
¾	O	O	O	O	O	O	(1)	(1)	(1)	T	
½	O	O	O	O	O	O	(1)	(1)	(1)	(1)	T
	12	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

O – OLET (MATCH END TYPE AND CLASS/SCHEDULE OF DESIGN PER PIPE SPEC)

T – TEE

RT – REDUCING TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCTING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS

	MATERIAL	NICKEL 200		GES 2-3-0 **CLA** BT
	RATING	ASME B16.5, CLASS 300, M.G. 3.2 229 PSIG @ 100°F – 400°F 0" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4E3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD498...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	REV 0 07/20/2022

CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

**** SHALL ONLY BE USED AS A REFERENCE FOR EXISITING PIPING. DO NOT USE FOR NEW CONSTRUCTION.****

SERVICES			
COLD CAUSTIC AFTER CAUSTIC EVAP [CCAU]			
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	1" – 6" 8" – 12" 8" – 12"	SCH 10S, B161 OR B725 (UNS N02200), ANNEALED, SMLS OR WELDED, BE SCH 20S, B161 (UNS N02200), ANNEALED, SMLS, BE SCH 40, B725 (UNS N02200), ANNEALED, WELDED, BE	
FITTINGS	1" – 6" 8" – 12" 8" – 12" 1" – 10"	SCH 10S, B366 (UNS N02200), SMLS (GR. WPN) OR WELDED (GR. WPX), BE, ASME B16.9 SCH 20S, B366 (UNS N02200), SMLS (GR. WPN), BE, ASME B16.9 SCH 40, B366 (UNS N02200), WELDED (GR. WPX), BE, ASME B16.9 INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), SCH TO MATCH PIPE, B564 (UNS N02200), ANNEALED, MSS SP-97	3 3 3
FLANGES	ALL ALL	300#, A-105, RF LAP JOINT, FS, GALVANIZED, ASME B16.5 300#, A-105, RF BLIND, ASME B16.5	4,5 6
STUB ENDS	1" – 6" 8" – 12" 8" – 12"	SCH 10S, B366 (UNS N02200), SMLS (GR. WPN), BE, ASME B16.9 SCH 20S, B366 (UNS N02200), SMLS (GR. WPN), BE, ASME B16.9 SCH 40, B366 (UNS N02200), SMLS (GR. WPN), BE, ASME B16.9	
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HEAVY NUTS, TEFLON COATED	
GASKETS	ALL ALL	CL 300, 1/8" THK. SPIRAL WOUND, NICKEL 200 WINDINGS WITH PTFE FILLER, 304SS OUTER RING, ANTI-BUCKLING, ASME B16.20; FLEXITALLIC STYLE CGI, VSP AB-326, OR EQ W/ ENGINEERING APPROVAL CL 300, 1/16" THK, FULL FACE, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21, DURLON 9000 OR EQ W/ ENGINEERING APPROVAL	4 6
THREAD LUBE	BOLTS	NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
VALVES			
VGA-105-3	1" – 12"	GATE, NICKEL 200 BODY/TRIM, 300#, RF FLG	7
VCH-317-3	1" – 12"	CHECK, SWING, NICKEL 200 BODY/TRIM, 300#, RF FLG	10,11
VPL-506-3 VPL-506G-3 VPL-513-3 VPL-513G-3	1" – 3" 4" – 6" 1" – 3" 4" – 6"	PLUG, CS BODY, DI PLUG, 300#, RF FLG, PFA LINER PLUG, CS BODY, DI PLUG, 300#, RF FLG, PFA LINER, GO PLUG, NICKEL BODY/PLUG, 300#, RF FLG, PTFE SLEEVE PLUG, NICKEL BODY/PLUG, 300#, RF FLG, PTFE SLEEVE, GO	8 8 9 9

	MATERIAL	NICKEL 200		GES 2-3-0 **CLA** BT REV 0 07/20/2022
	RATING	ASME B16.5, CLASS 300, M.G. 3.2 229 PSIG @ 100°F – 400°F 0" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C5CDEA51D49D...	

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3
2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 345 PSIG PER ASME B31.3. HYDROTEST PRESSURE DETEREMINED BY ASME B31.3
3. STUB ENDS SHALL BE USED FOR FLANGED CONNECTIONS. THEY SHALL BE SHORT PATTERN PER ASME B16.9
4. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.
5. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.
6. CARBON STEEL BLIND FLANGES WITH FULL FACE GASKETS SHALL BE USED FOR BLINDING, INCLUDING AT VENT AND DRAIN VALVES.
7. DEFAULT VENT, DRAIN, AND INSTRUMENT VALVE.
8. VALVES LIMITED TO A MAXIMUM TEMPERATURE OF 380°F
9. VALVES SHALL BE SPECIFIED AND PURCHASED AS FIRE SAFE.
10. INSTALL IN HORIZONTAL POSITION WITH COVER UP.
11. INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.

	MATERIAL	NICKEL 200		GES 2-3-0 **CLA** BT
	RATING	ASME B16.5, CLASS 300, M.G. 3.2 229 PSIG @ 100°F – 400°F 0" CORR. ALLOW.		REV 0 07/20/2022
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	

BRANCH CONNECTIONS

BRANCH

12	T								
10	RT	T							
8	RT	RT	T						
6	RT	RT	RT	T					
4	W	W	RT	RT	T				
3	W	W	W	RT	(1)	T			
2	W	W	W	W	(1)	(1)	T		
1½	W	W	W	W	W	(1)	(1)	T	
1	W	W	W	W	W	W	(1)	(1)	T
	12	10	8	6	4	3	2	1½	1

SYMBOLS

T – TEE

RT – REDUCING TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCTING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.

GENERAL			
MATERIAL	CARBON STEEL (LOW TEMP)		
RATING	300 PSIG @ -150°F TO 100°F 300 PSIG @ 300°F 1/16" CORROSION ALLOWANCE		
SERVICES	DRY CHLORINE GAS [DCG], DRY CHLORINE LIQUID [DCL], DRY CHLORINE OFF GAS [DCLO], LOW TEMP CL2		
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	¾" – 6"	SCH 80, A333 GR. 3, SMLS, BE	1, 2, 5
FITTINGS	¾" – 6" ¾" – 3"	BW, SCH TO MATCH PIPE, A420 GR. WPL3, ASME B16.9 OLET, SCH/CLASS/TYPE TO MATCH PIPE/FITTINGS, A-350 GR. LF3, MSS SP-97	1, 2, 5 1, 2, 5
FLANGES	¾" – 6" ¾" – 6"	RF WN, CL 300, A350 GR. LF3, SCH TO MATCH PIPE, ASME B16.5 RF BLIND, CL 300, A350 GR. LF3, ASME B16.5	1, 2, 5 2, 5
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	STUD BOLTS, A320 GR. L7, TEFLON COATED HEAVY HEX NUTS, A194 GR. 7L, TEFLON COATED	
GASKETS	ALL ALL	CL 300, 1/8" THK, RING TYPE, EPTFE WITH ENCAPSULATED C-276 CORRUGATED RING, ASME B16.21; VSP PITA OR EQ W/ ENGINEERING APPROVAL CL 300, 1/8" THK, RING TYPE, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21; DURLON 9000 OR EQ W/ ENGINEERING APPROVAL **DO NOT APPLY LUBRICANT TO THE FLANGE FACES OR GASKETS FOR CHLORINE SERVICE**	
THREAD LUBE	BOLTS	NONE	
TEMPORARY STRAINERS	ALL	CL 300 RF, CONICAL, 150% OPEN AREA, SS SCREEN/PLATE	

VALVES							
BALL	BUTTERFLY	CHECK	GATE	GLOBE	PLUG	OTHER	NOTES
VBA-630	VBF-933	VCH-319 VCH-461	VGA-227	VGL-295	VPL-558		5, 8

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT 100% FOR CATEGORY M FLUID SERVICE PER ASME B31.3. REQUIREMENTS FOR PIPING DESIGN, FABRICATION, WELDING, NON-DESTRUCTIVE EVALUATION, INSTALLATION, DOCUMENTATION, ETC. IN WESTLAKE STANDARD GES-230 "PIPING SPECIFICATIONS" MUST BE FOLLOWED.
2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 450 PSIG. HYDROTEST PRESSURE DETERMINED BY ASME B31.3. DRAIN AND BLOW FREE OF LIQUID. WESTLAKE PERSONNEL TO DRY BY BLOWING WITH MINIMUM (-)40°F DEWPOINT AIR OR NITROGEN UNTIL DEWPOINT LEAVING IS SAME AS DEWPOINT ENTERING. BALL VALVES AND PLUG VALVES SHOULD BE HALF OPEN TO DRY THE BODY CAVITY. PIPING MUST BE HYDROSTATICALLY TESTED BEFORE DELIVERY TO WESTLAKE GEISMAR.
3. PURGE GAS / DRYING GAS / INERTING GAS MUST BE OIL FREE.
4. WELDING SHALL BE PER ASME CODE SECTION IX, LATEST EDITION. WPS SHOULD BE SUITABLE FOR LOW TEMPERATURE SERVICE.

5. ALL PIPING AND VALVES MUST CONFORM TO CHLORINE INSTITUTE PAMPHLET 6. FOR PIPING SYSTEMS 8 INCH AND LARGER, CONSULT THE CHLORINE INSTITUTE PAMPHLET 6 AND WESTLAKE ENGINEERING REPRESENTATIVE FOR APPROVAL.
6. FLANGED CONNECTIONS ARE PREFERRED FOR CHLORINE SERVICE INCLUDING VENTS AND DRAINS. THREADED CONNECTIONS ARE NOT PERMITTED.
7. EQUIVALENT CHLORINE SERVICE VALVES MAY BE USED IF CHECKED AND APPROVED BY A WESTLAKE ENGINEERING REPRESENTATIVE. (CHECK FACE TO FACE DIMENSIONS)
8. ALL VALVES AND INSTRUMENTS ARE TO BE PREPARED, DOUBLE BAGGED, AND TAGGED FOR CHLORINE SERVICE. VALVES SHALL BE CLEANED AND PACKAGED AS PER REQUIREMENTS OF CHLORINE INSTITUTE PAMPHLET 6.
9. FOR END OF LINE RAILCAR UNLOADING OPERATIONS, GLOBE VALVES ARE PREFERRED.
10. USE OF WEAR PADS (DYNAGARD OR EQ.) ARE REQUIRED AT ALL STRUCTURAL STEEL/CONCRETE SUPPORT POINTS. IF BOLT-ON PIPE SHOES ARE NEEDED AS A SUBSTITUTE, THEY SHALL BE GALVANIZED AND BE PROVIDED WITH A BUILT-IN NON- METALLIC CONTACT PLATE BETWEEN THE PIPE AND THE SUPPORT.
11. WHEN CONNECTING OTHER PIPING SYSTEMS TO CL2 SPECIFIED PIPING, IT IS REQUIRED TO HAVE A PRIMARY ISOLATION VALVE, A BLEED VALVE, AND A SECONDARY ISOLATION VALVE. THE PRIMARY ISOLATION VALVE AND BLEED VALVE MUST BE OF THE AFFECTED CL2 PIPING SPECIFICATION. THE PIPE SPECIFICATION BREAK WILL BE AT THE SECONDARY ISOLATION VALVE.
12. TWO BOLT FLANGES ARE ACCEPTABLE ONLY IN BULK CONTAINER (RAILCAR) UNLOADING. TAKE CARE TO APPLY GASKET LOADING FORCES UNIFORMLY BY TIGHTING BOTH BOLTS EVENLY.

BRANCH CONNECTIONS

BRANCH							
6	T						
4	RT	T					
3	RT	RT	T				
2	W	RT	RT	T			
1½	W	W	(1)	(1)	T		
1	W	W	W	(1)	(1)	T	
¾	W	W	W	(1)	(1)	(1)	T
	6	4	3	2	1½	1	¾

SYMBOLS

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – FULL SIZE TEE AND REDUCER. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS

GENERAL			
MATERIAL	CARBON STEEL (LOW TEMP)		
RATING	LIMITED BY VBA-630 & VCH-461 600 PSIG @ -50°F TO 100°F 490 PSIG @ 300°F 1/8" CORROSION ALLOWANCE CI PAMPHLET 6 SERVICE CLASS V IS LIMITED TO 300 PSIG @ 300°F		
SERVICES	WET CHLORINATE GAS – HIGH [CL], WET CHLORINE OFF GAS [CLO], DRY CHLORINE GAS [DCG], DRY CHLORINE LIQUID [DCL], DRY CHLORINE OFF GAS [DCLO], UTILITY VENT SYSTEM [UVS]		
ITEM	**SIZE**	**DESCRIPTION**	**NOTES**
PIPE	½" - ¾" 1" – 10"	SCH 160, A333 GR. 6, SMLS, BE SCH 80, A333 GR. 6, SMLS, BE	1, 2, 5 1, 2, 5, 6
FITTINGS	½" – 10" ½" – 6"	BW, SCH TO MATCH PIPE, A420 GR. WPL6, ASME B16.9 OLET, SCH/TYPE TO MATCH PIPE/FITTINGS, A350 GR. LF2 CL. 1, MSS SP-97	1, 2, 5, 6 1, 2, 5
FLANGES	½" – 10" ½" – 10"	RF WN, CL 300, A350 GR. LF2 CL. 1, SCH TO MATCH PIPE, ASME B16.5 RF BLIND, CL 300, A350 GR. LF2 CL. 1, ASME B16.5	1, 2, 5, 6, 18 5, 18
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	STUD BOLTS, A320 GR. L7, GREEN TEFLON COATED HEAVY HEX NUTS, A194 GR. 7L, GREEN TEFLON COATED	 16
GASKETS	ALL	CL 300, 1/8" THK. RING TYPE, FILLED PTFE WITH INORGANIC FILLER, ASME B16.21; DURLON 9000 OR APPROVED EQUAL **DO NOT APPLY LUBRICANT TO THE FLANGE FACES OR GASKETS FOR CHLORINE SERVICE**	
THREAD LUBE	NONE	NONFLAMMABLE LUBRICANT RATED FOR OXYGEN/CHLORINE SERVICE; FLUOROLUBE OR EQ W/ ENGINEERING APPROVAL	

VALVES							
BALL	BUTTERFLY	CHECK	GATE	GLOBE	PLUG	OTHER	NOTES
VBA-630 VBA-700 (300#)	VBF-933	VCH-319 VCH-461	VGA-227	VGL-295	VPL-558		2, 5, 6, 9, 10, 11, 12, 13, 16, 17

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT 100% FOR CATEGORY M FLUID SERVICE PER ASME B31.3, PARA. M341.4.1. IF THE PIPING IS GRADED AS SEVERE CYCLIC SERVICE A MINIMUM OF 100% RADIOGRAPHIC EXAMINATION IS REQUIRED PER ASME B31.3, PARA. 341.4.3. ENGINEERING MAY REQUIRE ADDITIONAL MEASURES FOR SPECIAL SERVICES. SEE GES-230 PIPING SPECIFICATIONS FOR OTHER NDE REQUIREMENTS.
2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 900 PSIG. HYDROTEST PRESSURE DETERMINED BY ASME B31.3, SECT 345.4. DRAIN AND BLOW FREE OF LIQUID. WESTLAKE PERSONNEL TO DRY BY BLOWING WITH MINIMUM (-)40°F DEWPOINT AIR OR NITROGEN UNTIL DEWPOINT LEAVING IS SAME AS DEWPOINT ENTERING. BALL VALVES AND PLUG VALVES SHOULD BE HALF OPEN TO DRY THE BODY CAVITY.
3. PURGE GAS / DRYING GAS / INERTING GAS MUST BE OIL FREE.
4. WELDING SHALL BE PER ASME CODE SECTION IX, LATEST EDITION. WPS SHOULD BE SUITABLE FOR LOW TEMPERATURE SERVICE.

5. ALL PIPING AND VALVES MUST CONFORM TO CHLORINE INSTITUTE PAMPHLET 6.
6. FOR PIPING SYSTEMS 8 INCH AND LARGER, CONSULT THE CHLORINE INSTITUTE PAMPHLET 6 AND WESTLAKE ENGINEERING REPRESENTATIVE FOR APPROVAL.
7. FLANGED CONNECTIONS ARE PREFERRED FOR CHLORINE SERVICE INCLUDING VENTS AND DRAINS. THREADED CONNECTIONS ARE NOT PERMITTED.
8. SEVERAL VALVE MANUFACTURERS MAKE EQUIVALENT CHLORINE SERVICE VALVES. THESE "OR EQUAL" VALVES MAY BE USED IF CHECKED AND APPROVED BY A WESTLAKE ENGINEERING REPRESENTATIVE. (CHECK FACE TO FACE DIMENSIONS)
9. ALL VALVES AND INSTRUMENTS ARE TO BE PREPARED, DOUBLE BAGGED, AND TAGGED FOR CHLORINE SERVICE. VALVES SHALL BE CLEANED AND PACKAGED AS PER REQUIREMENTS OF CHLORINE INSTITUTE PAMPHLET 6.
10. VPL-558 TO BE USED ONLY WITH APPROVAL FROM OPERATIONS. VGL-295 IS THE PREFERRED VALVE.
11. VPL-558 TO BE USED ONLY IN THE CHLORINE LOADING RACK.
12. CHECK VALVES TO BE INSTALLED IN HORIZONTAL POSITION WITH COVER UP.
13. CHECK VALVE INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.
14. USE OF WEAR PADS (DYNAGARD OR EQ.) ARE REQUIRED AT ALL STRUCTURAL STEEL/CONCRETE SUPPORT POINTS. IF BOLT-ON PIPE SHOES ARE NEEDED AS A SUBSTITUTE, THEY SHALL BE GALVANIZED AND BE PROVIDED WITH A BUILT-IN NON- METALLIC CONTACT PLATE BETWEEN THE PIPE AND THE SUPPORT.
15. WHEN CONNECTING OTHER PIPING SYSTEMS TO CL2 SPECIFIED PIPING, IT IS REQUIRED TO HAVE A PRIMARY ISOLATION VALVE, A BLEED VALVE, AND A SECONDARY ISOLATION VALVE. THE PRIMARY ISOLATION VALVE AND BLEED VALVE MUST BE OF THE AFFECTED CL2 PIPING SPECIFICATION. THE PIPE SPECIFICATION BREAK WILL BE AT THE SECONDARY ISOLATION VALVE.
16. VPL-558: LOW TEMPERATURE REQUIREMENTS AS DEFINED IN A320 FOR GR. 7L APPLY PER A194, S3.
17. HYDRO TEST PRESSURE PER B16.5 (FLANGES) OR B31.3 (PIPING/FITTING COMPONENTS) MAY BE HIGHER THAN THE MANUFACTURER'S VALVE RATINGS IN SOME CASES. VERIFY MANUFACTURER VALVE RATING BEFORE HYDROTEST. VBA-630 and VCH-461 ARE LIMITED BY MATERIAL GROUP 3.4 to 600 PSI/100F, MAX HYDRO = 900 PSI. IF INCLUDED IN HYDROTESTING, VALVES SHOULD BE LEFT PARTIALLY OPEN DURING HYDROTEST.

BRANCH CONNECTIONS

BRANCH

10	T									
8	RT	T								
6	RT	RT	T							
4	W	RT	RT	T						
3	W	W	RT	(1)	T					
2	W	W	W	(1)	(1)	T				
1½	W	W	W	W	(1)	(1)	T			
1	W	W	W	W	W	(1)	(1)	T		
¾	W	W	W	W	W	(1)	(1)	(1)	T	
½	W	W	W	W	W	(1)	(1)	(1)	(1)	T
	10	8	6	4	3	2	1½	1	¾	½

SYMBOLS

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPE DIMENSIONS.

	MATERIAL	CARBON STEEL		GES 2-3-0 **CLA** D
	RATING	ASME B16.5, CLASS 600, M.G. 1.1 1480 PSIG @ 100°F 1015 PSIG @ 750°F 1/16" CORR. ALLOW.		
MAINT. APPROVAL DocuSigned by: Matt Martin 1F1037AA1859411...	HSE APPROVAL DocuSigned by: Ryan Estevens 402213A8234D4F3...	OPER. APPROVAL DocuSigned by: Louis Lawrence EFA3F2FCC8AD408...	ENG. APPROVAL DocuSigned by: Jeff Carkuff 444C6CDEA51D49D...	REV 5 07/20/2022

CURRENT LIVE VERSION OF PIPE SPEC LOCATED ON EDMS. PRINTED COPIES ARE UNCONTROLLED.

SERVICES

STEAM [S600], STEAM CONDENSATE [SC600] (FOR USE WITH NON-BOILER EXTERNAL PIPING ONLY, IN ACCORDANCE WITH ASME B31.3. NOT UNDER THE JURISDICTION OF ASME BPVC OR ASME B31.1.)

ITEM	SIZE	DESCRIPTION	NOTES
PIPE	½" – 1½" 2" – 8" 10" – 24"	SCH 80, A-106 GR. B SMLS, PE SCH 80, A-106 GR. B SMLS, BE SCH 80, A-333 GR. 6, SMLS, BE	1,2,3 1,2 1,2,11,12
FITTINGS	½" – 1½" 2" – 8" 10" – 24" ½" – 8"	CL 3000, A-105, SW, ASME B16.11 SCH 80, A-234, GR. WPB, BE, ASME B16.9 SCH 80, A-420, GR. WPL6, BE, ASME B16.9 SCH/CLASS TO MATCH PIPE/FITTINGS, A-105, INTEGRALLY REINFORCED OUTLET CONNECTIONS (O'LET), MSS SP-97	1,2,3 1,2 1,2,11,12 1,2
FLANGES	½" – 1½" 2" – 24" 8" – 24" ½" – 24" 2" – 24"	CL 600, A-105, SCH 80, RF SW, ASME B16.5 CL 600, A-105, SCH 80, RF WN, ASME B16.5 CL 600, A-105, SCH 80, RF SO, ASME B16.5 CL 600, A-105, RF BLIND, ASME B16.5 CL 600, A-105, SCH 80, RF ORIFICE FLANGE, ASME B16.36, ½" SW TAPS	1,2,5,6 1,2,5,6,11 1,2,5,6,7 5 11
UNIONS	NONE	USE FLANGES	
BOLTING	ALL	A-193 GR. B7 STUD BOLTS, TEFLON COATED A-194 GR. 2H HVY. NUTS, TEFLON COATED	14 14
GASKETS	ALL	CL 600, 1/8" THK. SPIRAL WOUND, 304SS WINDINGS WITH GRAPHITE FILLER, CS OUTER RING, ANTI-BUCKLING, ASME B16.20; FLEXITALLIC STYLE CGI, VSP AB-326, OR EQ W/ ENGINEERING APPROVAL	5
THREAD LUBE	PIPE BOLTS	TFE TAPE (≤400°F), MOLYCOTE G OR EQ (>400°F) NEVER-SEEZ PURE NICKEL SPECIAL OR EQ.	
TEMPORARY STRAINERS	ALL	CL 600, CONICAL, 150% OPEN AREA, SS SCREEN/PLATE	
"Y" STRAINERS	½" – 1½" 2" – 24"	CL 600, SW, A-216, 0.020" PERF. SS SCREEN CL 600, RF FLG, A-216, 0.020" PERF. SS SCREEN	
VALVES			
VGA-120 VGA-112 VGA-107 VGA-107G	½" – 1½" ½" – 1½" 2" – 12" 14" – 24"	GATE, EXTENDED BODY, CS, CL 800, MSWxFNPT, TRIM #8 GATE, CS, CL 800, SW, TRIM #8 GATE, CS, CL 600, RF FLG, TRIM #8 GATE, CS, CL 600, RF FLG, TRIM #8, GO	8
VGL-322 VGL-216 VGL-216G	½" – 1½" 2" – 6" 8" – 12"	GLOBE, CS, CL 600, RF FLG, TRIM #8 GLOBE, CS, CL 600, RF FLG, TRIM #8 GLOBE, CS, CL 600, RF FLG, TRIM #8, GO	

	MATERIAL	CARBON STEEL		GES 2-3-0 **CLA** D REV 5 07/20/2022
	RATING	ASME B16.5, CLASS 600, M.G. 1.1 1480 PSIG @ 100°F 1015 PSIG @ 750°F 1/16" CORR. ALLOW.		
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VCH-428	½" – 1½"	CHECK, PISTON, CS, CL 600, RF FLG, TRIM #8	9
VCH-308	2" – 24"	CHECK, WAFER, CS, CL 600, RF, TRIM #10	9,10,13

NOTES

1. RADIOGRAPHIC EXAMINATION SHALL BE DONE AT A MINIMUM OF 5% FOR NORMAL FLUID SERVICE PER ASME B31.3, PARA. 341.4.1. ENGINEERING MAY REQUIRE HIGHER PERCENTAGES FOR SPECIAL SERVICES.
2. HYDROSTATIC TESTING SHALL BE PERFORMED AT 2225 PSIG PER ASME B31.3. HYDROTEST PRESSURE DETERMINED BY ASME B16.5, PARA. 2.6.
3. IF THREADED PIPE/FITTINGS ARE USED, THEY SHALL BE SCHEDULE 160.
4. ALL BURIED PIPING SHALL BE COATED AND WRAPPED IN ACCORDANCE WITH GES 2-2-1.
5. USE FLAT FACED FLANGES AGAINST EQUIPMENT WITH FLAT FACED FLANGES. FULL FACE GASKETS SHALL BE USED BETWEEN THESE FLANGES.
6. FLANGES SHALL BE USED FOR ALL PIPE TO EQUIPMENT AND VESSEL CONNECTIONS. SPOOL SECTIONS SHALL BE USED WHEN NECESSARY TO FACILITATE EQUIPMENT REMOVAL. DIRECT WELDING IS NOT PERMITTED.
7. SLIP-ON FLANGES SHALL NOT BE USED DIRECTLY ON FITTINGS UNLESS SO INDICATED ON THE DESIGN DRAWINGS.
8. VENT, DRAIN, AND INTRUMENT VALVE. ¾" SIZE IS THE DEFAULT SIZE, BUT ½" AND 1" MAY BE USED IF REQUIRED.
9. INSTALL IN HORIZONTAL POSITION WITH COVER UP.
10. INSTALL ALSO ALLOWED IN VERTICAL POSITION WITH UPWARD FLOW.
11. PRE-HEAT & POST WELD HEAT TREATMENT REQUIREMENTS FOR PIPING AND COMPONENT WELDS SHALL BE PER ASME B31.3 PARA. 331.1.
12. IMPACT TESTED MATERIAL USED DUE TO WALL THICKNESS.
13. FOR UTILITY SERVICES ONLY. NOT TO BE USED IN ETHLYENE SERVICE.
14. MAXIMUM TEMPERATURE FOR COATING IN FASTENERS PER MANUFACTURER.

	MATERIAL	CARBON STEEL		GES 2-3-0 **CLA** D REV 5 07/20/2022
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BRANCH CONNECTIONS

BRANCH

24	T														
20	RT	T													
18	P	RT	T												
16	P	P	RT	T											
14	P	P	P	RT	T										
12	P	P	P	P	RT	T									
10	P	P	P	P	P	RT	T								
8	W	W	W	W	W	RT	RT	T							
6	W	W	W	W	W	RT	RT	RT	T						
4	W	W	W	W	W	W	W	RT	RT	T					
3	W	W	W	W	W	W	W	W	RT	(1)	T				
2	O	O	O	O	O	O	O	O	O	(1)	(1)	T			
1½	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T		
1	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	T	
¾	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	T
½	O	O	O	O	O	O	O	O	O	O	O	(1)	(1)	(1)	(1)
	24	20	18	16	14	12	10	8	6	4	3	2	1½	1	¾

SYMBOLS

O – OLET (MATCH END TYPE AND CLASS/SCHEDULE OF DESIGN PER PIPE SPEC)

P – BRANCH WELD WITH REINFORCING PAD (PAD THICKNESS EQUALS RUN PIPE THICKNESS, PAD WIDTH EQUALS ½ BRANCH OD.)

RT – REDUCING TEE

T – TEE

W – WELDOLET

(1) – USE FULL SIZE TEE AND REDUCER FOR BRANCH. USE REDUCING TEE ONLY IF REQUIRED BY PIPING DIMENSIONS.