

# UNIVERSITY OF IOWA CHILLED WATER PLANT PIPING STANDARD SPECIFICATIONS

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PIPE SPECIFICATION	SYSTEM	DESIGN CONDITIONS		OPERATING CONDITIONS		PAGE:	REV:	DATE:
		PRESSURE (PSIG)	TEMPERATURE (°F)	PRESSURE (PSIG)	TEMPERATURE (°F)			
UI-CHW	<a href="#">CHILLED WATER</a>	150	100	50-120	SUPPLY: 42 RETURN: 54-60	2	0	2/22/2021
UI-CS-DI	<a href="#">CONDENSER WATER - DI</a>	150	150	50-75	SUPPLY: 85 RETURN: 95-102	3	0	2/22/2021
UI-CS-CS	<a href="#">CONDENSER WATER - CS</a>	150	150	50-75	SUPPLY: 85 RETURN: 95-102	4	0	2/22/2021
UI-CS-SS	<a href="#">CONDENSER WATER - SS</a>	150	150	50-75	SUPPLY: 85 RETURN: 95-102	5	0	2/22/2021
UI-CS-DRAIN	<a href="#">CONDENSER WATER DRAINS</a>	150	120	50-75	SUPPLY: 85 RETURN: 95-102	6	0	2/22/2021
UI-LPS	<a href="#">LOW PRESSURE STEAM</a>	50	340	20	260	7	0	2/22/2021
UI-HPS	<a href="#">HIGH PRESSURE STEAM</a>	175	500	155	350	8	0	2/22/2021
UI-LP-CON	<a href="#">LOW PRESSURE CONDENSATE</a>	50	340	20	260	9	4	2/22/2021
UI-HP-CON	<a href="#">HIGH PRESSURE CONDENSATE</a>	175	500	155	350	10	4	2/22/2021
UI-AIR	<a href="#">COMPRESSED AIR</a>	150	150	80-100	75	11	3	2/22/2021
UI-SEW	<a href="#">SANITARY SEWER</a>	15	140	0	75	12	2	2/22/2021
UI-PCW (CS)	<a href="#">PROCESS COLD WATER - CS</a>	135	200	60-80	55	13	2	2/22/2021
UI-PCW (SS)	<a href="#">PROCESS COLD WATER - SS</a>	150	100	60-80	55	14	1	2/22/2021
UI-PCW (DI)	<a href="#">PROCESS COLD WATER - DI</a>	150	100	60-80	55	15	0	2/22/2021
UI-CSS	<a href="#">SAMPLE WATER</a>	150	100	50-75	95-102	16	0	2/22/2021
UI-CHEM (CPVC)	<a href="#">CHEMICAL TREATMENT SERVICE</a>	150	100	50-75	75	17	0	2/22/2021
UI-CHEM (PVDF)	<a href="#">CHEMICAL TREATMENT SERVICE - ACID</a>	150	100	50-75	75	18	0	2/22/2021
UI-DCW	<a href="#">DOMESTIC WATER SYSTEM</a>	135	200	60	COLD: 50 HOT: 150	19	0	2/22/2021
UI-LOL	<a href="#">LUBE OIL</a>	230	100	10	75-95	20	0	2/22/2021
UI-REF	<a href="#">REFRIGERANT</a>	300	250	NOTE 1		21	0	2/22/2021
UI-RV	<a href="#">REFRIGERANT VENT PIPING</a>	285	150	NOTE 1		22	0	2/22/2021
	<a href="#">BRANCH TABLE</a>					23	1	2/22/2021

**NOTES**

- 1) OPERATING CONDITIONS DETERMINED ON A SYSTEM BY SYSTEM BASIS
- 2) ALL SYSTEMS ARE ABOVE GROUND UNLESS OTHERWISE STATED

**CHILLED WATER (TO 150 PSIG)**

PIPING SPECIFICATION:		PROCESS:	DESIGN CONDITIONS:	
<b>UI-CHW</b>	PIPE SIZE (NPS)	CHILLED WATER	150 PSIG AT 100 °F	
	WEIGHT/SCHEDULE	2" AND SMALLER	2 1/2" THRU 30"	36" THRU 48"
PIPE MATERIAL:	MATERIAL	--	STD	STD
ASME B36.10M/B88	MATERIAL	ASTM B88 COPPER, TYPE L, HARD DRAWN	A53 OR A106 GRADE B - SEAMLESS	API 5L GRADE B - SEAMLESS
FITTINGS:	CONSTRUCTION	SOLDERED OR PRESS FIT	BUTTWELD - ASME B16.9	
	WALL THICKNESS	SAME AS ADJOINING PIPE	SAME AS ADJOINING PIPE	
	MATERIAL	ASME B16.18 CAST COPPER OR ASME B16.22 WROUGHT COPPER ALLOY	BUTTWELD FITTING - ASTM A234 GRADE B - SEAMLESS	
PIPING JOINTS:	TYPE	SOLDERED OR PRESS FIT	BUTTWELD - END PREP PER B16.25	
	OTHER	SEE BELOW FOR JOINT DETAILS	--	
SOLDER/FLANGES:	CONSTRUCTION	SOLDER: ASTM B32 ALLOY, GRADE Sb-5 95/5 TIN-ANTIMONY, LEAD FREE OR: ASTM B32 ALLOY, GRADE SN95 TIN-SILVER, LEAD FREE	CLASS 150 - WELD NECK - ASME B16.47 AND B16.5	
	WALL THICKNESS		SAME AS ADJOINING PIPE	
	MATERIAL		FORGED STEEL - ASTM A105 OR ASTM A516 GRADE 70	
SOLDER/FLANGE BOLTS:	CONSTRUCTION	SOLDER: FILLER METAL LEAD-FREE - WATER-FLUSHABLE FLUX ASTM B813 - SILVER BRAZING FILLER METAL SHALL BE BCuP SERIES, COPPER PHOSPHORUS ALLOYS FOR GENERAL DUTY BRAZING - AWS A5.8	ALLOY STEEL, AISI 4140/4142 QUENCHED AND TEMPERED, A193 GRADE B7	
	MATERIAL		HIGH-STRENGTH STEEL - ASTM A193 - GRADE B7, FULL LENGTH STUD	
PRESS FIT/FLANGE NUTS:	CONSTRUCTION		HEAVY HEX - ASME B1.1 - CLASS 2B THREADS	
	MATERIAL	PRESS FIT: MATERIALS CONFORM TO ASME B16.18 OR: ASME B16.22 AND CRITERIA UNDER IAPMO PS 117 - SEALING ELEMENTS: EPDM - SEALING ELEMENTS FACTORY INSTALLED - FITTINGS SHALL BE PRESSED BY TOOLS RECOMMENDED BY FITTING MANUFACTURER	CARBON STEEL - ASTM A194 GRADE 2H HEAVY - F436 WASHERS	
PRESS FIT/GASKETS:	CONSTRUCTION		SPIRAL WOUND - SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES	
	MATERIAL		TYPE 304 SS - FULL FACE - FLEXITALLIC FLEXICARB STYLE CGI OR EQUAL	
WASHER:	CONSTRUCTION	--	CARBON STEEL - ASTM A194 GRADE 2H HEAVY - F436 WASHERS	
PIPE MATERIAL:	PIPE CODE:	DESIGN/CONSTRUCTION CODE:	REVISION:	DATE REVISED:
COPPER/CARBON STEEL	ASME B36.10M/B88	ASME B31.1	0	2/22/2021
VALVE SPECIFICATION:	SPECIFICATION MATERIAL:	PRESSURE CLASS:	DESIGN CODE:	
<b>UI-CHW</b>	AS NOTED	150 PSIG	ASME B31.1	ASME B16.34
	PIPE SIZE (NPS)	2" AND SMALLER	2 1/2" THRU 48"	
	CONNECTION AND RATING	--	LUGGED FOR CLASS 150 FLANGES	
BUTTERFLY VALVE	CONSTRUCTION	--	BODY/SEAT: CARBON STEEL STEM: SS DISC: SS GLAND/BEARING: SS WITH RTFE IMPREGNATED OPERATOR: GEARED HANDWHEEL W/ POSITION INDICATOR SEAT: PTFE 200 PSIG WORKING PRESSURE	
	VALVE SELECTION	--	ABZ SERIES 400 DEZURIK STYLE BHP JAMESBURY SERIES 815	
CHECK VALVE	CONNECTION AND RATING	CLASS 600 PSIG THREADED OR SOLDERED	CLASS 150 FLANGED ENDS (2 1/2" THRU 24")	
	CONSTRUCTION	BODY/BONNET: BRONZE DISC: BRONZE SEAT DISC: BUNA-N HINGE PIN AND PLUG: BRONZE ASTM B140 ALLOY DISC HANGER: SAME AS BODY	BODY/CAP: A216 GR. WCB (BOLTED) SEAT RING: HARDFACED DISC: A105 OR A216 WCB WITH 13% CR OVERLAY GASKET: CORRUGATED SST WITH GRAPHITE	
	VALVE SELECTION	NIBCO 433 SERIES APOLLO 161S SERIES	POWELL FIGURE 1561 CRANE FIGURE 147 BONNEY FORGE 1-61 RF	
SILENT CHECK VALVE	CONNECTION AND RATING	--	CLASS 150 FLANGED ENDS	
	CONSTRUCTION	--	BODY/CAP: CAST OR FORGED ASTM A216 GRADE WCB CARBON STEEL SEAT: STAINLESS STEEL DISC OR PLUG: TYPE 316 STAINLESS STEEL STEM: STAINLESS STEEL TORSION SPRING: TYPE 316 STAINLESS STEEL GASKET: SPIRAL WOUND SS WITH GRAPHITE 12" THRU 42": GLOBE 10" AND SMALLER: WAFER	
BALL VALVE	CONNECTION AND RATING	CLASS 600 PSIG THREADED OR SOLDERED	--	
	CONSTRUCTION	BODY: BRONZE, 2-PIECE, FULL-PORT BALL: SS 316 STEM: STAINLESS STEEL, BLOWOUT PROOF PACKING: PTFE SEATS AND SEALS: REINFORCED PTFE	--	
	VALVE SELECTION	APOLLO 77-140 SERIES NIBCO MODEL 580-70-66 MILWAUKE 20BS SERIES	--	
<b>REVISION HISTORY</b>				
NUMBER	DESCRIPTION			DATE
1	CHANGED SMALL BORE VALVES TO CLASS 600 FROM CLASS 3000			6/30/2017
2	ADDED SPECIFICATIONS FOR PIPE SIZES 36" THRU 48", CHANGED SMALL BORE BALL VALVE MODEL; CHANGED SMALL BORE PIPING TO COPPER			2/22/2021

**CONDENSER WATER - DI (TO 150 PSIG)**

PIPING SPECIFICATION:		PROCESS:	DESIGN CONDITIONS:	
<b>UI-CS-DI</b>		CONDENSER WATER	150 PSIG at 150 °F	
	PIPE SIZE (NPS)	3" THRU 48"		
<b>PIPE MATERIAL:</b>	<b>WEIGHT/SCHEDULE</b>	SPECIAL THICKNESS CLASS 53 ANSI/AWWA C150/A21.50		
ANSI/AWWA C151/A21.51	<b>MATERIAL</b>	ANSI/AWWA C151/A21.51 DUCTILE IRON PIPING		
	<b>CONSTRUCTION</b>	ANSI/AWWA C110/A21.10 FLANGED		
<b>FITTINGS:</b>	<b>DESIGN RATING</b>	150 PSIG IN ACCORDANCE WITH ANSI/AWWA C110/A21.10		
	<b>MATERIAL</b>	DUCTILE IRON		
	<b>TYPE</b>	ANSI/AWWA C115/A21.15 FLANGED		
<b>JOINTS:</b>	<b>DESIGN RATING</b>	250 PSIG IN ACCORDANCE WITH ANSI/AWWA C115/A21.15		
	<b>OTHER</b>	--		
	<b>CONSTRUCTION</b>	ASTM A536 DUCTILE IRON		
<b>SERVICE SADDLES:</b>	<b>DESIGN RATING</b>	350 PSIG IN ACCORDANCE WITH ANSI/AWWA C800		
	<b>COATING</b>	FUSION BONDED BLACK NYLON		
	<b>STRAPS</b>	TYPE 304 STAINLESS STEEL		
	<b>CONSTRUCTION</b>	CLASS 150 - WELD NECK - ASME B16.5		
<b>FLANGES:</b>	<b>WALL THICKNESS</b>	SAME AS ADJOINING PIPE		
	<b>MATERIAL</b>	FORGED CARBON STEEL - ASTM A105		
<b>BOLTS:</b>	<b>CONSTRUCTION</b>	STAINLESS STEEL IN ACCORDANCE WITH ASTM A240		
<b>NUTS:</b>	<b>CONSTRUCTION</b>	HEAVY HEX - A194 GRADE 2H		
<b>WASHERS:</b>	<b>CONSTRUCTION</b>	TYPE 304 STAINLESS STEEL		
	<b>CONSTRUCTION</b>	SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES AND FOR USE WITH SERVICE SADDLES		
<b>GASKETS:</b>	<b>STANDARD</b>	ANSI/AWWA C111/A21.11		
	<b>MATERIAL</b>	FULL FACE - 1/16" ARAMID FIBER WITH SBR BINDER - GARLOCK BLUE-GARD OR EQUAL		
<b>PIPE LINING:</b>	<b>CONSTRUCTION</b>	CEMENT MORTAR LINING AND SEAL COAT		
	<b>STANDARD</b>	ANSI/AWWA C104/A21.4		
<b>PIPE MATERIAL:</b>	<b>PIPE CODE:</b>	<b>DESIGN/CONSTRUCTION CODE:</b>	<b>REVISION:</b>	<b>DATE REVISED:</b>
DUCTILE IRON	ANSI/AWWA C151/A21.51	--	0	2/22/2021
<b>VALVE SPECIFICATION:</b>	<b>SPECIFICATION MATERIAL:</b>	<b>PRESSURE CLASS:</b>	<b>DESIGN CODE:</b>	
	DUCTILE IRON	--	--	--
<b>UI-CS-DI</b>	PIPE SIZE (NPS)	3" THRU 48"		
	<b>CONNECTION AND RATING</b>	LUGGED FOR CLASS 150 FLANGES		
<b>BUTTERFLY VALVE</b>	<b>CONSTRUCTION</b>	BODY/SEAT: CARBON STEEL STEM: SS DISC: SS GLAND/BEARING: SS WITH RTFE IMPREGNATED OPERATOR: GEARED HANDWHEEL W/ POSITION INDICATOR SEAT: PTFE 200 PSIG WORKING PRESSURE		
	<b>VALVE SELECTION</b>	ABZ SERIES 400 DEZURIK STYLE BHP JAMESBURY SERIES 815		
<b>REVISION HISTORY</b>				
<b>NUMBER</b>	<b>DESCRIPTION</b>	<b>DATE</b>		
0	INITIAL ISSUE	1/5/2018		
1	ADDED INFORMATION FOR BUTTERFLY VALVE	2/22/2021		

**CONDENSER WATER - COPPER AND CARBON STEEL (TO 150 PSIG)**

PIPING SPECIFICATION:		PROCESS:		DESIGN CONDITIONS:	
<b>UI-CS-CS</b>	PIPE SIZE (NPS)	CONDENSER WATER		150 PSIG AT 150 °F	
	WEIGHT/SCHEDULE	2" AND SMALLER		2 1/2" THRU 30"	36" THRU 48"
PIPE MATERIAL:	MATERIAL	ASTM B88 COPPER, TYPE L, HARD DRAWN		STD	STD
ASME B36.10M/B88	MATERIAL	ASTM B88 COPPER, TYPE L, HARD DRAWN		A53 OR A106 GRADE B - SEAMLESS	API 5L GRADE B - SEAMLESS
FITTINGS:	CONSTRUCTION	SOLDERED OR PRESS FIT		BUTTWELD - ASME B16.9	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	MATERIAL	ASME B16.18 CAST COPPER OR ASME B16.22 WROUGHT COPPER ALLOY		BUTTWELD FITTING - ASTM A234 GRADE B - SEAMLESS	
PIPING JOINTS:	TYPE	SOLDERED OR PRESS FIT		BUTTWELD - END PREP PER B16.25	
	OTHER	SEE BELOW FOR JOINT DETAILS			
SOLDER/FLANGES:	CONSTRUCTION	SOLDER: ASTM B32 ALLOY, GRADE Sb-5 95/5 TIN-ANTIMONY, LEAD FREE OR: ASTM B32 ALLOY, GRADE SN95 TIN-SILVER, LEAD FREE		CLASS 150 - WELD NECK - ASME B16.47 AND B16.5	
	WALL THICKNESS	SOLDER: ASTM B32 ALLOY, GRADE Sb-5 95/5 TIN-ANTIMONY, LEAD FREE OR: ASTM B32 ALLOY, GRADE SN95 TIN-SILVER, LEAD FREE		SAME AS ADJOINING PIPE	
	MATERIAL	SOLDER: FILLER METAL LEAD-FREE - WATER-FLUSHABLE FLUX ASTM B813 - SILVER BRAZING FILLER METAL SHALL BE BCuP SERIES, COPPER PHOSPHORUS ALLOYS FOR GENERAL DUTY BRAZING - AWS A5.8		FORGED STEEL - ASTM A105 OR ASTM A516 GRADE 70	
SOLDER/FLANGE BOLTS:	CONSTRUCTION	SOLDER: FILLER METAL LEAD-FREE - WATER-FLUSHABLE FLUX ASTM B813 - SILVER BRAZING FILLER METAL SHALL BE BCuP SERIES, COPPER PHOSPHORUS ALLOYS FOR GENERAL DUTY BRAZING - AWS A5.8		ALLOY STEEL, AISI 4140/4142 QUENCHED AND TEMPERED, A193 GRADE B7	
	MATERIAL	SOLDER: FILLER METAL LEAD-FREE - WATER-FLUSHABLE FLUX ASTM B813 - SILVER BRAZING FILLER METAL SHALL BE BCuP SERIES, COPPER PHOSPHORUS ALLOYS FOR GENERAL DUTY BRAZING - AWS A5.8		HIGH-STRENGTH STEEL - ASTM A193 - GRADE B7, FULL LENGTH STUD	
PRESS FIT/FLANGE NUTS:	CONSTRUCTION	PRESS FIT: MATERIALS CONFORM TO ASME B16.18 OR: ASME B16.22 AND CRITERIA UNDER IAPMO PS 117 - SEALING ELEMENTS: EPDM - SEALING ELEMENTS FACTORY INSTALLED - FITTINGS SHALL BE PRESSED BY TOOLS RECOMMENDED BY FITTING MANUFACTURER		HEAVY HEX - ASME B1.1 - CLASS 2B THREADS	
	MATERIAL	PRESS FIT: MATERIALS CONFORM TO ASME B16.18 OR: ASME B16.22 AND CRITERIA UNDER IAPMO PS 117 - SEALING ELEMENTS: EPDM - SEALING ELEMENTS FACTORY INSTALLED - FITTINGS SHALL BE PRESSED BY TOOLS RECOMMENDED BY FITTING MANUFACTURER		CARBON STEEL - ASTM A194 GRADE 2H HEAVY - F436 WASHERS	
PRESS FIT/GASKETS:	CONSTRUCTION	PRESS FIT: MATERIALS CONFORM TO ASME B16.18 OR: ASME B16.22 AND CRITERIA UNDER IAPMO PS 117 - SEALING ELEMENTS: EPDM - SEALING ELEMENTS FACTORY INSTALLED - FITTINGS SHALL BE PRESSED BY TOOLS RECOMMENDED BY FITTING MANUFACTURER		SPIRAL WOUND - SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES	
	MATERIAL	PRESS FIT: MATERIALS CONFORM TO ASME B16.18 OR: ASME B16.22 AND CRITERIA UNDER IAPMO PS 117 - SEALING ELEMENTS: EPDM - SEALING ELEMENTS FACTORY INSTALLED - FITTINGS SHALL BE PRESSED BY TOOLS RECOMMENDED BY FITTING MANUFACTURER		TYPE 304 SS - FULL FACE - FLEXITALLIC FLEXICARB STYLE CGI OR EQUAL	
WASHER:	CONSTRUCTION	--		CARBON STEEL - ASTM A194 GRADE 2H HEAVY - F436 WASHERS	
PIPE MATERIAL:	PIPE CODE:	DESIGN/CONSTRUCTION CODE:		REVISION:	DATE REVISED:
COPPER/CARBON STEEL	ASME B36.10M/B88	ASME B31.1		0	2/22/2021
FINISH:	SPECIFICATION MATERIAL:	3-COAT SYSTEM WITH EPOXY PRIMER, ACRYLIC INTERMEDIATE COAT AND POLYURETHANE TOP COAT COLOR TO MATCH GRAY OF EXISTING CONDENSER WATER PIPING - FOR UNINSULATED CONDENSER WATER PIPING			
VALVE SPECIFICATION:	SPECIFICATION MATERIAL:	PRESSURE CLASS:	DESIGN CODE:		
<b>UI-CS-CS</b>	AS NOTED	150 PSIG	ASME B31.1	ASME B16.34	
	PIPE SIZE (NPS)	2" AND SMALLER		2 1/2" THRU 48"	
	CONNECTION AND RATING	--		LUGGED FOR CLASS 150 FLANGES	
BUTTERFLY VALVE	CONSTRUCTION	--		BODY/SEAT: CARBON STEEL STEM: SS DISC: SS GLAND/BEARING: SS WITH RTFE IMPREGNATED OPERATOR: GEARED HANDWHEEL W/ POSITION INDICATOR SEAT: PTFE 200 PSIG WORKING PRESSURE	
	VALVE SELECTION	--		ABZ SERIES 400 DEZURIK STYLE BHP JAMESBURY SERIES 815	
CHECK VALVE	CONNECTION AND RATING	CLASS 600 PSIG THREADED OR SOLDERED		CLASS 150 FLANGED ENDS (2 1/2" THRU 24")	
	CONSTRUCTION	BODY/BONNET: BRONZE DISC: BRONZE SEAT DISC: BUNA-N HINGE PIN AND PLUG: BRONZE ASTM B140 ALLOY DISC HANGER: SAME AS BODY		BODY/CAP: A216 GR. WCB (BOLTED) SEAT RING: HARDFACED DISC: A105 OR A216 WCB WITH 13% CR OVERLAY GASKET: CORRUGATED SST WITH GRAPHITE	
	VALVE SELECTION	NIBCO 433 SERIES APOLLO 161S SERIES		POWELL FIGURE 1561 CRANE FIGURE 147 BONNEY FORGE 1-61 RF	
SILENT CHECK VALVE	CONNECTION AND RATING	--		CLASS 150 FLANGED ENDS	
	CONSTRUCTION	--		BODY/CAP: CAST OR FORGED ASTM A216 GRADE WCB CARBON STEEL SEAT: STAINLESS STEEL DISC OR PLUG: TYPE 316 STAINLESS STEEL STEM: STAINLESS STEEL TORSION SPRING: TYPE 316 STAINLESS STEEL GASKET: SPIRAL WOUND SS WITH GRAPHITE 12" THRU 42": GLOBE 10" AND SMALLER: WAFER	
	VALVE SELECTION	--		KECKLEY CO. MODEL CG (GLOBE) OR CW (WAFER) MUELLER MODEL 101MDT OR 105MDT DEZURIK STYLE CSC	
BALL VALVE	CONNECTION AND RATING	CLASS 600 PSIG THREADED OR SOLDERED		--	
	CONSTRUCTION	BODY: BRONZE, 2-PIECE, FULL-PORT BALL: SS 316 STEM: STAINLESS STEEL, BLOWOUT PROOF PACKING: PTFE SEATS AND SEALS: REINFORCED PTFE		--	
	VALVE SELECTION	APOLLO 77-140 SERIES NIBCO MODEL T-580-70-66 MILWAUKEE 20BS SERIES		--	
GLOBE VALVE	CONNECTION AND RATING	--		CLASS 150 FLANGED ENDS (2 1/2" THRU 24")	
	CONSTRUCTION	--		BODY/BONNET: A216 GR. WCB (BOLTED) SEAT RING: A105 OR A216 HARDFACED DISC: A105 OR A216 WCB WITH 13% CR OVERLAY STEM: 410 SS PACKING: GRAPHITE GASKET: CORRUGATED SST WITH GRAPHITE	
	VALVE SELECTION	--		CRANE FIGURE 143 POWELL FIGURE 1531 VELAN FIGURE 0074C	
<b>REVISION HISTORY</b>					
NUMBER	DESCRIPTION			DATE	
0	INITIAL ISSUE			2/22/2021	

**CONDENSER WATER - SS (TO 150 PSIG)**

PIPING SPECIFICATION:		PROCESS:		DESIGN CONDITIONS:	
<b>UI-CS-SS</b>	PIPE SIZE (NPS)	CONDENSER WATER		150 PSIG AT 150 °F	
	WEIGHT/SCHEDULE	2" AND SMALLER		2 1/2" THRU 48"	
PIPE MATERIAL: ASME B36.10M	MATERIAL	SCH 40S		SCH 10S	
	MATERIAL	A312 TYPE 304 - SEAMLESS		A312 TYPE 304 - SEAMLESS OR WELDED	
FITTINGS:	CONSTRUCTION	SOCKETWELD: CLASS 3000, B16.11 THREADED: CLASS 2000, B16.11		BUTTWELD - ASME B16.9	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	MATERIAL	ASTMA403, WP304L - SEAMLESS, B16.25		ASTM A403, WP304L - SEAMLESS, B16.25	
JOINTS:	TYPE	SOCKETWELD CLASS 3000 OR THREADED CLASS 2000		BUTTWELD - END PREP PER B16.25	
	OTHER	UNIONS: CLASS 3000 - SW - B16.11 - FLAT FACE WITH SPIRAL WOUND GASKET DESIGN		WHERE FLANGE REQUIRED	
FLANGES:	CONSTRUCTION	FLANGES NOT PERMITTED		CLASS 150 - WELD NECK - ASME B16.47 AND B16.5	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	MATERIAL	--		SS, ASTM A182, F330L, ASME B16.5	
FLANGE BOLTS:	CONSTRUCTION	--		HIGH-STRENGTH STAINLESS STEEL, GRADE B8, CLASS 2, STUD - FULL LENGTH	
FLANGE NUTS:	CONSTRUCTION	--		HEAVY HEX - A194 GRADE 8	
WASHER:	CONSTRUCTION	--		SS304	
GASKETS:	CONSTRUCTION	--		SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES	
	MATERIAL	--		FULL FACE - 1/16" ARAMID FIBER WITH SBR BINDER - GARLOCK BLUE-GARD OR EQUAL	
PIPE MATERIAL:	PIPE CODE:	DESIGN/CONSTRUCTION CODE:		REVISION:	DATE REVISED:
STAINLESS STEEL	ASME B36.10M	ASME B31.1		0	2/22/2021
VALVE SPECIFICATION:	SPECIFICATION MATERIAL:	PRESSURE CLASS:	DESIGN CODE:		
<b>UI-CS-SS</b>	CARBON STEEL	150 PSIG	ASME B31.1	ASME B16.34	
<b>UI-CS-SS</b>	PIPE SIZE (NPS)	2" AND SMALLER		2 1/2" THRU 48"	
	CONNECTION AND RATING	--		LUGGED FOR CLASS 150 FLANGES	
BUTTERFLY VALVE	CONSTRUCTION	--		BODY: A182 GR. F316 OR A351 GR. CF8M SEAT: TFE/VITON DISC: A182 GR. F316 OR A351 GR. CF8M SHAFT: 17-4 PH PACKING: TFE	
	VALVE SELECTION	--		POWELL FIGURE 1572 CRANE FLOWSEAL TYPE 1LA (12" AND SMALLER) TYPE 1LC (14" AND LARGER) JAMESBURY SERIES 815	
CHECK VALVE	CONNECTION AND RATING	CLASS 800 PSIG SOCKETWELD		CLASS 150 FLANGED ENDS (2-1/2" THRU 12")	
	CONSTRUCTION	BODY/CAP: A182 F316L CARRIER/CARRIER PIN: 316SS DISC: A276 T316 SEAT RING: 316 SST GASKET: SPIRAL WOUND SST WITH PTFE		BODY: ASTM A351 GR. CF8M CAP: ASTM A351 GR. CF8M CARRIER/CARRIER PIN: 316SS DISC: ASTM A351 GR. CF8M GASKET: PTFE	
SILENT CHECK VALVE	VALVE SELECTION	POWELL FIGURE SW08 VOGT SERIES SWS718 BONNEY FORGE HL-68-SW		POWELL FIGURE 1561 CRANE FIGURE 147 (THRU 24") BONNEY FORGE 1-68 RF	
	CONNECTION AND RATING	--		CLASS 150 FLANGED ENDS	
BALL VALVE	CONSTRUCTION	--		BODY/CAP: CAST STAINLESS STEEL ASTM A351 GR. CF8M SEAT: CAST STAINLESS STEEL, ASTM A351 GR. CF8M DISC OR PLUG: CAST STAINLESS STEEL, ASTM A351 GR. CF8M STEM: STAINLESS STEEL SPRING: TYPE 316 STAINLESS STEEL GASKET: SPIRAL WOUND SS WITH GRAPHITE 12" THRU 42": GLOBE 10" AND SMALLER: WAFER	
	VALVE SELECTION	--		KECKLEY CO. MODEL OG (GLOBE) OR CW (WAFER) MUELLER MODEL 101MDT OR 105MDT DEZURIK STYLE CSC	
GLOBE VALVE	CONNECTION AND RATING	CLASS 800 PSIG SOCKETWELD		CLASS 150 FLANGED ENDS (2-1/2" THRU 20")	
	CONSTRUCTION	BODY/BONNET: ASTM A351, CF8M STAINLESS STEEL, FULL-PORT SEAT RING: XTREME BALL: SS 316 SEAL: PTFE PACKING: GRAPHITE		BODY/INSERT: A351 CF8M BALL: 316 SS STEM: 316 SS SEAL: PTFE BODY SEAL: TFM STEM SEAL: PTFE GEAR OPERATOR 4" AND LARGER	
GLOBE VALVE	VALVE SELECTION	JAMESBURY SERIES 4000 MODEL A KECKLEY SYTE BVM3 KITZ U3TZM		JAMESBURY SERIES 7150 KECKLEY BVF1 (THRU 6") VELAN SB-150	
	CONNECTION AND RATING	--		CLASS 150 FLANGED ENDS (2 1/2" THRU 12")	
GLOBE VALVE	CONSTRUCTION	--		BODY: ASTM A351 CF8M BONNET: ASTM A351 CF8M DISC: ASTM A351 CF8M STEM: ASTM A276 T316 PACKING: PTFE	
	VALVE SELECTION	--		POWELL FIGURE 1531 CRANE FIGURE 143 (THRU 24") BONNEY FORGE 1-38 RF	
REVISION HISTORY					
NUMBER	DESCRIPTION			DATE	
0	INITIAL ISSUE			2/22/2021	

**CONDENSER WATER  
DRAINS (TO 150 PSIG)**

PIPING SPECIFICATION:		PROCESS:	DESIGN CONDITIONS:	
<b>UI-CS-DRAIN</b>	PIPE SIZE (NPS)	CONDENSER WATER	150 PSIG AT 120 °F	
	WEIGHT/SCHEDULE		2"	
PIPE MATERIAL: ASME B36.10M	MATERIAL	ASTM B88 COPPER, TYPE K, HARD DRAWN		
	CONSTRUCTION	SOLDERED OR PRESS FIT		
FITTINGS:	WALL THICKNESS	SAME AS ADJOINING PIPE		
	MATERIAL	ASME B16.18 CAST COPPER OR ASME B16.22 WROUGHT COPPER ALLOY		
PIPING JOINTS:	TYPE	SOLDERED OR PRESS FIT		
	OTHER	SEE BELOW FOR JOINT DETAILS		
SOLDER:	CONSTRUCTION	SOLDER: ASTM B32 ALLOY, GRADE SB-5 95/5 TIN-ANTIMONY, LEAD FREE OR: ASTM B32 ALLOY, GRADE SN95 TIN-SILVER, LEAD FREE		
	WALL THICKNESS			
SOLDER:	MATERIAL	SOLDER: FILLER METAL LEAD-FREE - WATER-FLUSHABLE FLUX ASTM B813 - SILVER BRAZING FILLER METAL SHALL BE BCuP SERIES, COPPER PHOSPHORUS ALLOYS FOR GENERAL DUTY BRAZING - AWS A5.8		
	CONSTRUCTION	PRESS FIT: MATERIALS CONFORM TO ASME B16.18 OR: ASME B16.22 AND CRITERIA UNDER IAPMO PS 117 - SEALING ELEMENTS: EPDM - SEALING ELEMENTS FACTORY INSTALLED - FITTINGS SHALL BE PRESSED BY TOOLS RECOMMENDED BY FITTING MANUFACTURER		
PRESS FIT:	MATERIAL			
	CONSTRUCTION			
PIPE MATERIAL: COPPER	PIPE CODE: ASTM B88	DESIGN/CONSTRUCTION CODE: ASME B31.1	REVISION: 0	DATE REVISED: 2/22/2021
VALVE SPECIFICATION:	SPECIFICATION MATERIAL: AS NOTED	PRESSURE CLASS: 150 PSIG	DESIGN CODE: ASME B31.1 ASME B16.34	
<b>UI-CS-DRAIN</b>	PIPE SIZE (NPS)	2"		
	CONNECTION AND RATING	CLASS 200 PSIG THREADED		
CHECK VALVE	CONSTRUCTION	BODY/CAP: ASTM B584 BRONZE DISC: BRONZE, SWING TYPE, Y-PATTERN SEAT: BRASS SPRING: SS 316		
	VALVE SELECTION	APOLLO 161T-LF SERIES POWELL MSS SP-80 NIBCO T-413-Y-LF		
BALL VALVE	CONNECTION AND RATING	CLASS 600 PSIG THREADED		
	CONSTRUCTION	BODY: BRONZE, 2-PIECE, FULL-PORT BALL: SS 316 STEM: STAINLESS STEEL, BLOWOUT PROOF PACKING: RPTFE SEATS AND SEALS: RPTFE		
	VALVE SELECTION	APOLLO 77-140 SERIES NIBCO MODEL T-580-70-66 MILWAUKE 20BS SERIES		

REVISION HISTORY		
NUMBER	DESCRIPTION	DATE
0	INITIAL ISSUE	2/22/2021

**LOW PRESSURE STEAM (TO 50 PSIG)**

PIPING SPECIFICATION:		PROCESS:		DESIGN CONDITIONS:	
<b>UI-LPS</b>	PIPE SIZE (NPS)	LOW PRESSURE STEAM		50 PSIG AT 340 °F	
	WEIGHT/SCHEDULE	2" AND SMALLER		2 1/2" THRU 24"	
PIPE MATERIAL: ASME B36.10M	MATERIAL	XS		STD	
	CONSTRUCTION	A106 GRADE B - SEAMLESS		A106 GRADE B - SEAMLESS	
FITTINGS:	CONSTRUCTION	CLASS 3000 - SOCKETWELD - B16.11		BUTTWELD - ASME B16.9	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	MATERIAL	FORGED CARBON STEEL - ASTM A105		BUTTWELD FITTING - ASTM A234 GRADE B - SEAMLESS	
PIPING JOINTS:	TYPE	SOCKETWELD		BUTTWELD - END PREP PER B16.25	
	OTHER	WHERE FLANGE OR THREAD REQUIRED		WHERE FLANGE REQUIRED	
UNIONS:	CONSTRUCTION	CLASS 3000 - SW - B16.11 - FLAT FACE WITH SPIRAL WOUND GASKET DESIGN		NOT PERMITTED	
	WALL THICKNESS	SAME AS ADJOINING PIPE		--	
	MATERIAL	FORGED CARBON STEEL - ASTM A105		--	
FLANGES:	CONSTRUCTION	CLASS 150 - WELD NECK - ASME B16.5			
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	MATERIAL	FORGED CARBON STEEL - ASTM A105		FORGED CARBON STEEL - ASTM A105	
FLANGE BOLTS:	CONSTRUCTION	ALLOY STEEL, AISI 4140/4142 QUENCHED AND TEMPERED, A193 GRADE B7			
FLANGE NUTS:	CONSTRUCTION	HEAVY HEX - A194 GRADE 2H			
WASHER:	CONSTRUCTION	F436			
GASKETS:	CONSTRUCTION	SPIRAL WOUND - SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES			
	MATERIAL	FLEXITALLIC STYLE CGI - TYPE 304 STAINLESS - FLEXICARB FILLER			
THERMOWELLS:	CONSTRUCTION	INSERTION THERMOWELLS - 3000 PSIG PRESSURE CLASS - SEAL WELDED WELLS			
	MATERIAL	ASTM A106 CARBON STEEL			
PIPE MATERIAL:	PIPE CODE:	DESIGN/CONSTRUCTION CODE:	REVISION:	DATE REVISED:	
CARBON STEEL	ASTM B36.10M	ASME B31.1	0	2/22/2021	
VENT PIPING FINISH:	SPECIFICATION MATERIAL:	2-COAT SYSTEM WITH SOLVENT-BASED INORGANIC ZINC PRIMER, AND INORGANIC SILICATE POLYMER TOP COAT - COLOR TO MATCH RED OF EXISTING RELIEF DEVICE PIPING			
VALVE SPECIFICATION:	SPECIFICATION MATERIAL:	PRESSURE CLASS:	DESIGN CODE:		
<b>UI-LPS</b>	CARBON STEEL	150 PSIG	ASME B31.1	ASME B16.34	
	PIPE SIZE (NPS)	2" AND SMALLER		2 1/2" THRU 24"	
GATE VALVE	CONNECTION AND RATING	CLASS 800 PSIG SOCKETWELD (1" THRU 2")		CLASS 150 FLANGED ENDS	
	CONSTRUCTION	BODY/BONNET: A105, TRIM 13% CR OUTSIDE SCREW & YOKE, BOLTED GLAND, SOLID WEDGE, HARD FACED SEATS, CLASS 800 PACKING: GRAPHITE		BODY/BONNET: A216 GR. WCB SEAT RING: HARDFACED DISC/WEDGE: A217 GR. CA15 OR WCB WITH 13% CR OVERLAY STEM: 410 SS PACKING: GRAPHITE GASKET: CORRUGATED SS WITH GRAPHITE	
	VALVE SELECTION	POWELL FIGURE GA08 VOGT SW12111 BONNEY FORGE FIG. H11SW		POWELL FIGURE 1503 CRANE FIGURE 47 BONNEY FORGE 1-11 RF	
BUTTERFLY VALVE	CONNECTION AND RATING	--		CLASS 150 FLANGED ENDS	
	CONSTRUCTION	--		BODY/BONNET: A216 GR. WCB SEAT RING: METAL SEAT DISC: A351 CF8M SHAFT: 17-4 PH PACKING: PTFE GLAND: 304 SS	
	VALVE SELECTION	--		POWELL FIGURE 1572 DEZURIK STYLE BHP FLOWSEAL TYPE 1LA	
CHECK VALVE	CONNECTION AND RATING	CLASS 800 PSIG SOCKETWELD		CLASS 150 FLANGED ENDS	
	CONSTRUCTION	BODY/CAP: A105 (BOLTED) SWING CHECK SEAT RING: STELLITE 6 FACED 410 SS DISC: 13% CR GASKET: SPIRAL WOUND		BODY/CAP: A216 GR. WCB (BOLTED) SEAT RING: HARDFACED DISC: A105 OR A216 WCB WITH 13% CR OVERLAY GASKET: CORRUGATED SST WITH GRAPHITE	
	VALVE SELECTION	POWELL FIGURE SW08 VOGT SW701 BONNEY FORGE FIG. H61SW		POWELL FIGURE 1561 CRANE FIGURE 147 BONNEY FORGE 1-61 RF	
BALL VALVE	CONNECTION AND RATING	CLASS 900 PSIG SOCKETWELD		CLASS 150 FLANGED ENDS (UP TO 6")	
	CONSTRUCTION	BODY: A105, STEM SS 410 COND. 2 THRUST WASHER: STELLITE 6; BALL AND SEAT: SS 410/CHROME CARBIDE COATED; STEM: SS 410; THRUST BUSHING: BRONZE; PACKING FLANGE SS 304 STEM BUSHING: NITRIDED SS410 COND. 2; SEAT SS 410 COND.2 CHROME CARBIDE COATED LOCKABLE LEVER		BODY: A105, STEM SS 410 COND. 2 THRUST WASHER: STELLITE 6; BALL AND SEAT: SS 410/CHROME CARBIDE COATED; STEM: SS 410; THRUST BUSHING: BRONZE; PACKING FLANGE SS 304 STEM BUSHING: NITRIDED SS410 COND. 2; SEAT SS 410 COND.2 CHROME CARBIDE COATED LOCKABLE LEVER (GEAR OPERATOR OVER 4")	
	VALVE SELECTION	VELAN TYPE R, METAL SEATED, CLASS 900		VELAN TYPE R	
GLOBE VALVE	CONNECTION AND RATING	CLASS 800 PSIG SOCKETWELD		CLASS 150 FLANGED ENDS	
	CONSTRUCTION	BODY/BONNET: A105 (BOLTED) (BODY HARDFACED) DISC: 420SST TRIM: 13% Cr STEM: A183 F6A PACKING: GRAPHITE GASKET: SPIRAL WOUND SST WITH GRAPHITE		BODY/BONNET: A216 GR. WCB (BOLTED) SEAT RING: A105 OR A216 HARDFACED DISC: A105 OR A216 WCB WITH 13% CR OVERLAY STEM: 410 SS PACKING: GRAPHITE GASKET: CORRUGATED SST WITH GRAPHITE	
	VALVE SELECTION	POWELL FIGURE GL08 VOGT SW12141 BONNEY FORGE FIG. H31SW		POWELL FIGURE 1531 CRANE FIGURE 143 BONNEY FORGE 1-31 RF	
<b>REVISION HISTORY</b>					
NUMBER	DESCRIPTION			DATE	
0	INITIAL ISSUE			2/22/2021	

**HIGH PRESSURE STEAM (TO 175 PSIG)**

PIPING SPECIFICATION:		PROCESS:		DESIGN CONDITIONS:	
<b>UI-HPS</b>	PIPE SIZE (NPS)	HIGH PRESSURE STEAM		175 PSIG AT 500 °F	
	WEIGHT/SCHEDULE	2" AND SMALLER		2 1/2" THRU 24"	
PIPE MATERIAL: ASME B36.10M	MATERIAL	XS		STD	
	CONSTRUCTION	A106 GRADE B - SEAMLESS		A106 GRADE B - SEAMLESS	
FITTINGS:	CONSTRUCTION	CLASS 3000 - SOCKETWELD - B16.11		BUTTWELD - ASME B16.9	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	MATERIAL	FORGED CARBON STEEL - ASTM A105		BUTTWELD FITTING - ASTM A234 GRADE B - SEAMLESS	
PIPING JOINTS:	TYPE	SOCKETWELD		BUTTWELD - END PREP PER B16.25	
	OTHER	WHERE FLANGE OR THREAD REQUIRED		WHERE FLANGE REQUIRED	
UNIONS:	CONSTRUCTION	CLASS 3000 - SW - B16.11 - FLAT FACE WITH SPIRAL WOUND GASKET DESIGN		NOT PERMITTED	
	WALL THICKNESS	SAME AS ADJOINING PIPE		--	
	MATERIAL	FORGED CARBON STEEL - ASTM A105		--	
FLANGES:	CONSTRUCTION	CLASS 300 - WELD NECK - ASME B16.5			
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	MATERIAL	FORGED CARBON STEEL - ASTM A105		FORGED CARBON STEEL - ASTM A105	
FLANGE BOLTS:	CONSTRUCTION	ALLOY STEEL, AISI 4140/4142 QUENCHED AND TEMPERED, A193 GRADE B7			
FLANGE NUTS:	CONSTRUCTION	HEAVY HEX - A194 GRADE 2H			
WASHER:	CONSTRUCTION	F436			
GASKETS:	CONSTRUCTION	SPIRAL WOUND - SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES			
	MATERIAL	FLEXITALLIC STYLE CGI - TYPE 304 STAINLESS - FLEXICARB FILLER			
THERMOWELLS:	CONSTRUCTION	INSERTION THERMOWELLS - 3000 PSIG PRESSURE CLASS - SEAL WELDED WELLS			
	MATERIAL	ASTM A106 CARBON STEEL			
PIPE MATERIAL:	PIPE CODE:	DESIGN/CONSTRUCTION CODE:	REVISION:	DATE REVISED:	
CARBON STEEL	ASTM B36.10M	ASME B31.1	0	2/22/2021	
VENT PIPING FINISH:	SPECIFICATION MATERIAL:	2-COAT SYSTEM WITH SOLVENT-BASED INORGANIC ZINC PRIMER, AND INORGANIC SILICATE POLYMER TOP COAT COLOR TO MATCH RED OF EXISTING RELIEF DEVICE PIPING			
VALVE SPECIFICATION:	SPECIFICATION MATERIAL:	PRESSURE CLASS:	DESIGN CODE:		
<b>UI-HPS</b>	CARBON STEEL	300 PSIG	ASME B31.1	ASME B16.34	
	PIPE SIZE (NPS)	2" AND SMALLER		2 1/2" THRU 24"	
GATE VALVE	CONNECTION AND RATING	CLASS 800 PSIG SOCKETWELD		BUTTWELD ENDS	
	CONSTRUCTION	BODY/BONNET: A105, TRIM 13% CR OUTSIDE SCREW & YOKE, BOLTED GLAND, SOLID WEDGE, HARD FACED SEATS, CLASS 800 PACKING: GRAPHITE		BODY/BONNET: A105 OR A216 GR. WCB SEAT RING: HARDFACED DISC/WEDGE: A217 GR. CA15 OR WCB WITH 13% CR OVERLAY STEM: 410 SS PACKING: GRAPHITE GASKET: SPIRAL WOUND SS WITH GRAPHITE	
	VALVE SELECTION	POWELL FIGURE GA08 VOGT SW12111 BONNEY FORGE FIG. H11SW		POWELL FIGURE 3003 CRANE FIGURE 33-1/2 BONNEY FORGE 3-11 BW	
BUTTERFLY VALVE	CONNECTION AND RATING	--		BUTTWELD ENDS	
	CONSTRUCTION	--		BODY: A216 GR. WCB CAP: A 516 GR 60 OR A 696 GR B CLOSE STOP: A 516 GR 60 DRIVE SHAFT: A 276 GR 431 DISC: A351 CF8M BEARING: A 439 TPD2 SEAL/SEAT GASKET: GRAPHITE BEARING SEAL: GRAPHITE GASKET: GRAPHITE PACKING: GRAPHITE	
	VALVE SELECTION	--		ADAMS SERIES MAK	
CHECK VALVE	CONNECTION AND RATING	CLASS 800 PSIG SOCKETWELD		BUTTWELD ENDS	
	CONSTRUCTION	BODY/CAP: A105 (BOLTED) SWING CHECK SEAT RING: 316 HF DISC: 13% CR GASKET: SPIRAL WOUND		BODY/CAP: A216 GR. WCB (BOLTED) SEAT RING: HARDFACED DISC: A105 OR A216 WCB WITH 13% CR OVERLAY GASKET: CORRUGATED SST WITH GRAPHITE	
	VALVE SELECTION	POWELL FIGURE SW08 VOGT SW701 BONNEY FORGE FIG. H61SW		POWELL FIGURE 3061 CRANE FIGURE 159-1/2 BONNEY FORGE 3-61 BW	
BALL VALVE	CONNECTION AND RATING	CLASS 900 PSIG SOCKETWELD		--	
	CONSTRUCTION	BODY: A105, STEM SS 410 COND. 2 THRUST WASHER: STELLITE 6; BALL AND SEAT: SS 410/CHROME CARBIDE COATED; STEM: SS 410; THRUST BUSHING: BRONZE; PACKING FLANGE SS 304 STEM BUSHING: NITRIDED SS410 COND. 2; SEAT SS 410 COND.2 CHROME CARBIDE COATED LOCKABLE LEVER		--	
	VALVE SELECTION	VELAN TYPE R, METAL SEATED, CLASS 900		--	
GLOBE VALVE	CONNECTION AND RATING	CLASS 800 PSIG SOCKETWELD		BUTTWELD ENDS	
	CONSTRUCTION	BODY/BONNET: A105 (BOLTED) (BODY HARDFACED) DISC: 420SST TRIM: 13% Cr STEM: A183 F6A PACKING: GRAPHITE GASKET: SPIRAL WOUND SST WITH GRAPHITE		BODY/BONNET: A216 GR. WCB (BOLTED) SEAT RING: A105 OR A216 HARDFACED DISC: A105 OR A216 WCB WITH 13% CR OVERLAY STEM: 410 SS PACKING: GRAPHITE GASKET: CORRUGATED SST WITH GRAPHITE	
	VALVE SELECTION	POWELL FIGURE GL08 VOGT SW12141 BONNEY FORGE FIG. H31SW		POWELL FIGURE 3031 CRANE FIGURE 151-1/2 BONNEY FORGE 3-31 BW	
<b>REVISION HISTORY</b>					
NUMBER	DESCRIPTION			DATE	
0	INITIAL ISSUE			2/22/2021	



**LOW PRESSURE CONDENSATE (TO 50 PSIG)**

PIPING SPECIFICATION:		PROCESS:		DESIGN CONDITIONS:	
<b>UI-LP-CON</b>	PIPE SIZE (NPS)	LOW PRESSURE CONDENSATE		50 PSIG AT 340 °F	
	WEIGHT/SCHEDULE	2" AND SMALLER		2 1/2" THRU 24"	
PIPE MATERIAL: ASME B36.10M	MATERIAL	XS		XS	
	CONSTRUCTION	A106 GRADE B - SEAMLESS		A106 GRADE B - SEAMLESS	
FITTINGS:	CONSTRUCTION	CLASS 3000 - SOCKETWELD - B16.11		BUTTWELD - ASME B16.9	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	MATERIAL	FORGED CARBON STEEL - ASTM A105		BUTTWELD FITTING - ASTM A234 GRADE B - SEAMLESS	
PIPING JOINTS:	TYPE	SOCKETWELD		BUTTWELD - END PREP PER B16.25	
	OTHER	WHERE FLANGE OR THREAD REQUIRED		WHERE FLANGE REQUIRED	
UNIONS:	CONSTRUCTION	CLASS 3000 - SW - B16.11 - FLAT FACE WITH SPIRAL WOUND GASKET DESIGN		NOT REQUIRED	
	WALL THICKNESS	SAME AS ADJOINING PIPE		--	
	MATERIAL	FORGED CARBON STEEL - ASTM A105		--	
FLANGES:	CONSTRUCTION	CLASS 150 - WELD NECK - ASME B16.5			
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	MATERIAL	FORGED CARBON STEEL - ASTM A105		FORGED CARBON STEEL - ASTM A105	
FLANGE BOLTS:	CONSTRUCTION	ALLOY STEEL, AISI 4140/4142 QUENCHED AND TEMPERED, A193 GRADE B7			
FLANGE NUTS:	CONSTRUCTION	HEAVY HEX - A194 GRADE 2H			
WASHER:	CONSTRUCTION	F436			
GASKETS:	CONSTRUCTION	SPIRAL WOUND - SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES			
	MATERIAL	FLEXITALLIC STYLE CGI - TYPE 304 STAINLESS - FLEXICARB FILLER			
THERMOWELLS:	CONSTRUCTION	INSERTION THERMOWELLS - 3000 PSIG PRESSURE CLASS - SEAL WELDED WELLS			
	MATERIAL	ASTM A106 CARBON STEEL			
PIPE MATERIAL:	PIPE CODE:	DESIGN/CONSTRUCTION CODE:		REVISION:	DATE REVISED:
CARBON STEEL	ASTM B36.10M	ASME B31.1		4	2/22/2021
VALVE SPECIFICATION:	SPECIFICATION MATERIAL:	PRESSURE CLASS:	DESIGN CODE:		
	CARBON STEEL	150 PSIG	ASME B31.1	ASME B16.34	
<b>UI-LP-CON</b>	PIPE SIZE (NPS)	2" AND SMALLER		2 1/2" THRU 24"	
	CONNECTION AND RATING	CLASS 800 PSIG SOCKETWELD		CLASS 150 FLANGED ENDS	
GATE VALVE	CONSTRUCTION	BODY/BONNET: A105, TRIM 13% CR OUTSIDE SCREW & YOKE, BOLTED GLAND, SOLID WEDGE, HARD FACED SEATS, CLASS 800 PACKING: GRAPHITE		BODY/BONNET: A216 GR. WCB SEAT RING: HARDFACED DISC/WEDGE: A217 GR. CA15 OR WCB WITH 13% CR OVERLAY STEM: 410 SS PACKING: GRAPHITE GASKET: CORRUGATED SS WITH GRAPHITE	
	VALVE SELECTION	POWELL FIGURE GA08 VOGT SW12111 BONNEY FORGE FIG. H11SW		POWELL FIGURE 1503 CRANE FIGURE 47 BONNEY FORGE 1-11 RF	
BUTTERFLY VALVE	CONNECTION AND RATING	--		CLASS 150 FLANGED ENDS	
	CONSTRUCTION	--		BODY/BONNET: A216 GR. WCB SEAT RING: METAL SEAT DISC: A351 CF8M SHAFT: 17-4 PH PACKING: PTFE GLAND: 304 SS	
	VALVE SELECTION	--		POWELL FIGURE 1572 DEZURIK STYLE BHP FLOWSEAL TYPE 1LA	
CHECK VALVE	CONNECTION AND RATING	CLASS 800 PSIG SOCKETWELD		CLASS 150 FLANGED ENDS	
	CONSTRUCTION	BODY/CAP: A105 (BOLTED) SWING CHECK SEAT RING: STELLITE 6 FACED 410 SS DISC: 13% CR GASKET: SPIRAL WOUND		BODY/CAP: A216 GR. WCB (BOLTED) SEAT RING: HARDFACED DISC: A105 OR A216 WCB WITH 13% CR OVERLAY GASKET: CORRUGATED SST WITH GRAPHITE	
	VALVE SELECTION	POWELL FIGURE SW08 VOGT SW701 BONNEY FORGE FIG. H61SW		POWELL FIGURE 1561 CRANE FIGURE 147 BONNEY FORGE 1-61 RF	
BALL VALVE	CONNECTION AND RATING	CLASS 800 PSIG SOCKETWELD		CLASS 150 FLANGED ENDS (UP TO 6")	
	CONSTRUCTION	BODY: A105, STEM SS 410 COND. 2 THRUST WASHER: STELLITE 6; BALL AND SEAT: SS 410/CHROME CARBIDE COATED; STEM: SS 410; THRUST BUSHING: BRONZE; PACKING FLANGE SS 304 STEM BUSHING: NITRIDED SS410 COND. 2; SEAT SS 410 COND.2 CHROME CARBIDE COATED LOCKABLE LEVER		BODY: A105, STEM SS 410 COND. 2 THRUST WASHER: STELLITE 6; BALL AND SEAT: SS 410/CHROME CARBIDE COATED; STEM: SS 410; THRUST BUSHING: BRONZE; PACKING FLANGE SS 304 STEM BUSHING: NITRIDED SS410 COND. 2; SEAT SS 410 COND.2 CHROME CARBIDE COATED LOCKABLE LEVER (GEAR OPERATOR OVER 4")	
	VALVE SELECTION	VELAN TYPE R, METAL SEATED, CLASS 900		VELAN TYPE R	
GLOBE VALVE	CONNECTION AND RATING	CLASS 800 PSIG SOCKETWELD		CLASS 150 FLANGED ENDS	
	CONSTRUCTION	BODY/BONNET: A105 (BOLTED) (BODY HARDFACED) DISC: 420SST TRIM: 13% Cr STEM: A183 F6A PACKING: GRAPHITE GASKET: SPIRAL WOUND SST WITH GRAPHITE		BODY/BONNET: A216 GR. WCB (BOLTED) SEAT RING: A105 OR A216 HARDFACED DISC: A105 OR A216 WCB WITH 13% CR OVERLAY STEM: 410 SS PACKING: GRAPHITE GASKET: CORRUGATED SST WITH GRAPHITE	
	VALVE SELECTION	POWELL FIGURE GL08 VOGT SW12141 BONNEY FORGE FIG. H31SW		POWELL FIGURE 1531 CRANE FIGURE 143 BONNEY FORGE 1-31 RF	
REVISION HISTORY					
NUMBER	DESCRIPTION			DATE	
1	CHANGED SMALL BORE VALVES TO CLASS 800 FROM CLASS 3000			6/30/2017	
2	ADDED WALL THICKNESS TO TABLE, REMOVED OTHER REFERENCES TO WALL THICKNESS			9/22/2017	
3	CHANGED UNIONS TO A FLAT-FACED GASKETED DESIGN			11/22/2017	
4	UPDATED LARGE BORE PIPE SCHEDULE; VALVE SELECTIONS			2/22/2021	

**HIGH PRESSURE CONDENSATE (TO 175 PSIG)**

PIPING SPECIFICATION:		PROCESS:		DESIGN CONDITIONS:	
<b>UI-HP-CON</b>	PIPE SIZE (NPS)	HIGH PRESSURE CONDENSATE		175 PSIG AT 500 °F	
	WEIGHT/SCHEDULE	2" AND SMALLER		2 1/2" THRU 24"	
PIPE MATERIAL: ASME B36.10M	MATERIAL	XS		XS	
	CONSTRUCTION	A106 GRADE B - SEAMLESS		A106 GRADE B - SEAMLESS	
FITTINGS:	CONSTRUCTION	CLASS 3000 - SOCKETWELD - B16.11		BUTTWELD - ASME B16.9	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	MATERIAL	FORGED CARBON STEEL - ASTM 105		BUTTWELD FITTING - ASTM A234 GRADE B - SEAMLESS	
PIPING JOINTS:	TYPE	SOCKETWELD		BUTTWELD - END PREP PER B16.25	
	OTHER	WHERE FLANGE OR THREAD REQUIRED		WHERE FLANGE REQUIRED	
UNIONS:	CONSTRUCTION	CLASS 3000 - SW - B16.11 - FLAT FACE WITH SPIRAL WOUND GASKET DESIGN		NOT PERMITTED	
	WALL THICKNESS	SAME AS ADJOINING PIPE		--	
	MATERIAL	FORGED CARBON STEEL - ASTM A105		--	
FLANGES:	CONSTRUCTION	CLASS 300 - WELD NECK - ASME B16.5			
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	MATERIAL	FORGED CARBON STEEL - ASTM A105		FORGED CARBON STEEL - ASTM A105	
FLANGE BOLTS:	CONSTRUCTION	ALLOY STEEL, AISI 4140/4142 QUENCHED AND TEMPERED, A193 GRADE B7, STUD - FULL LENGTH			
FLANGE NUTS:	CONSTRUCTION	HEAVY HEX - A194 GRADE 2H			
WASHER:	CONSTRUCTION	F436			
GASKETS:	CONSTRUCTION	SPIRAL WOUND - SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES			
	MATERIAL	FLEXITALLIC STYLE CGI - TYPE 304 STAINLESS - FLEXICARB FILLER			
THERMOWELLS:	CONSTRUCTION	INSERTION THERMOWELLS - 3000 PSIG PRESSURE CLASS - SEAL WELDED WELLS			
	MATERIAL	ASTM A106 CARBON STEEL			
PIPE MATERIAL:	PIPE CODE:	DESIGN/CONSTRUCTION CODE:		REVISION:	DATE REVISED:
CARBON STEEL	ASTM B36.10M	ASME B31.1		4	2/22/2021
VALVE SPECIFICATION:	SPECIFICATION MATERIAL:	PRESSURE CLASS:	DESIGN CODE:		
	CARBON STEEL	300 PSIG	ASME B31.1	ASME B16.34	
<b>UI-HP-CON</b>	PIPE SIZE (NPS)	2" AND SMALLER		2 1/2" THRU 24"	
	CONNECTION AND RATING	CLASS 800 PSIG SOCKETWELD		CLASS 300 FLANGED ENDS	
GATE VALVE	CONSTRUCTION	BODY/BONNET: A105, TRIM 13% CR OUTSIDE SCREW & YOKE, BOLTED GLAND, SOLID WEDGE, HARD FACED SEATS, CLASS 800 PACKING: GRAPHITE		BODY/BONNET: A105 OR A216 GR. WCB SEAT RING: HARDFACED DISC/WEDGE: A217 GR. CA15 OR WCB WITH 13% CR OVERLAY STEM: 410 SS PACKING: GRAPHITE GASKET: SPIRAL WOUND SS WITH GRAPHITE	
	VALVE SELECTION	POWELL FIGURE GA08 VOGT SW12111 BONNEY FORGE FIG. H11SW		POWELL FIGURE 3003 CRANE FIGURE 33-1/2 BONNEY FORGE 3-11 RF	
BUTTERFLY VALVE	CONNECTION AND RATING	--		CLASS 300 FLANGED ENDS (LUG STYLE)	
	CONSTRUCTION	--		BODY/BONNET: A217 GR. WC6 SEAT RING: A182 F11; STELLITE 6 FACED DISC/WEDGE: A217 GR. WC6; STELLITE 6 FACED STEM: 410 SS PACKING: GRAPHITE GASKET: SPIRAL WOUND SS WITH GRAPHITE	
	VALVE SELECTION			POWELL FIGURE 3072 (3" AND LARGER) FLOWSEAL METAL SEAT CLASS 300	
CHECK VALVE	CONNECTION AND RATING	CLASS 800 PSIG SOCKETWELD		CLASS 300 FLANGED ENDS	
	CONSTRUCTION	BODY/CAP: A105 (BOLTED) SWING CHECK SEAT RING: 316 HF DISC: 13% CR GASKET: SPIRAL WOUND		BODY/CAP: A216 GR. WCB (BOLTED) SEAT RING: HARDFACED DISC: A105 OR A216 WCB WITH 13% CR OVERLAY GASKET: CORRUGATED SST WITH GRAPHITE	
	VALVE SELECTION	POWELL FIGURE SW08 VOGT SW701 BONNEY FORGE FIGURE H61SW		POWELL FIGURE 3061 CRANE FIGURE 159-1/2 BONNEY FORGE 3-61 RF	
BALL VALVE	CONNECTION AND RATING	CLASS 900 PSIG SOCKETWELD		CLASS 300 FLANGED ENDS	
	CONSTRUCTION	BODY: A105, STEM SS 410 COND. 2 THRUST WASHER: STELLITE 6; BALL AND SEAT: SS 410/CHROME CARBIDE COATED; STEM: SS 410; THRUST BUSHING: BRONZE; PACKING FLANGE SS 304 STEM BUSHING: NITRIDED SS410 COND. 2; SEAT SS 410 COND.2 CHROME CARBIDE COATED LOCKABLE LEVER		BODY: A105, STEM SS 410 COND. 2 THRUST WASHER: STELLITE 6; BALL AND SEAT: SS 410/CHROME CARBIDE COATED; STEM: SS 410; THRUST BUSHING: BRONZE; PACKING FLANGE SS 304 STEM BUSHING: NITRIDED SS410 COND. 2; SEAT SS 410 COND.2 CHROME CARBIDE COATED LOCKABLE LEVER (GEAR OPERATOR OVER 4")	
	VALVE SELECTION	VELAN TYPE R, METAL SEATED, CLASS 900		VELAN TYPE R	
GLOBE VALVE	CONNECTION AND RATING	CLASS 800 PSIG SOCKETWELD		CLASS 300 FLANGED ENDS	
	CONSTRUCTION	BODY/BONNET: A105 (BOLTED) (BODY HARDFACED) DISC: 420SST TRIM: 13% Cr STEM: A183 F6A PACKING: GRAPHITE GASKET: SPIRAL WOUND SST WITH GRAPHITE		BODY/BONNET: A216 GR. WCB (BOLTED) SEAT RING: A105 OR A216 HARDFACED DISC: A105 OR A216 WCB WITH 13% CR OVERLAY STEM: 410 SS PACKING: GRAPHITE GASKET: CORRUGATED SST WITH GRAPHITE	
	VALVE SELECTION	POWELL FIGURE GL08 VOGT SW12141 BONNEY FORGE FIG. H31SW		POWELL FIGURE 3031 CRANE FIGURE 151-1/2 BONNEY FORGE 3-31 RF	
<b>REVISION HISTORY</b>					
NUMBER	DESCRIPTION			DATE	
1	CHANGED SMALL BORE VALVES TO CLASS 800 FROM CLASS 3000			6/30/2017	
2	ADDED WALL THICKNESS TO TABLE, REMOVED OTHER REFERENCES TO WALL THICKNESS			9/22/2017	
3	CHANGED UNIONS TO A FLAT-FACED GASKETED DESIGN			11/22/2017	
4	UPDATED LARGE BORE WALL THICKNESS; VALVE SELECTIONS			1/18/2021	

**COMPRESSED AIR SYSTEMS (TO 150 PSIG)**

PIPING SPECIFICATION:		PROCESS:		DESIGN CONDITIONS:	
<b>UI-AIR</b>	PIPE SIZE (NPS)	COMPRESSED AIR/INSTRUMENT AIR		150 PSIG AT 150 °F	
	WEIGHT/SCHEDULE	4" AND SMALLER (NOTE 1)		2-1/2" THRU 24" (NOTE 1)	
PIPE MATERIAL: ASME B36.10M/B88	MATERIAL	ASTM B88 COPPER, TYPE L, HARD DRAWN		ASTM A106 GRADE B - SEAMLESS (NON-BLACK STEEL)	
FITTINGS:	CONSTRUCTION	SOLDERED OR PRESS FIT		BUTTWELD	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	MATERIAL	ASME B16.18 CAST COPPER OR ASME B16.22 WROUGHT COPPER ALLOY		BUTTWELD FITTING - ASTM A234 GRADE B - SEAMLESS	
PIPING JOINTS:	TYPE	SOLDERED OR PRESS FIT		BUTTWELD - END PREP PER B16.25	
	OTHER	SEE BELOW FOR JOINT DETAILS		--	
SOLDER/FLANGES:	CONSTRUCTION	SOLDER: ASTM B32 ALLOY, GRADE Sb-5 95/5 TIN-ANTIMONY, LEAD FREE OR: ASTM B32 ALLOY, GRADE SN95 TIN-SILVER, LEAD FREE		CLASS 150 - WELD NECK - ASME B16.5	
	WALL THICKNESS			SAME AS ADJOINING PIPE	
	MATERIAL			FORGED STEEL - ASTM A105	
SOLDER/FLANGE BOLTS:	CONSTRUCTION	SOLDER: FILLER METAL LEAD-FREE - WATER-FLUSHABLE FLUX ASTM B813 - SILVER BRAZING FILLER METAL SHALL BE BCuP SERIES, COPPER PHOSPHORUS ALLOYS FOR GENERAL DUTY BRAZING - AWS A5.8		STUD - FULL-LENGTH ASME B1.1	
	MATERIAL			HIGH-STRENGTH STEEL - ASTM A193 - GRADE B7, FULL LENGTH STUD	
PRESS FIT/FLANGE NUTS:	CONSTRUCTION			HEAVY HEX - ASME B1.1 - CLASS 2B THREADS	
	MATERIAL	PRESS FIT: MATERIALS CONFORM TO ASME B16.18 OR: ASME B16.22 AND CRITERIA UNDER IAPMO PS 117 - SEALING ELEMENTS: EPDM - SEALING ELEMENTS FACTORY INSTALLED - FITTINGS SHALL BE PRESSED BY TOOLS RECOMMENDED BY FITTING MANUFACTURER		CARBON STEEL - ASTM A194 GRADE 2H HEAVY - F436 WASHERS	
PRESS FIT/GASKETS:	CONSTRUCTION			SPIRAL WOUND - SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES	
	MATERIAL			TYPE 304 SS - FULL FACE - FLEXITALLIC FLEXICARB STYLE CGI OR EQUAL	
UNIONS:	CONSTRUCTION	THREADED		NOT PERMITTED	
	MATERIAL	SAME AS ADJOINING PIPE			
	OTHER	INSTALL UNIONS: IN LONG RUNS AT 80' INTERVALS - IN BYPASS OF VALVES/EQUIPMENT - AT EQUIPMENT CONNECTIONS			
PIPE MATERIAL:	PIPE CODE:	DESIGN/CONSTRUCTION CODE:		REVISION:	DATE REVISED:
COPPER/CARBON STEEL	ASME B36.10M/B88	ASME B31.1		3	2/22/2021
FINISH:	SPECIFICATION MATERIAL:	DO NOT PAINT COPPER AIR PIPING		REFER TO PROJECT SPECIFICATION PAINT COMPRESSED AIR PIPING WHITE	
VALVE SPECIFICATION:	SPECIFICATION MATERIAL:	PRESSURE CLASS:	DESIGN CODE:		
<b>UI-AIR</b>	AS NOTED	150 PSIG	ASME B31.1	ASME B16.34	
	PIPE SIZE (NPS)	4" AND SMALLER (NOTE 1)		2 1/2" THRU 24" (NOTE 1)	
GATE VALVE	CONNECTION AND RATING	--		CLASS 150 FLANGED ENDS	
	CONSTRUCTION	--		BODY/BONNET: A216 GR. WCB SEAT RING: STELLITE 6 FACED DISC/WEDGE: A217 GR. CA15 OR WCB WITH 13% CR OVERLAY STEM: 410 SS PACKING: GRAPHITE GASKET: CORRUGATED SS WITH GRAPHITE	
	VALVE SELECTION	--		POWELL FIGURE 1503 CRANE FIGURE 47 BONNEY FORGE 1-11 RF	
BUTTERFLY VALVE	CONNECTION AND RATING	--		CLASS 150 FLANGED - LUG STYLE	
	CONSTRUCTION	--		BODY/BONNET: A216 GR. WCB SEAT RING: PTFE/RTFE/UHMWPE DISC: A351 CF8M SHAFT: 17-4 PH PACKING: PTFE GLAND: 304 SS	
	VALVE SELECTION	--		POWELL FIGURE 1572 JAMESBURY SERIES 815 FLOWSEAL TYPE 1LA	
CHECK VALVE	CONNECTION AND RATING	CLASS 200 PSIG THREADED OR SOLDERED		CLASS 150 FLANGED ENDS	
	CONSTRUCTION	BODY/BONNET: BRONZE DISC: BRONZE SEAT DISC: BUNA-N HINGE PIN AND PLUG: BRONZE ASTM B140 ALLOY DISC HANGER: SAME AS BODY		BODY/CAP: A216 GR. WCB (BOLTED) SEAT RING: HARDFACED DISC: A105 OR A216 WCB WITH 13% CR OVERLAY GASKET: CORRUGATED SST WITH GRAPHITE	
	VALVE SELECTION	NIBCO 433 SERIES APOLLO 161S SERIES (THRU 2")		POWELL FIGURE 1561 CRANE FIGURE 147 BONNEY FORGE 1-61 RF	
BALL VALVE	CONNECTION AND RATING	CLASS 600 PSIG THREADED OR SOLDERED		CLASS 150 FLANGED ENDS	
	CONSTRUCTION	BODY: CAST BRONZE OR BRASS, FULL PORT BALL: CHROME PLATED BRONZE OR BRASS STEM: BRONZE OR BRASS SEATS/SEALS: RPTFE PACKING: RPTFE LOCKABLE, QUARTER TURN LEVER HANDLE		BODY/BONNET: A105 OR WCB (BOLTED) SEAT RING: MPTE/PTFE/RPTFE BALL AND STEM: SS 316 PACKING: PTFE AND GRAPHITE BODY SEAL: SS 316 GRAPHITE LOCKING LEVER (3" AND SMALLER) LOCKING GEAR OPERATOR (4" AND LARGER)	
	VALVE SELECTION	APOLLO 70-200 SERIES MILWAUKEE BA-485B NIBCO S-FP-600A SERIES		VELAN UB-150 JAMESBURY SERIES 7000 KECKLEY BVF1	

**NOTES:**  
1) EITHER COPPER OR CARBON STEEL PIPE MATERIAL MAY BE USED FOR PIPE SIZES BETWEEN 2-1/2" AND 4". FINAL PIPE MATERIAL SHALL BE SELECTED BASED UPON THE INDIVIDUAL PROJECT NEEDS. DESIGN PROFESSIONAL SHALL COORDINATE SELECTION OF PIPE MATERIAL WITH UTILITY OPERATOR.

REVISION HISTORY		
NUMBER	DESCRIPTION	DATE
1	ADDED WALL THICKNESS TO TABLE, REMOVED OTHER REFERENCES TO WALL THICKNESS	9/22/2017
2	ADDED 'FINISH' SPECIFICATION	10/10/2019
3	UPDATED VALVE SELECTIONS; INCREASED UPPER LIMIT FOR COPPER PIPE SIZE TO 4" AND ADDED OVERLAP SIZE RANGE	2/22/2021

**SANITARY/STORM SEWER/VENT**

PIPING SPECIFICATION:		PROCESS:		DESIGN CONDITIONS:	
<b>UI-SEW</b>		SANITARY SEWER, SEWER VENT, STORM		15 PSIG AT 140 °F	
PIPE SIZE (NPS)		4" AND SMALLER		ALL SIZES	
WEIGHT/SCHEDULE		--		SERVICE WEIGHT	
MATERIAL		ASTM B306, DWV		CAST IRON, ASTM A74	
CONSTRUCTION		SOLDERED OR PRESS FIT		BELL AND SPIGOT	
MATERIAL		ASTM B16.23 CAST BRONZE OR ASME B16.29 WROUGHT COPPER		CAST IRON, ASTM A74	
ABOVE GRADE TYPE		SOLDERED OR PRESS FIT		ASTM C564, RUBBER GASKETS JOINT DEVICES OR LEAD AND OAKUM	
SOLDER/BURIED TYPE		SOLDER: ASTM B32 ALLOY, GRADE Sb-5 95/5 TIN-ANTIMONY, LEAD FREE OR: ASTM B32 ALLOY, GRADE SN95 TIN-SILVER, LEAD FREE		HUB AND SPIGOT, CISPI HSN COMPRESSION TYPE WITH ASTM C564 NEOPRENE GASKETS OR LEAD AND OAKUM	
NOTES:		1) THIS SPECIFICATION IS INTENDED FOR MAIN DRAIN AND VENT LINES WITHIN THE POWER AND CHILLED WATER PLANTS ON MAIN CAMPUS AND OAKDALE CAMPUS. FOLLOW THE UNIVERSITY OF IOWA DESIGN STANDARDS AND PROCEDURES FOR BUILDING PLUMBING SYSTEMS (I.E. RESTROOMS, KITCHEN AREAS, ETC.) WITHIN THESE PLANTS. 2) EITHER COPPER OR CAST IRON PIPE MATERIAL MAY BE USED FOR PIPE SIZES BETWEEN 4" AND SMALLER. FINAL PIPE MATERIAL SHALL BE SELECTED BASED UPON THE INDIVIDUAL PROJECT NEEDS. DESIGN PROFESSIONAL SHALL COORDINATE SELECTION OF PIPE MATERIAL WITH UTILITY OPERATOR. 3) PROVIDE TRAPS ON ALL SANITARY BRANCH WASTE CONNECTIONS FROM FIXTURES WITHOUT TRAPS 4) EXPOSED BRASS SHALL BE CHROME-PLATED POLISHED BRASS WITH NIPPLE AND SET SCREW ESCUTCHEONS 5) CONCEALED TRAPS MAY BE ROUGH CAST BRASS OR SAME MATERIAL AS PIPE CONNECTED TO 6) SLIP JOINTS NOT ALLOWED ON SEWER SIDE OF TRAP 7) TRAPS SHALL CORRESPOND TO FITTINGS ON CAST IRON SOIL PIPE OR STEEL PIPE 8) SIZE SHALL BE AS REQUIRED BY CONNECTED SERVICE OR FIXTURE			
PIPE MATERIAL:		PIPE CODE		TYPE	
COPPER/CAST IRON		ASTM B306/A74		PRESS FIT, SOLDER, BELL AND SPIGOT OR HUBLESS	
VALVE SPECIFICATION:		SPECIFICATION MATERIAL:		REVISION:	
UI-SEW		CAST IRON		2	
CONNECTION AND RATING		PRESSURE CLASS:		DATE REVISION:	
GATE VALVE		125 PSIG OR 150 PSIG		2/22/2021	
CONSTRUCTION		DESIGN CODE:			
VALVE SELECTION		ASTM B31.1 / ASME B16.34			
CONNECTION AND RATING		--		PER ADJOINING PIPING SPECIFICATIONS	
CONSTRUCTION		--		BODY: CAST IRON COVER: CAST IRON HANDWHEEL: CAST IRON (REMOVABLE) GATE FLAPPER: BRONZE EXTENSIONS: CAST IRON	
CONSTRUCTION		--		POWELL FIGURE 1787 (2" THRU 24") MILWAUKEE SERIES F-2882 CRANE F53	
CONNECTION AND RATING		--		PER ADJOINING PIPING SPECIFICATIONS	
CONSTRUCTION		--		BODY/BONNET: ASTM A126 CAST IRON BODY BEARING: SS 316 PACKING: PTFE HANDWHEEL: CAST IRON (REMOVABLE) PLUG: SS 316 EXTENSIONS: CAST IRON	
STANDARD		--		ANSI/AWWA C517	
VALVE SELECTION		--		DEZURIK PEC SERIES OR EQUAL BY MILLIKEN	

CARBON STEEL:		
NUMBER	DESCRIPTION	DATE
1	INITIAL ISSUE	4/14/2017
2	UPDATED VALVE SELECTIONS; ADDED COPPER DWV PIPING AS AN OPTION FOR SMALLER SIZES	2/22/2021

**PROCESS WATER - INTERIOR (TO 135 PSIG)**

PIPING SPECIFICATION:		PROCESS:		DESIGN CONDITIONS:	
<b>UI-PCW (CS)</b>	PIPE SIZE (NPS)	PROCESS WATER 4" AND SMALLER (NOTE 1)		135 PSIG at 200 °F 2 1/2" THRU 24" (NOTE 1)	
	PIPE MATERIAL: ASME B36.10M/B88	WEIGHT/SCHEDULE	--	STD	
FITTINGS:	MATERIAL	ASTM B88 COPPER, TYPE L, HARD DRAWN		ASTM A106 GRADE B SEAMLESS (NON-BLACK STEEL)	
	CONSTRUCTION	SOLDERED OR PRESS FIT		BUTTWELD - ASME B16.25	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
JOINTS:	MATERIAL	ASME B16.18 CAST COPPER OR ASME B16.22 WROUGHT COPPER ALLOY		BUTTWELD FITTING - ASTM A234 GRADE B - SEAMLESS	
	TYPE	SOLDERED OR PRESS FIT		BUTTWELD - END PREP PER B16.25	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
SOLDER/FLANGES:	OTHER	SEE BELOW FOR JOINT DETAILS		--	
	CONSTRUCTION	SOLDER: ASTM B32 ALLOY, GRADE Sb-5 95/5 TIN-ANTIMONY, LEAD FREE OR: ASTM B32 ALLOY, GRADE SN95 TIN-SILVER, LEAD FREE		CLASS 150 - WELD NECK - ASME B16.5	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
SOLDER/FLANGE BOLTS:	MATERIAL	FORGED CARBON STEEL - ASTM A105		--	
	CONSTRUCTION	SOLDER: FILLER METAL LEAD-FREE - WATER-FLUSHABLE FLUX ASTM B813 - SILVER BRAZING FILLER METAL SHALL BE BCuP SERIES, COPPER PHOSPHORUS ALLOYS FOR GENERAL DUTY BRAZING - AWS A5.8		STUD - FULL-LENGTH ASME B1.1	
PRESS FIT/FLANGE NUTS:	MATERIAL	HIGH-STRENGTH STEEL - ASTM A193 - GRADE B7, FULL LENGTH STUD		HEAVY HEX - ASME B1.1 - CLASS 2B THREADS	
	CONSTRUCTION	PRESS FIT: MATERIALS CONFORM TO ASME B16.18 OR: ASME B16.22 AND CRITERIA UNDER IAPMO PS 117 - SEALING ELEMENTS: EPDM - SEALING ELEMENTS FACTORY INSTALLED - FITTINGS SHALL BE PRESSED BY TOOLS RECOMMENDED BY FITTING MANUFACTURER		CARBON STEEL - ASTM A194 GRADE 2H HEAVY - F436 WASHERS	
PRESS FIT/GASKETS:	CONSTRUCTION	SPIRAL WOUND - SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES		--	
	MATERIAL	TYPE 304 SS - FULL FACE - FLEXITALLIC FLEXICARB STYLE CGI OR EQUAL		--	
WASHER:	CONSTRUCTION	--		CARBON STEEL - ASTM A194 GRADE 2H HEAVY - F436 WASHERS	
UNIONS:	CONSTRUCTION	THREADED		--	
	MATERIAL	SAME AS ADJOINING PIPE		--	
	OTHER	INSTALL UNIONS: IN LONG RUNS AT 80' INTERVALS - IN BYPASS OF VALVES/EQUIPMENT - AT EQUIPMENT CONNECTIONS		NOT PERMITTED	
PIPE MATERIAL:	PIPE CODE:	DESIGN/CONSTRUCTION CODE:		REVISION:	DATE REVISED:
COPPER/CARBON STEEL	ASME B36.10M/B88	ASME B31.1		2	2/22/2021
VALVE SPECIFICATION:	SPECIFICATION MATERIAL:	PRESSURE CLASS:	DESIGN CODE:		
<b>UI-PCW (CS)</b>	AS NOTED	150 PSIG	ASME B31.1	ASME B16.34	
GATE VALVE	PIPE SIZE (NPS)	4" AND SMALLER (NOTE 1)		2 1/2" THRU 24" (NOTE 1)	
	CONNECTION AND RATING	--		CLASS 150 FLANGED ENDS	
	CONSTRUCTION	--		BODY/BONNET: A216 GR. WCB SEAT RING: STELLITE 6 FACED DISC/WEDGE: A217 GR. CA15 OR WCB WITH 13% CR OVERLAY STEM: 410 SS PACKING: GRAPHITE GASKET: CORRUGATED SS WITH GRAPHITE	
BUTTERFLY VALVE	VALVE SELECTION	--		POWELL FIGURE 1503 CRANE FIGURE 47 BONNEY FORGE 1-11 RF	
	CONNECTION AND RATING	--		CLASS 150 FLANGED ENDS (LUG STYLE)	
	CONSTRUCTION	--		BODY/BONNET: A216 GR. WCB SEAT RING: PTFE/RTFE/UHMWPE DISC: A351 CF8M SHAFT: 17-4 PH PACKING: PTFE GLAND: 304 SS	
CHECK VALVE	VALVE SELECTION	--		POWELL FIGURE 1572 JAMESBURY SERIES 815 FLOWSEAL TYPE 1LA	
	CONNECTION AND RATING	CLASS 200 PSIG THREADED OR SOLDERED		CLASS 150 FLANGED ENDS	
	CONSTRUCTION	BODY/BONNET: BRONZE DISC: BRONZE SEAT DISC: BUNA-N HINGE PIN AND PLUG: BRONZE ASTM B140 ALLOY DISC HANGER: SAME AS BODY		BODY/CAP: A216 GR. WCB (BOLTED) SEAT RING: HARD FACED DISC: A105 OR A216 WCB WITH 13% CR OVERLAY GASKET: CORRUGATED SST WITH GRAPHITE	
BALL VALVE	VALVE SELECTION	NIBCO 433 SERIES APOLLO 161S SERIES (THRU 2")		POWELL FIGURE 1561 CRANE FIGURE 147 BONNEY FORGE 1-61 RF	
	CONNECTION AND RATING	CLASS 600 PSIG THREADED OR SOLDERED		CLASS 150 FLANGED ENDS (UP TO 6")	
	CONSTRUCTION	BODY: CAST BRONZE OR BRASS, FULL PORT BALL: CHROME PLATED BRONZE OR BRASS STEM: BRONZE OR BRASS SEATS/SEALS: RPTFE PACKING: RPTFE LOCKABLE, QUARTER TURN LEVER HANDLE		BODY/BONNET: A105 OR WCB (BOLTED) SEAT RING: MPTFE/PTFE/RPTFE BALL AND STEM: SS 316 PACKING: PTFE AND GRAPHITE BODY SEAL: SS 316 GRAPHITE GEAR OPERATOR 4" AND LARGER	
	VALVE SELECTION	APOLLO 70-200 SERIES MILWAUKEE BA-485B NIBCO S-FP-800A SERIES		VELAN UB-150 JAMESBURY SERIES 7000 KECKLEY BVF1	
<b>NOTES:</b>					
1) EITHER COPPER OR CARBON STEEL PIPE MATERIAL MAY BE USED FOR PIPE SIZES BETWEEN 2-1/2" AND 4". FINAL PIPE MATERIAL SHALL BE SELECTED BASED UPON THE INDIVIDUAL PROJECT NEEDS. DESIGN PROFESSIONAL SHALL COORDINATE SELECTION OF PIPE MATERIAL WITH UTILITY OPERATOR.					
<b>REVISION HISTORY</b>					
1	CHANGED SMALL BORE VALVES TO CLASS 600 FROM CLASS 3000			6/30/2017	
2	ADDED ADDITIONAL VALVE MANUFACTURERS; CHANGED SMALL BORE PIPING TO COPPER AND ALLOWED PIPE SIZE OVERLAP			2/22/2021	

**PROCESS WATER - EXTERIOR (TO 150 PSIG)**

PIPING SPECIFICATION:		PROCESS:		DESIGN CONDITIONS:	
<b>UI-PCW (SS)</b>	PIPE SIZE (NPS)	PROCESS WATER - OUTSIDE		150 PSIG AT 100 °F	
	WEIGHT/SCHEDULE	2" AND SMALLER		2 1/2" THRU 24"	
PIPE MATERIAL: ASME B36.10M	MATERIAL	SCH 40S		SCH 10S	
	CONSTRUCTION	A312 TYPE 304 - SEAMLESS OR WELDED		A312 GRADE 304 - SEAMLESS OR WELDED	
FITTINGS:	CONSTRUCTION	CLASS 3000 - SOCKETWELD - B16.11		BUTT WELD - ASME B16.9	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	MATERIAL	FORGED STEEL - ASTM A182, F304L, ASME B16.25		ASTM A403, WP304L - SEAMLESS, B16.25	
PIPING JOINTS:	TYPE	SOCKETWELD		BUTT WELD - END PREP PER B16.25	
	OTHER	UNIONS: CLASS 3000 - SW - B16.11 - FLAT-FACE WITH SPIRAL WOUND GASKET DESIGN		--	
FLANGES:	CONSTRUCTION	FLANGES NOT PERMITTED		CLASS 150 - WELD NECK - ASME B16.47 AND B16.5	
	WALL THICKNESS	--		SAME AS ADJOINING PIPE	
	MATERIAL	--		SS, ASTM A182, F330L, ASME B16.5	
FLANGE BOLTS:	CONSTRUCTION	--		HIGH-STRENGTH STAINLESS STEEL, GRADE B8, CLASS 2, STUD - FULL LENGTH	
FLANGE NUTS:	CONSTRUCTION	--		HEAVY HEX - A194 GRADE 8	
WASHER:	CONSTRUCTION	--		SS304	
GASKETS:	CONSTRUCTION	--		SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES	
	MATERIAL	--		FULL FACE - 1/16" ARAMID FIBER WITH SBR BINDER - GARLOCK BLUE-GARD OR EQUAL	
PIPE MATERIAL:	PIPE CODE:	DESIGN/CONSTRUCTION CODE:		REVISION:	DATE REVISED:
STAINLESS STEEL	ASTM B36.10M	ASME B31.1		1	2/22/2021
VALVE SPECIFICATION:	SPECIFICATION MATERIAL:	PRESSURE CLASS:	DESIGN CODE:		
<b>UI-PCW (SS)</b>	STAINLESS STEEL	150 PSIG	ASME B31.1 ASME B16.34		
	PIPE SIZE (NPS)	2" AND SMALLER		2 1/2" THRU 24"	
GATE VALVE	CONNECTION AND RATING	--		CLASS 150 FLANGED ENDS	
	CONSTRUCTION	--		BODY: ASTM A351 CF8M BONNET: ASTM A351 CF8M DISC: ASTM A351 CF8M STEM: ASTM A276 T316 PACKING: PTFE	
	VALVE SELECTION	--		POWELL FIGURE 1503 CRANE FIGURE 47 (THRU 24") BONNEY FORGE 1-18 RF	
BUTTERFLY VALVE	CONNECTION AND RATING	--		LUGGED FOR CLASS 150 FLANGED ENDS	
	CONSTRUCTION	--		BODY: A182 GR. F316 OR A351 GR. CF8M SEAT: TFE/ITON DISC: A182 GR. F316 OR A351 GR. CF8M SHAFT: 17-4 PH PACKING: TFE	
	VALVE SELECTION	--		POWELL FIGURE 1572 CRANE FLOWSEAL TYPE 1LA (12" AND SMALLER) TYPE 1LC (14" AND LARGER) JAMESBURY SERIES 815	
CHECK VALVE	CONNECTION AND RATING	CLASS 800 SOCKETWELD		CLASS 150 FLANGED ENDS (2-1/2" THRU 12")	
	CONSTRUCTION	BODY/CAP: A182 F316L CARRIER/CARRIER PIN: 316SS DISC: A276 T316 SEAT RING: 316 SST GASKET: SPIRAL WOUND SST WITH PTFE		BODY: ASTM A351 GR. CF8M CAP: ASTM A351 GR. CF8M CARRIER/CARRIER PIN: 316SS DISC: ASTM A351 GR. CF8M GASKET: PTFE	
	VALVE SELECTION	POWELL FIGURE SW08 VOGT SERIES SWS718 BONNEY FORGE HL-68-SW		POWELL FIGURE 1561 CRANE FIGURE 147 (THRU 24") BONNEY FORGE 1-68 RF	
BALL VALVE	CONNECTION AND RATING	CLASS 800 SOCKETWELD		CLASS 150 FLANGED ENDS (2-1/2" THRU 20")	
	CONSTRUCTION	BODY/BONNET: ASTM A351, CF8M STAINLESS STEEL, FULL-PORT SEAT RING: XTREME BALL: SS 316 SEAL: PTFE PACKING: GRAPHITE		BODY/INSERT: A351 CF8M BALL: 316 SS STEM: 316 SS SEAT: PTFE BODY SEAL: TFM STEM SEAL: PTFE GEAR OPERATOR 4" AND LARGER	
	VALVE SELECTION	JAMESBURY SERIES 4000 MODEL A KECKLEY SYTE BVM3 KITZ U3T2M		JAMESBURY SERIES 7150 KECKLEY BVF1 (THRU 6") VELAN SB-150	
<b>REVISION HISTORY</b>					
NUMBER	DESCRIPTION			DATE	
0	INITIAL ISSUE			12/5/2018	
1	ADDED VALVE MANUFACTURERS			1/21/2021	

**PROCESS WATER - DI (TO 150 PSIG)**

PIPING SPECIFICATION:		PROCESS:		DESIGN CONDITIONS:	
<b>UI-PCW-DI</b>	PIPE SIZE (NPS)	PROCESS WATER - OUTSIDE		150 PSIG at 150 °F	
	WEIGHT/SCHEDULE	3" THRU 24"			
PIPE MATERIAL:	MATERIAL	SPECIAL THICKNESS CLASS 53 ANSI/AWWA C150/A21.50			
ANSI/AWWA C151/A21.51	CONSTRUCTION	ANSI/AWWA C151/A21.51 DUCTILE IRON PIPING			
FITTINGS:	DESIGN RATING	ANSI/AWWA C110/A21.10 FLANGED			
	MATERIAL	150 PSIG IN ACCORDANCE WITH ANSI/AWWA C110/A21.10 DUCTILE IRON			
JOINTS:	TYPE	ANSI/AWWA C115/A21.15 FLANGED			
	DESIGN RATING	250 PSIG IN ACCORDANCE WITH ANSI/AWWA C115/A21.15			
SERVICE SADDLES:	OTHER	-			
	CONSTRUCTION	ASTM A536 DUCTILE IRON			
	DESIGN RATING	350 PSIG IN ACCORDANCE WITH ANSI/AWWA C800			
	COATING	FUSION BONDED BLACK NYLON			
FLANGES:	STRAPS	TYPE 304 STAINLESS STEEL			
	CONSTRUCTION	CLASS 150 - WELD NECK - ASME B16.5			
	WALL THICKNESS	SAME AS ADJOINING PIPE			
BOLTS:	MATERIAL	FORGED CARBON STEEL - ASTM A105			
	CONSTRUCTION	STAINLESS STEEL IN ACCORDANCE WITH ASTM A240			
NUTS:	CONSTRUCTION	HEAVY HEX - A194 GRADE 2H			
WASHERS:	CONSTRUCTION	TYPE 304 STAINLESS STEEL			
GASKETS:	CONSTRUCTION	SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES AND FOR USE WITH SERVICE SADDLES			
	STANDARD	ANSI/AWWA C111/A21.11			
	MATERIAL	FULL FACE - 1/16" ARAMID FIBER WITH SBR BINDER - GARLOCK BLUE-GARD OR EQUAL			
PIPE LINING:	CONSTRUCTION	CEMENT MORTAR LINING AND SEAL COAT			
	STANDARD	ANSI/AWWA C104/A21.4			
PIPE MATERIAL:	PIPE CODE:	DESIGN/CONSTRUCTION CODE:	REVISION:	DATE REVISED:	
DUCTILE IRON	ANSI/AWWA C151/A21.51	--	0	2/22/2021	
VALVE SPECIFICATION:	SPECIFICATION MATERIAL:	PRESSURE CLASS:	DESIGN CODE:		
<b>UI-PCW-DI</b>	DUCTILE IRON	--	--	--	
	PIPE SIZE (NPS)	3" THRU 24"			
BUTTERFLY VALVE	CONNECTION AND RATING	LUGGED FOR CLASS 150 FLANGES			
	CONSTRUCTION	BODY/SEAT: CARBON STEEL STEM: SS DISC: SS GLAND/BEARING: SS WITH RTFE IMPREGNATED OPERATOR: GEARED HANDWHEEL W/ POSITION INDICATOR SEAT: PTFE 200 PSIG WORKING PRESSURE			
	VALVE SELECTION	ABZ SERIES 400 DEZURIK STYLE BHP JAMESBURY SERIES 815			
<b>NOTES:</b>					
1) DESIGN PROFESSIONAL SHALL DISCUSS THE USE OF DUCTILE IRON PIPING IN PROCESS WATER SERVICE WITH UTILITY OPERATOR DURING PROJECT DESIGN					
<b>REVISION HISTORY</b>					
NUMBER	DESCRIPTION			DATE	
0	INITIAL ISSUE			2/22/2021	

**CHEMICAL TREATMENT SERVICE  
- SAMPLE WATER (TO 150 PSIG)**

PIPING SPECIFICATION:		PROCESS:	DESIGN CONDITIONS:	
<b>UI-CSS</b>	<b>PIPE SIZE (NPS)</b>	CHEMICAL TREATMENT	150 PSIG AT 100 °F	
	<b>WEIGHT/SCHEDULE</b>	2" AND SMALLER	2 1/2" THRU 6"	
<b>PIPE MATERIAL:</b> ASME B36.10M	<b>MATERIAL</b>	POLYVINYL CHLORIDE (PVC) ASTM D1784, WITH CELL CLASS OF 12454	POLYVINYL CHLORIDE (PVC) ASTM D1784, WITH CELL CLASS OF 12454	
	<b>CONSTRUCTION</b>	SOLVENT WELD TYPE	SOLVENT WELD TYPE	
<b>FITTINGS:</b>	<b>STANDARD</b>	ASTM D2467	ASTM F1970	
	<b>WALL THICKNESS</b>	SAME AS ADJOINING PIPE	SAME AS ADJOINING PIPE	
	<b>SOLVENT MATERIAL</b>	SOLVENT CEMENT IN ACCORDANCE WITH ASTM D2564	SOLVENT CEMENT IN ACCORDANCE WITH ASTM D2564	
<b>JOINTS:</b>	<b>CONSTRUCTION</b>	SOLVENT WELD TYPE	SOLVENT WELD TYPE	
	<b>WALL THICKNESS</b>	SAME AS ADJOINING PIPE	SAME AS ADJOINING PIPE	
	<b>SOLVENT MATERIAL</b>	SOLVENT CEMENT IN ACCORDANCE WITH ASTM D2564	SOLVENT CEMENT IN ACCORDANCE WITH ASTM D2564	
<b>FLANGES:</b>	<b>CONSTRUCTION</b>	FLANGE ONLY PERMITTED FOR EQUIPMENT OR VALVE CONNECTIONS	FLANGE ONLY PERMITTED FOR EQUIPMENT OR VALVE CONNECTIONS	
	<b>WALL THICKNESS</b>	SAME AS ADJOINING PIPE	SAME AS ADJOINING PIPE	
	<b>MATERIAL</b>	POLYVINYL CHLORIDE (PVC) ASTM F1970, WITH CLASS 150 FLANGE DIMENSIONS	POLYVINYL CHLORIDE (PVC) ASTM F1970, WITH CLASS 150 FLANGE DIMENSIONS	
<b>FLANGE BOLTS:</b>	<b>CONSTRUCTION</b>	CARBON STEEL BOLTS AND STUDS IN ACCORDANCE WITH ASTM A307	CARBON STEEL BOLTS AND STUDS IN ACCORDANCE WITH ASTM A307	
<b>FLANGE NUTS:</b>	<b>MATERIAL</b>	HEAVY HEX - A194 GRADE 8	HEAVY HEX - A194 GRADE 8	
	<b>CONSTRUCTION</b>	SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES	SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES	
<b>GASKETS:</b>	<b>CONSTRUCTION</b>	FULL FACE - 1/8" POLYTETRAFLUOETHYLENE (PTFE) - GARLOCK 3500 OR EQUAL	FULL FACE - 1/8" POLYTETRAFLUOETHYLENE (PTFE) - GARLOCK 3500 OR EQUAL	
	<b>MATERIAL</b>	FULL FACE - 1/8" POLYTETRAFLUOETHYLENE (PTFE) - GARLOCK 3500 OR EQUAL	FULL FACE - 1/8" POLYTETRAFLUOETHYLENE (PTFE) - GARLOCK 3500 OR EQUAL	
<b>PIPE MATERIAL:</b> PVC 1120	<b>PIPE CODE:</b> ASTM B36.10M	<b>DESIGN/CONSTRUCTION CODE:</b> ASME B31.1 (2012)		<b>REVISION:</b> 0
<b>VALVE SPECIFICATION:</b>	<b>SPECIFICATION MATERIAL:</b> PVC	<b>PRESSURE CLASS:</b> 150	<b>DESIGN CODE:</b> ASME B31.1	<b>DATE REVISED:</b> 2/22/2021
<b>UI-CSS</b>	<b>PIPE SIZE (NPS)</b>	1/2" THRU 6"		
	<b>CONNECTION AND RATING</b>	CLASS: 150 SOCKETWELD		
<b>CHECK VALVE</b>	<b>CONSTRUCTION</b>	BODY: ASTM D1784 CELL CLASS 12454, PVC, TYPE IV, "TRUE UNION" STYLE BALL: PVC, TYPE IV, ASTM D1784, CELL CLASSIFICATION 12454 SEAT PLATE: PVC, TYPE IV, ASTM D1784, CELL CLASSIFICATION 12454 PACKING: GRAPHITE O-RING: FKM		
	<b>VALVE SELECTION</b>	SPEARS TRUE UNION 2000 COLONIAL TRUE UNION CHECK VALVE HAYWARD TC SERIES		
<b>BALL VALVE</b>	<b>CONNECTION AND RATING</b>	CLASS: 150 SOCKETWELD		
	<b>CONSTRUCTION</b>	BODY: ASTM D1784 CELL CLASS 12454, PVC, SCH. 80, FULL-PORT, "TRUE UNION" STYLE BALL: PVC, TYPE 1, ASTM D1784, CELL CLASSIFICATION 12454 SEAT: PTFE STEM: PVC, TYPE 1, ASTM D1784, CELL CLASS 12454 HANDLE: POLYPROPYLENE PACKING: GRAPHITE O-RING: EPDM		
	<b>VALVE SELECTION</b>	SPEARS TRUE UNION 2000 COLONIAL FULL BLOCK INDUSTRIAL TRUE UNION BALL VALVE HAYWARD TB SERIES		
<b>REVISION HISTORY</b>				
<b>NUMBER</b>	<b>DESCRIPTION</b>		<b>DATE</b>	
0	INITIAL ISSUE		2/22/2021	



**CHEMICAL TREATMENT SERVICE  
(TO 150 PSIG)**

PIPING SPECIFICATION:		PROCESS:		DESIGN CONDITIONS:	
<b>UI-CHEM (CPVC)</b>	PIPE SIZE (NPS)	CHEMICAL TREATMENT		150 PSIG AT 100°F	
	WEIGHT/SCHEDULE	2" AND SMALLER		2 1/2" THRU 6"	
PIPE MATERIAL:	MATERIAL	SCH 80		SCH 80	
	MATERIAL	CHLORINATED POLYVINYL CHLORIDE (CPVC) ASTM D1784 TYPE IV, GRADE 1, WITH CELL CLASS OF 23447		CHLORINATED POLYVINYL CHLORIDE (PVC) ASTM D1784 TYPE IV, GRADE 1, WITH CELL CLASS OF 23447	
FITTINGS:	CONSTRUCTION	SOLVENT/SOCKET WELD TYPE		FABRICATED	
	STANDARD	ASTM F439		ASTM F1970	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	SOLVENT MATERIAL	SOLVENT CEMENT IN ACCORDANCE WITH ASTM F493		SOLVENT CEMENT IN ACCORDANCE WITH ASTM F493	
JOINTS:	CONSTRUCTION	SOLVENT WELD TYPE		SOLVENT WELD TYPE	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	SOLVENT MATERIAL	SOLVENT CEMENT IN ACCORDANCE WITH ASTM F493		SOLVENT CEMENT IN ACCORDANCE WITH ASTM F493	
FLANGES:	CONSTRUCTION	FLANGE ONLY PERMITTED FOR EQUIPMENT OR VALVE CONNECTIONS		FLANGE ONLY PERMITTED FOR EQUIPMENT OR VALVE CONNECTIONS	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	MATERIAL	CHLORINATED POLYVINYL CHLORIDE (CPVC) ASTM F1970, WITH CLASS 150 FLANGE DIMENSIONS		CHLORINATED POLYVINYL CHLORIDE (CPVC) ASTM F1970, WITH CLASS 150 FLANGE DIMENSIONS	
FLANGE BOLTS:	CONSTRUCTION	CARBON STEEL BOLTS AND STUDS IN ACCORDANCE WITH ASTM A307		CARBON STEEL BOLTS AND STUDS IN ACCORDANCE WITH ASTM A307	
FLANGE NUTS:	MATERIAL	HEAVY HEX - A194 GRADE 8		HEAVY HEX - A194 GRADE 8	
GASKETS:	CONSTRUCTION	SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES		SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES	
	MATERIAL	FULL FACE - 1/8" POLYTETRAFLUOETHYLENE (PTFE) - GARLOCK 3500 OR EQUAL		FULL FACE - 1/8" POLYTETRAFLUOETHYLENE (PTFE) - GARLOCK 3500 OR EQUAL	
PIPE MATERIAL:	PIPE CODE:	DESIGN/CONSTRUCTION CODE:		REVISION:	DATE REVISED:
CPVC (ASTM D1784)	ASTM F441	ASME B31.1		0	2/22/2021
VALVE SPECIFICATION:	SPECIFICATION MATERIAL:	PRESSURE CLASS:	DESIGN CODE:		
UI-CHEM (CPVC)	CHLORINATED POLYVINYL CHLORIDE (CPVC)	235 PSIG at 73°F	ASME B31.1	ASTM F1970	
	PIPE SIZE (NPS)	1/2" THRU 6"			
	CONNECTION AND RATING	CLASS: 150 SOCKETWELD			
CHECK VALVE	CONSTRUCTION	BODY: ASTM D1784 CELL CLASS 23447, CPVC, TYPE IV, "TRUE UNION" STYLE BALL: CPVC, TYPE IV, ASTM D1784, CELL CLASSIFICATION 23447 SEAT PLATE: CPVC, TYPE IV, ASTM D1784, CELL CLASSIFICATION 23447 O-RINGS: FKM			
	VALVE SELECTION	SPEARS TRUE UNION 2000 COLONIAL TRUE UNION CHECK VALVE HAYWARD TC SERIES			
BALL VALVE	CONNECTION AND RATING	CLASS: 150 SOCKETWELD			
	CONSTRUCTION	BODY: ASTM D1784 CELL CLASS 23447, CPVC, SCH. 80, FULL-PORT, "TRUE UNION" STYLE BALL: CPVC, TYPE 1, ASTM D1784, CELL CLASSIFICATION 23447 SEAT: PTFE STEM: CPVC, TYPE 1, ASTM D1784, CELL CLASS 23447 HANDLE: POLYPROPYLENE PACKING: GRAPHITE O-RINGS: FKM			
	VALVE SELECTION	SPEARS TRUE UNION 2000 COLONIAL FULL BLOCK INDUSTRIAL TRUE UNION BALL VALVE HAYWARD TB SERIES			
NOTES:					
1 FOR USE WITH LIQUID SERVICE. NOT FOR COMPRESSED AIR OR GAS SERVICE.					
2 PRESSURE RATINGS FOR FITTINGS AND FLANGES SHALL MEET OR EXCEED MAXIMUM WORKING PRESSURE.					
<b>REVISION HISTORY</b>					
NUMBER	DESCRIPTION			DATE	
0	INITIAL ISSUE			2/22/2021	

**CHEMICAL TREATMENT  
SERVICE - ACID (TO 150 PSIG)**

PIPING SPECIFICATION:		PROCESS:		DESIGN CONDITIONS:	
<b>UI-CHEM (PVDF)</b>	PIPE SIZE (NPS)	CHEMICAL TREATMENT		150 PSIG AT 100 °F	
	WEIGHT/SCHEDULE	2" AND SMALLER		2 1/2" THRU 6"	
PIPE MATERIAL:	MATERIAL	SCH 80		SCH 80	
	ASTM D3222	POLYVINYLIDENE FLUORIDE (PVDF) ASTM D3222 FOR TYPE I HOMOPOLYMERS WITH 1.7% RED PIGMENT		POLYVINYLIDENE FLUORIDE (PVDF) ASTM D3222 FOR TYPE I HOMOPOLYMERS WITH 1.7% RED PIGMENT	
FITTINGS:	CONSTRUCTION	HEAT FUSION WELDED		HEAT FUSION WELDED	
	STANDARD	ASTM D2467		ASTM D2467	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
JOINTS:	CONSTRUCTION	HEAT FUSION WELDED		HEAT FUSION WELDED	
	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	CONSTRUCTION	FLANGES NOT PERMITTED		FLANGES NOT PERMITTED	
FLANGES:	WALL THICKNESS	--		--	
	MATERIAL	--		--	
	CONSTRUCTION	--		--	
FLANGE BOLTS:	MATERIAL	--		--	
FLANGE NUTS:	MATERIAL	--		--	
GASKETS:	CONSTRUCTION	--		--	
	MATERIAL	--		--	
PIPE MATERIAL:	PIPE CODE:	DESIGN/CONSTRUCTION CODE:		REVISION:	DATE REVISED:
PVDF (ASTM D3222)	ASTM D1785	ASME B31.1		0	2/22/2021
<b>VALVE SPECIFICATION:</b>	<b>SPECIFICATION MATERIAL:</b>	<b>PRESSURE CLASS:</b>	<b>DESIGN CODE:</b>		
<b>UI-CHEM (PVDF)</b>	POLYVINYLIDENE FLUORIDE (PVDF)	150 PSIG at 73°F	ASME B31.1	--	
	PIPE SIZE (NPS)	1/2" THRU 4"			
CHECK VALVE	CONNECTION AND RATING	CLASS: 150 SOCKETWELD			
	CONSTRUCTION	BODY: ASTM D3222, WITH CELL CLASS TYPE II, RED PVDF, SCH. 80, FULL-PORT, "TRUE UNION" STYLE BALL: PVDF, ASTM D3222, WITH CELL CLASS TYPE II SEAT: FKM STOP RING: RED PVDF O-RING: FKM			
	VALVE SELECTION	NIBCO PVDF TRU UNION BALL CHECK WATTS PVDF TRUE UNION BALL CHECK			
BALL VALVE	CONNECTION AND RATING	CLASS: 150 SOCKETWELD			
	CONSTRUCTION	BODY: ASTM D3222, WITH CELL CLASS TYPE II, RED PVDF, SCH. 80, FULL-PORT, "TRUE UNION" STYLE BALL: PVDF, ASTM D3222, WITH CELL CLASS TYPE II SEAT: PTFE STEM: PVDF, ASTM D3222, WITH CELL CLASS TYPE II HANDLE: POLYPROPYLENE PACKING: GRAPHITE O-RINGS: FKM			
	VALVE SELECTION	NIBCO PVDF TRU-BLOC MODEL C WATTS PVDF TRUE UNION BALL			
<b>NOTES:</b> 1 FOR USE WITH LIQUID SERVICE. NOT FOR COMPRESSED AIR OR GAS SERVICE. 2 PRESSURE RATINGS FOR FITTINGS AND FLANGES SHALL MEET OR EXCEED MAXIMUM WORKING PRESSURE.					
<b>REVISION HISTORY</b>					
NUMBER	DESCRIPTION			DATE	
0	INITIAL ISSUE			2/22/2021	

**DOMESTIC WATER SYSTEMS (TO 135 PSIG)**

PIPING SPECIFICATION:		PROCESS:		DESIGN CONDITIONS:	
<b>UI-DCW</b>	PIPE SIZE (NPS)	DOMESTIC COLD AND HOT WATER 4" AND SMALLER (NOTE 1)		135 PSIG AT 200 °F 2 1/2" THRU 24" (NOTE 1)	
	WEIGHT/SCHEDULE	--		STD	
PIPE MATERIAL: ASME B36.10M/B88	MATERIAL	ASTM B88 COPPER, TYPE K, HARD DRAWN		ASTM A53 GRADE B - SEAMLESS GALVANIZED	
	CONSTRUCTION	SOLDERED OR PRESS FIT		BUTT WELD	
FITTINGS:	WALL THICKNESS	SAME AS ADJOINING PIPE		SAME AS ADJOINING PIPE	
	MATERIAL	ASME B16.18 CAST COPPER OR ASME B16.22 WROUGHT COPPER ALLOY		CLASS 125 FLANGED	
	TYPE	SOLDERED OR PRESS FIT		CLASS 125 FLANGED	
PIPING JOINTS:	OTHER	SEE BELOW FOR JOINT DETAILS		--	
	CONSTRUCTION	SOLDER: ASTM B32 ALLOY, GRADE Sb-5 95/5 TIN-ANTIMONY, LEAD FREE OR: ASTM B32 ALLOY, GRADE SN95 TIN-SILVER, LEAD FREE		CLASS 150 - WELD NECK - ASME B16.5	
SOLDER/FLANGES:	WALL THICKNESS	--		SAME AS ADJOINING PIPE	
	MATERIAL	--		GALVANIZED STEEL - ASTM A105	
	CONSTRUCTION	SOLDER: FILLER METAL LEAD-FREE - WATER-FLUSHABLE FLUX ASTM B813 - SILVER BRAZING FILLER METAL SHALL BE BCuP SERIES, COPPER PHOSPHORUS ALLOYS FOR GENERAL DUTY BRAZING - AWS A5.8		STUD - FULL LENGTH ASME B1.1	
SOLDER/FLANGE BOLTS:	MATERIAL	--		ASTM A307 - GRADE B, FULL LENGTH STUD	
	CONSTRUCTION	--		HEAVY HEX - ASME B1.1 - CLASS 2B THREADS	
PRESS FIT/FLANGE NUTS:	MATERIAL	PRESS FIT: MATERIALS CONFORM TO ASME B16.18 OR: ASME B16.22 AND CRITERIA UNDER IAPMO PS 117 - SEALING ELEMENTS: EPDM - SEALING ELEMENTS FACTORY INSTALLED - FITTINGS SHALL BE PRESSED BY TOOLS RECOMMENDED BY FITTING MANUFACTURER		CARBON STEEL - ASTM A194 GRADE 2H HEAVY - F436 WASHERS	
	CONSTRUCTION	--		SPIRAL WOUND - SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES	
PRESS FIT/GASKETS:	MATERIAL	--		FULL FACE - RED RUBBER	
	PIPE CODE:	DESIGN/CONSTRUCTION CODE:		REVISION:	DATE REVISED:
PIPE MATERIAL: COPPER/CARBON STEEL	ASTM B36.10M	ASME B31.1		0	2/22/2021
VALVE SPECIFICATION:	SPECIFICATION MATERIAL:	PRESSURE CLASS:	DESIGN CODE:		
<b>UI-DCW</b>	AS NOTED	125 PSIG	ASME B31.1	ASME B16.34	
	PIPE SIZE (NPS)	4" AND SMALLER (NOTE 1)		2 1/2" THRU 24" (NOTE 1)	
GATE VALVE	CONNECTION AND RATING	--		CLASS 125 FLANGED ENDS	
	CONSTRUCTION	--		IN ACCORDANCE WITH MSS SP-70 BODY/SEAT: ASTM A395 CAST IRON SHAFT: B16 BRASS DISC: BRONZE INTERNALS: BRONZE SEATS AND SEALS: RENEWABLE BRONZE OS&Y CLASS 125	
	VALVE SELECTION	--		POWELL FIG. NO. 1793 CRANE F84 ELITE GTVA-FC1333-HW	
BALL VALVE	CONNECTION AND RATING	CLASS 200 PSIG SOLDERED OR PRESS FIT		--	
	CONSTRUCTION	BODY: C89836 LEAD-FREE BRONZE, STANDARD PORT BALL: C27451 LEAD-FREE BRASS STEM: C27451 LEAD-FREE BRASS SEATS/SEALS: RPTFE PACKING: RPTFE LOCKABLE, QUARTER TURN LEVER HANDLE		--	
	VALVE SELECTION	APOLLO 70LF SERIES (SOLDER) APOLLO 77VLF SERIES (PRESS FIT) NIBCO 580 LF SERIES (THRU 3") MILWAUKEE UPBA-480B (PRESS FIT ENDS)		--	

**NOTES:**  
1) PIPE SIZE RANGE OVERLAP IS INTENTIONAL. EITHER MATERIAL CAN BE USED BETWEEN 2-1/2" AND 4" PENDING DESIGN PROFESSIONAL DISCUSSION WITH UTILITY OPERATOR.

REVISION HISTORY		
NUMBER	DESCRIPTION	DATE
0	ISSUED	12/1/2017
1	ADDED MODEL NUMBER FOR NIBCO BALL VALVE, ADDED VALVE MANUFACTURERS; INCREASED SMALL BORE COPPER SIZE TO 4" AND ALLOWED SIZE RANGE OVERLAP	2/22/2021

LUBE OIL (TO 230 PSIG)

PIPING SPECIFICATION:		PROCESS:	DESIGN CONDITIONS:	
<b>UI-LOL</b>	PIPE SIZE (NPS)	LUBE OIL 2" AND SMALLER	230 PSIG AT 100 °F	
	WEIGHT/SCHEDULE	SCH 40S	2 1/2" THRU 10"	12" THRU 24"
PIPE: ASME B36.10M	MATERIAL	ASTM A312 TYPE 304 - SEAMLESS	ASTM A312 TYPE 304 - SEAMLESS	
FITTINGS:	CONSTRUCTION	CLASS 3000 - SOCKETWELD - B16.11	BUTTWELD - ASME B16.9	
	WALL THICKNESS	SAME AS ADJOINING PIPE	SAME AS ADJOINING PIPE	
PIPING JOINTS:	MATERIAL	FORGED STEEL - ASTM A182, F304L, ASME 16.11	ASTMA403, WP304L - SEAMLESS, ASME B16.25	
	TYPE	SOCKETWELD	BUTTWELD - END PREP PER B16.25	
FLANGES:	OTHER	--	--	
	CONSTRUCTION	FLANGES NOT PERMITTED	FLANGES NOT PERMITTED	
	WALL THICKNESS	--	--	
FLANGE BOLTS:	MATERIAL	--	--	
	CONSTRUCTION	--	--	
FLANGE NUTS:	CONSTRUCTION	--	--	
WASHER:	CONSTRUCTION	--	--	
GASKETS:	CONSTRUCTION	--	--	
	MATERIAL	--	--	
PIPE MATERIAL:	PIPE CODE:	DESIGN/CONSTRUCTION CODE:	REVISION:	DATE REVISED:
STAINLESS STEEL	ASTM B36.10M	ASME B31.1	0	2/22/2021
VALVE SPECIFICATION:	SPECIFICATION MATERIAL:	PRESSURE CLASS:	DESIGN CODE:	
<b>UI-LOL</b>	STAINLESS STEEL	300 PSIG	ASME B31.1	MSS SP-110
	PIPE SIZE (NPS)	2" AND SMALLER	2 1/2" THRU 10"	
BALL VALVE	CONNECTION AND RATING	CLASS 300 THREADED		
	CONSTRUCTION	BODY/BONNET: ASTM A351, CF8M STAINLESS STEEL, FULL-PORT SEAT RING: XTREME BALL: SS 316 STEM: SS 316 SEAL: REINFORCED PTFE PACKING: GRAPHITE		
	VALVE SELECTION	APOLLO 76F-100-A NIBCO T-585-S6-R-66-LL MILWAUKEE SERIES BA260		
<b>REVISION HISTORY</b>				
NUMBER	DESCRIPTION		DATE	
0	INITIAL ISSUE		2/22/2021	

REFRIGERANT (TO 300 PSIG)

PIPING SPECIFICATION:		PROCESS:		DESIGN CONDITIONS:	
<b>UI-REF</b>	PIPE SIZE (NPS)	10" AND SMALLER			
	WEIGHT/SCHEDULE	--			
PIPE MATERIAL: ASME B31.5	MATERIAL	ASTM B88 COPPER, TYPE K, HARD DRAWN, SEAMLESS			
FITTINGS:	CONSTRUCTION	BRAZED-JOINT PRESSURE TYPE			
	WALL THICKNESS	SAME AS ADJOINING PIPE			
PIPING JOINTS:	MATERIAL	ASME B16.50 WROUGHT COPPER ALLOY			
	TYPE	BRAZED WITH BAG SERIES FILLER METAL AND CAPILLARY FITTINGS, IN ACCORDANCE WITH AWS A5.8			
PIPE MATERIAL: COPPER	PIPE CODE:	DESIGN/CONSTRUCTION CODE:		REVISION:	DATE REVISED:
	ASTM B31.5	ASME B31.5		0	2/22/2021
VALVE SPECIFICATION:	SPECIFICATION MATERIAL:	PRESSURE CLASS:	DESIGN CODE:		
	AS NOTED	150 PSIG	ASME B31.1	ASME B16.34	
<b>UI-REF</b>	PIPE SIZE (NPS)	3/8" THRU 2 5/8"		3" THRU 10"	
	CONNECTION AND RATING	CLASS 500 PSIG SOLDERED OR THREADED		--	
CHECK VALVE	CONSTRUCTION	BODY/CAP: BRONZE STEM: SILICON BRASS SEAT: NITRILE RUBBER DISC: BRONZE, IN-LINE GASKET: SPIRAL WOUND SS WITH GRAPHITE GRAPHITE ARAMID FIBERS		--	
	VALVE SELECTION	HENRY VALVE COMPANY SERIES 205 ALCO SERIES EC PARKER SERIES C		--	
BALL VALVE	CONNECTION AND RATING	CLASS 600 PSIG SOLDERED OR THREADED		--	
	CONSTRUCTION	BODY: BOLTED FORGED BRASS, 2-PIECE, FULL-PORT BALL: ELECTRO-PLATED BRASS STEM: STAINLESS STEEL WITH NOPHRENE RING STEM SEALS PACKING: PTFE SEATS AND SEALS: PTFE		--	
RELIEF VALVE	VALVE SELECTION	HENRY VALVE COMPANY SERIES 937 ALCO BVE PARKER SERIES 500		--	
	CONSTRUCTION	TYPE: ANGLE TYPE, DESIGNED, APPROVED, AND STAMPED IN ACCORDANCE WITH ANSI B9.1/ASHRAE STANDARD 15, SEALED AND STAMPED WITH ASME UV AND NATIONAL BOARD CERTIFICATION NB BODY/DISC: BRASS SEAT: NEOPRENE SETTING: 300 PSIG		--	
	VALVE SELECTION	MUELLER ANGLE NPTFE TO FLARE		--	
REVISION HISTORY					
NUMBER	DESCRIPTION			DATE	
0	INITIAL ISSUE			2/22/2021	

**REFRIGERANT VENT PIPING - CS**

PIPING SPECIFICATION:		PROCESS:	DESIGN CONDITIONS:	
<b>UI-RV</b>		R134A OR R123	285 PSIG AT 150 °F	
	PIPE SIZE (NPS)	4" THRU 12"		
PIPE MATERIAL: ASME B31.10M	WEIGHT/SCHEDULE	SCH. 40		
	MATERIAL	ASTM A53 GRADE B - SEAMLESS		
FITTINGS:	CONSTRUCTION	BUTTWELD - B16.25		
	WALL THICKNESS	SAME AS ADJOINING PIPE		
	MATERIAL	BUTTWELD FITTING - ASTM A234 GRADE B - SEAMLESS		
PIPING JOINTS:	TYPE	BUTTWELD - B16.25		
	OTHER	WHERE FLANGE OR THREAD REQUIRED		
UNIONS:	CONSTRUCTION	NOT PERMITTED		
	WALL THICKNESS	--		
	MATERIAL	--		
FLANGES:	CONSTRUCTION	CLASS 300 - WELD NECK - ASME B16.5 AND ASME B16.47		
	WALL THICKNESS	SAME AS ADJOINING PIPE		
	MATERIAL	FORGED CARBON STEEL - ASTM A105 OR ASTM A516 GRADE 70		
FLANGE BOLTS:	CONSTRUCTION	HIGH-STRENGTH STEEL ASTM A193, CLASS 2, GRADE B8		
FLANGE NUTS:	CONSTRUCTION	HEAVY HEX - A194 GRADE 2H		
WASHER:	CONSTRUCTION	F436		
GASKETS:	CONSTRUCTION	SPIRAL WOUND - SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES		
	MATERIAL	FLEXITALLIC STYLE CGI - TYPE 304 STAINLESS - FLEXICARB FILLER		
	MANUFACTURER	GARLOCK BLUE-GARD 3000 OR EQUAL		
THERMOWELLS:	MATERIAL	INSERTION THERMOWELLS - ASTM A105 - 3000 PSIG PRESSURE CLASS - SEAL-WELDED WELLS		
PIPE MATERIAL:	PIPE CODE:	DESIGN/CONSTRUCTION CODE:	REVISION:	DATE REVISED:
CARBON STEEL	ASTM B36.10M	ASME B31.1	0	2/22/2021
FINISH:	SPECIFICATION MATERIAL:	2-COAT SYSTEM WITH SOLVENT-BASED INORGANIC ZINC PRIMER, AND INORGANIC SILICATE POLYMER TOP COAT - REFER TO PROJECT SPECIFICATIONS COLOR TO MATCH RED OF EXISTING RELIEF DEVICE PIPING		
REVISION HISTORY				
NUMBER	DESCRIPTION		DATE	
0	INITIAL ISSUE		2/22/2021	

**REFRIGERANT VENT PIPING - SS**

PIPING SPECIFICATION:		PROCESS:	DESIGN CONDITIONS:	
<b>UI-RV</b>		R134A OR R123	285 PSIG AT 150 °F	
	PIPE SIZE (NPS)	4" THRU 12"		
PIPE MATERIAL: ASME B31.10M	WEIGHT/SCHEDULE	SCH 10S		
	MATERIAL	A312 GRADE 304 - SEAMLESS OR WELDED		
FITTINGS:	CONSTRUCTION	BUTTWELD - ASME B16.9		
	WALL THICKNESS	SAME AS ADJOINING PIPE		
	MATERIAL	ASTM A403, WP304L - SEAMLESS, B16.25		
PIPING JOINTS:	TYPE	BUTTWELD - END PREP PER B16.25		
	OTHER	--		
UNIONS:	CONSTRUCTION	NOT PERMITTED		
	WALL THICKNESS	--		
	MATERIAL	--		
FLANGES:	CONSTRUCTION	CLASS 300 - WELD NECK - ASME B16.5 AND ASME B16.47		
	WALL THICKNESS	SAME AS ADJOINING PIPE		
	MATERIAL	SS, ASTM A182, F330L, ASME B16.5		
FLANGE BOLTS:	CONSTRUCTION	HIGH-STRENGTH STEEL ASTM A193, CLASS 2, GRADE B8		
FLANGE NUTS:	CONSTRUCTION	HEAVY HEX - A194 GRADE 2H		
WASHER:	CONSTRUCTION	F436		
GASKETS:	CONSTRUCTION	SPIRAL WOUND - SUITABLE FOR RAISED-FACE OR FLAT-FACE FLANGES		
	MATERIAL	FLEXITALLIC STYLE CGI - TYPE 304 STAINLESS - FLEXICARB FILLER		
	MANUFACTURER	GARLOCK BLUE-GARD 3000 OR EQUAL		
THERMOWELLS:	MATERIAL	INSERTION THERMOWELLS - ASTM A105 - 3000 PSIG PRESSURE CLASS - SEAL-WELDED WELLS		
PIPE MATERIAL:	PIPE CODE:	DESIGN/CONSTRUCTION CODE:	REVISION:	DATE REVISED:
CARBON STEEL	ASTM B36.10M	ASME B31.1	0	2/22/2021
REVISION HISTORY				
NUMBER	DESCRIPTION		DATE	
0	INITIAL ISSUE		2/22/2021	

# BRANCH TABLE

BRANCH TABLE BRANCH SIZE (NPS)	HEADER SIZE (NPS)																		
	24	20	18	16	14	12	10	8	6	4	3	2 1/2	2	1 1/2	1 1/4	1	3/4	1/2	
1/2	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	RT	RT	RT	RT	ST
3/4	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	RT	RT	RT	RT	ST	
1	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	RT	RT	RT	RT	ST			
1 1/4	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	RT	RT	RT	ST				
1 1/2	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	RT	RT	RT	RT	ST					
2	SOL	SOL	SOL	SOL	SOL	SOL	SOL	SOL	RT	RT	RT	RT	ST						
2 1/2	WOL	WOL	WOL	WOL	WOL	WOL	WOL	WOL	RT	RT	RT	ST							
3	WOL	WOL	WOL	WOL	WOL	WOL	WOL	WOL	RT	RT	ST								
4	WOL	WOL	WOL	WOL	WOL	WOL	RT	RT	RT	ST									
6	WOL	WOL	WOL	RT	RT	RT	RT	RT	ST										
8	WOL	RT	RT	RT	RT	RT	RT	ST											
10	RT	RT	RT	RT	RT	RT	ST												
12	RT	RT	RT	RT	RT	ST													
14	RT	RT	RT	RT	ST														
16	RT	RT	RT	ST															
18	RT	RT	ST																
20	RT	ST																	
24	ST																		
30																			
36																			
42																			
48																			
FOR PIPE SIZES ABOVE 24", CONSULT DESIGN ENGINEER													ST	STANDARD TEE					
													RT	REDUCING TEE					
													WOL	WELDOLET					
													SOL	SOCKETOLET					
													CRBC	CUSTOM REINFORCED BRANCH CONNECTION					
													<b>REVISION:</b>	<b>DATE REVISED:</b>					
													1	2/22/2021					

REDUCING TEES: <http://www.ritinoxoverseas.com/images/pdf/Unequal-tees-and-cross.pdf>  
 WELOLETS AND SOCKETOLETS [http://petrowiki.org/File%3AVol3\\_Page\\_360\\_Image\\_0001.png](http://petrowiki.org/File%3AVol3_Page_360_Image_0001.png)  
 WELDOLETS <http://www.bonneyforge.com/specs/branch/conventional.cfm>  
 ASME 31.1

REVISION HISTORY		
NUMBER	DESCRIPTION	DATE
0	INITIAL ISSUE	12/5/2018
1	CHANGED 2" BRANCH CONNECTIONS TO SOL; CHANGED 8" BRANCH ON 24" HEADER TO WOL; MADE ALL REDUCING BRANCHES RT WHERE AVAILABLE	2/22/2021