PIPING CLASS: AC1S4C-FA

SECTION 1.0 – GENERAL

PIPE CLASS:	**AC1S4C-FA**	**DESIGN CODE:**	ASME B31.3
RATING:	150	**PWHT:**	NOTE 5
FLANGE FACE:	RF	**VALVE TRIM:**	ALLOY 825
BASIC MATERIAL:	CARBON STEEL (GROUP 1.1)	**SOUR:**	YES (NOTE 4 & 13)
CORROSION ALLOWANCE:	4.5 MM	**SPECIAL REQUIREMENT:**	NACE

TEMPERATURE (DEG.C) AND PRESSURE (BARG) RATING - (NOTE-22)

TEMP.	-29	0	38	50	100	150
PRESS.	19.6	19.6	19.6	19.2	17.7	15.8

SERVICE

REFER TO PIPING CLASS INDEX

SIZE RANGE, PIPE WALL THICKNESS (MM) TABLE – (NOTE-80)

NPS	½	¾	1	1 ½	2	3	4	6	8	10	12
SCHEDULE	XXS	XXS	XXS	XXS	160	160	80	80	60	40	STD
THICKNESS	7.47	7.82	9.09	10.15	8.74	11.13	8.56	10.97	10.31	9.27	9.53

NPS	14	16	18	20	24	30	36	42	48
SCHEDULE	30	30	XS	30	XS	-	-	-	-
THICKNESS	9.53	9.53	12.7	12.7	12.7	CALC	CALC	CALC	CALC

PIPING CLASS: AC1S4C-FA

SECTION 2.0 - NOTES

GENERAL NOTES

1. IN LINE WITH AGES-GL-08-001 (PROCESS DESIGN BASIS) THE MINIMUM PIPING SIZE IS NPS 1. HOWEVER, THE LINE SIZE IN THIS CLASS NPS 3/4 & NPS 1/2 ARE INCLUDED FOR INSTRUMENT CONNECTIONS ONLY.
2. ALL BUTT-WELDED COMPONENT THICKNESSES SHALL MATCH THE PIPE THICKNESS.
3. FOR SPECTACLE BLINDS (FIG-8 FLANGES) & BLINDS REFER TO SPECIFICATION AGES-SP-09-002.
4. ALL MATERIAL FOR SOUR SERVICE SHALL CONFORM TO THE REQUIREMENTS FOR MATERIAL SELECTION GUIDELINES AGES-GL-07-001, REQUIREMENTS FOR MATERIALS IN SEVERE SERVICE AGES-SP-07-003 AND NACE MR0175/ISO 15156 (FOR UPSTREAM) & NACE MR0103/ISO 17945 (FOR REFINERY SERVICE).
5. PWHT SHALL BE BASED ON ASME B31.3 AND THE REQUIREMENTS OF SPECIFICATION AGES-SP-09-002 PIPING MATERIAL SPECIFCATION INDEX. FOR SOUR SERVICE PWHT REQUIREMENT SHALL BE ALSO GOVERNED BY HARDNESS CRITERIA AS PER NACE MR0175 / ISO 15156 (FOR UPSTREAM) & NACE MR0103/ISO 17945 (FOR REFINERY SERVICE).

13. FOR SOUR/ LETHAL SERVICE 100%RT,100%MT/PT HAS TO BE CONSIDERED IRRESPECTIVE OF RATING IN LINE WITH REQUIREMENT FOR MATERIALS IN SEVERE SERVICE AGES-SP-07-003.

15. EXTERNAL FASTENERS (BOLTS, STUDS & NUTS) SHALL BE COATED WITH FLUOROCARBON POLYMER SYSTEM AND SHALL COMPLY WITH SALT SPRAY TEST AS PER MATERIAL SELECTION GUIDELINE AGES-GL-07-001

16. ALL VALVES IN SOUR OR TOXIC OR HYDROCARBON SERVICE SHALL MEET FUGITIVE EMISSION TESTING REQUIREMENTS AS PER BS EN ISO 15848 PART-1 & PART-2 WITH LEAKAGE CLASS 'BH' (REFER TO VALVE SPECIFICATION AGES-SP-09-003).

22. ALL PIPING COMPONENTS UPTO NPS 24 SHALL BE DESIGNED FOR VACUUM CONDITION AT AMBIENT TEMPERATURE. FOR HIGHER SIZES VACUUM DESIGN SHALL BE APPLICABLE IF INDICATED IN THE LINELIST.

23. WHEREVER ALLOY 825 TRIM IS SPECIFIED, COMPONENTS MADE FROM WELD OVERLAY SHALL USE INCONEL-625 WELDING CONSUMABLES. REFER AGES-SP-09-015

27. CS PIPE AND PIPE COMPONENTS WITH NOMINAL THICKNESS GREATER THAN 5.08 MM SHALL BE IMPACT TESTED AT -29 ° C OR LTCS MATERIAL MAY BE USED INSTEAD.

31. FOR CS & LTCS WELDED PIPE USED IN DOWNSTREAM SOUR & SEVERE SERVICE APPLICATION I.E. NACE MR0103/ISO 17945, ASTM A671-CC65 CLASS 32 & ASTM A672-C65 CLASS 32 SHALL BE USED RESPECTIVELY IN PLACE OF ASTM A671-CC65 CLASS 22 & ASTM A672-C65 CLASS 22.

33. TO BE USED FOR FLANGED CLASS 300 RF CONNECTION.

39. DELETED.

43. THREADED JOINTS ARE NOT PERMITTED.

54. COMPLETE ORIFICE ASSEMBLY SHALL BE SUPPLIED WITH PAIR OF ORIFICE FLANGES EACH HAVING ONE NPS 1/2 FLANGED TAP (RATING SAME AS PIPE CLASS).

58. THE USE OF SOFT SEATED BALL VALVES IS RESTRICTED TO MAX. DESIGN TEMPERATURE OF 150 ^{O}C. THE MATERIALS OF CONSTRUCTION FOR SEAT ARE INDICATIVE. VENDOR IS RESPONSIBLE TO SELECT SUITABLE MATERIAL TO ENSURE SERVICE LIFE OF THE VALVE CONSIDERING THE TYPE OF FLUID, SIZE AND SERVICE CONDITIONS.

70. LOW STRESS SPIRAL WOUND GASKET.

71. TO BE USED ONLY WHEN INDICATED ON THE P&ID.

73. NIPOFLANGE SHALL BE USED FOR THERMOWELL CONNECTION FOR HEADER NPS 4 AND ABOVE.

75. CORROSION ALLOWANCE OF PIPE CLASS IS ABOVE 3.0 MM. MINIMUM BODY WALL THICKNESS OF VALVES SHALL HAVE ADDITIONAL WALL THICKNESS CONSIDERING THE CORROSION ALLOWANCE SPECIFIED IN THE PIPE CLASS IN EXCESS OF ASME B16.34 REQUIREMENTS.

80. THE PIPE THICKNESS ARE CALCULATED BASED ON P-T RATING TABLE FOR THIS CLASS, HOWEVER FOR SIZES NPS 26 AND ABOVE THICKNESS SHALL BE CALCULATED BASED ON PROJECT PROCESS DESIGN PARAMETER.

81. PIPING CLASS COVERS ALL TYPES OF VALVES NORMALLY USED IN THE INDUSTRY. HOWEVER, VALVE TYPE SELECTION SHALL BE AS PER PROCESS ISOLATION PHILOSOPHY (AGES-PH-08-001, AGES-SP-09-003) AND P&ID.

PIPING CLASS: AC1S4C-FA

82. WELDED PIPES AND WELDED FITTINGS SHALL BE 100% RADIOGRAPHED. WALL THICKNESS NEGATIVE TOLERANCES OF WELDED FITTINGS SHALL NOT BE LESS THAN WELDED PIPE.
83. WHEN SMALL END OF REDUCER IS NPS 16 & BELOW THE REDUCER SHALL BE SEAMLESS.
85. SMALL BORE PIPE THE MINIMUM SCHEDULE SHALL BE AS PER AGES-SP-09-001 APPENDIX A1.
86. DISSIMILAR FLANGE MATERIAL SHALL BE SEPERATED USING INSULATING GASKET, ONLY TO BE USED WHEN STATED IN CORROSION REPORT AND IN P&ID OR OTHERWISE WITH COMPANY APPROVAL. FOR HYDROCARBON SERVICE FIRE SAFE INSULATING GASKET IS MANDATORY (REFER AGES-SP-09-005 FOR INSULATING GASKET DETAILS).
87. ALL BUTTERFLY VALVES IN HYDROCARBON & CRITICAL SERVICE SHALL BE TRIPLE OFFSET TYPE. FOR TRIPLE OFFSET BUTTERFLY VALVE, SHORT / LONG PATTERN SHALL BE DECIDED BASED ON LAYOUT REQUIREMENTS. FOR UTILITY SERVICES DOUBLE OFFSET BUTTERFLY CAN BE CONSIDERED.
90. PIPING TO INSTRUMENT IDBB, FLANGED ON BOTH PROCESS SIDE AND INSTRUMENT SIDE.TO BE USED IN SOUR, TOXIC, SULPHURIC ACID AND VIBRATING SERVICE.

PIPING CLASS: AC1S4C-FA

SECTION 3.0 – BRANCH TABLE

90^0 BRANCH CONNECTIONS

BRANCH PIPE (NPS)	HEADER PIPE (NPS)																				
		1/2	3/4	1	1 ½	2	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48
48																					E
42																				E	T
36																			E	T	T
30																		E	T	T	T
24																	E	T	T	T	T
20																E	T	T	T	T	TR
18															E	T	T	T	T	T	TR
16														E	T	T	T	T	T	T	TR
14													E	T	T	T	T	T	TR	TR	TR
12												E	T	T	T	T	T	T	TR	TR	TR
10											E	T	T	T	T	T	T	T	TR	TR	TR
8										E	T	T	T	T	T	T	W	W	W	W	W
6									E	T	T	T	T	T	W	W	W	W	W	W	W
4								E	T	T	T	W	W	W	W	W	W	W	W	W	W
3							E	T	T	W	W	W	W	W	W	W	W	W	W	W	W
2						E	T	T	W	W	W	W	W	W	W	W	W	W	W	W	W
1 ½					E	T	T	T	W	W	W	W	W	W	W	W	W	W	W	W	W
1				E	T	T	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
3/4			E	T	T	T	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W
1/2		E	T	T	T	TR	W	W	W	W	W	W	W	W	W	W	W	W	W	W	W

LEGEND (STANDARD SYMBOLOGY)

C	CALCULATION IN ACCORDANCE WITH ASME B31.3
E	EQUAL TEE
T	REDUCING TEE
TR	REDUCING TEE + REDUCER
W	WELDOLET

PIPING CLASS: AC1S4C-FA

SECTION 4.0 – PIPING COMPONENTS

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
PIPE							
PIPE	½	16	BE	SEAMLESS	B36.10	ASTM A106 GR.B, SOUR SERVICE	1,27,85
PIPE	18	48	BE	WELDED	B36.10	ASTM A672 GR.C65 CL.22, SOUR SERVICE	27,31, 82
NIPPLE	2	2	BE	AS PIPE, L=100mm	B36.10	ASTM A106 GR.B, SOUR SERVICE	27,85
FITTINGS							
ELBOW	½	16	BE	90 DEGREE, LR, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB-S, SOUR SERVICE	2,27
ELBOW	18	48	BE	90 DEGREE, LR, WROUGHT, WELDED	B16.9	ASTM A234 GR. WPB-W, SOUR SERVICE	2,27,82
ELBOW	½	16	BE	45 DEGREE, LR, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB-S, SOUR SERVICE	2,27
ELBOW	18	48	BE	45 DEGREE, LR, WROUGHT, WELDED	B16.9	ASTM A234 GR. WPB-W, SOUR SERVICE	2,27,82
REDUCER	¾	16	BE	CONCENTRIC, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB-S, SOUR SERVICE	2,27
REDUCER	18	48	BE	CONCENTRIC, WROUGHT, WELDED	B16.9	ASTM A234 GR. WPB-W, SOUR SERVICE	2,27,82, 83
REDUCER	¾	16	BE	ECCENTRIC, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB-S, SOUR SERVICE	2,27
REDUCER	18	48	BE	ECCENTRIC, WROUGHT, WELDED	B16.9	ASTM A234 GR. WPB-W, SOUR SERVICE	2,27,82, 83
CAP	½	48	BE	WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB-S, SOUR SERVICE	2.27

PIPING CLASS: AC1S4C-FA

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
BRANCH FITTINGS							
TEE	½	16	BE	EQUAL, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB-S, SOUR SERVICE	2,27
TEE	18	48	BE	EQUAL WROUGHT, WELDED	B16.9	ASTM A234 GR. WPB-W, SOUR SERVICE	2,27,82
TEE	¾	16	BE	REDUCING, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB-S, SOUR SERVICE	2,27
TEE	18	48	BE	REDUCING, WROUGHT, WELDED	B16.9	ASTM A234 GR. WPB-W, SOUR SERVICE	2,27,82
WELDOLET	½	8	BE	FORGED, SCH AS PIPE	MSS SP-97	ASTM A105N, SOUR SERVICE	27
FLANGES							
WELDNECK	½	24	RF	CL.150	B16.5	ASTM A105N, SOUR SERVICE	2,27
WELDNECK	30	48	RF	CL.150	B16.47-A	ASTM A105N, SOUR SERVICE	2,27
WELDNECK	½	24	RF	CL.300	B16.5	ASTM A105N, SOUR SERVICE	2,27,33
WELDNECK	30	48	RF	CL.300	B16.47-A	ASTM A105N, SOUR SERVICE	2,27,33
NIPOFLANGE	1	2	RF	CL.150, L=150 MM	B16.5	ASTM A105N, SOUR SERVICE	2,27,73
BLIND	½	24	RF	CL.150	B16.5	ASTM A105N, SOUR SERVICE	27
BLIND	30	48	RF	CL.150	B16.47 – A	ASTM A105N, SOUR SERVICE	27
ORIFICE	2	24	RF	CL.300	B16.36	ASTM A105N, SOUR SERVICE	2,27,54

PIPING CLASS: AC1S4C-FA

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
LINE BLINDS							
LINE BLIND	½	10	RF	CL.150, SPECTACLE BLIND	B16.48	ASTM A516 GR.70, SOUR SERVICE	3,27
LINE BLIND	12	24	RF	CL.150, SPADE & SPACER	B16.48	ASTM A516 GR.70, SOUR SERVICE	3,27
LINE BLIND	30	48	RF	CL.150, SPADE & SPACER	MFG STD.	ASTM A516 GR.70, SOUR SERVICE	3,27
GASKETS							
GASKET	½	24	-	CL.150, SPIRAL WOUND, 4.5MM THK.	B16.20/ B16.5	SP. WINDING + INNER RING: SS316, FILLER: GRAPHITE, CS OUTER RING, LOW STRESS, SOUR SERVICE	70
GASKET	30	48	-	CL.150, SPIRAL WOUND, 4.5MM THK	B16.20/ 16.47 – A	SP. WINDING + INNER RING: SS316, FILLER: GRAPHITE, CS OUTER RING, LOW STRESS, SOUR SERVICE	70
GASKET	½	24	-	CL.300, SPIRAL WOUND, 4.5MM THK.	B16.20/ B16.5	SP. WINDING + INNER RING: SS316, FILLER: GRAPHITE, CS OUTER RING, SOUR SERVICE	33
GASKET	30	48	-	CL.300, SPIRAL WOUND, 4.5MM THK	B16.20/ 16.47 – A	SP. WINDING + INNER RING: SS316, FILLER: GRAPHITE, CS OUTER RING, SOUR SERVICE	33
INSULATING GASKET	2	24	-	CL.150, RF FLANGE INSULATING GASKET SET, FULL FACE	MANF. STD.	GASKETS AND WASHERS SS316 CORE LAMINATED WITH DIELECTRIC COATING SUITABLE FOR DESIGN CONDTIONS, SOUR SERVICE	86
BOLTS							
STUD BOLT & NUTS	½	48	-	STUD BOLT C/W 2 HEAVY HEX. NUTS	B18.2.1/ B18.2.2	STUD: ASTM A193 GR. B7M, ASTM A194 GR. 2HM	15

PIPING CLASS: AC1S4C-FA

SECTION 5.0 - VALVES

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
VALVES (NOTE-81)							
CHECK	½	1 ½	RF	CL.150, FLGD TO B16.5, SPRING LOADED LIFT CHECK, BOLTED COVER, SOUR SERVICE	BS 1868 + ASME B16.34	BODY: ASTM A105N TRIM: ALLOY 825 + HF	23,75
CHECK	2	48	RF	CL.150, DUAL PLATE, TYPE A, RF DOUBLE FLGD TO B16.5 / B16.47-A, SOUR SERVICE	API 594	BODY: ASTM A216 GR.WCB TRIM: ALLOY 825 +HF	23,75
CHECK	2	24	RF	CL.150, SWING CHECK FLGD TO B16.5, SOUR SERVICE	API 6D	BODY: ASTM A216 GR.WCB TRIM: ALLOY 825 +HF	23,75
GATE	½	1 ½	RF	CL.150, FLGD TO B16.5, SOLID WEDGE, STD PORT, OS & Y, BOLTED BONNET, HANDWHEEL, SOUR SERVICE	API 602 + ASME B16.34	BODY: ASTM A105N TRIM: ALLOY 825 +HF	16,23,75
GATE	2	24	RF	CL.150, FLGD TO B16.5, FLEXIBLE WEDGE, STD PORT, OS & Y, BOLTED BONNET, HANDWHEEL / GEAR, SOUR SERVICE	API 600 + ASME B16.34	BODY: ASTM A216 GR.WCB TRIM: ALLOY 825 +HF	16,23,75
GATE	30	48	RF	CL.150, FLGD TO B16.47-A, FLEXIBLE WEDGE, STD PORT, OS & Y, BOLTED BONNET, GEAR, SOUR SERVICE	API 6D	BODY: ASTM A216 GR.WCB TRIM: ALLOY 825 +HF	16,23,75
GLOBE	½	1 ½	RF	CL.150, FLGD TO B16.5, SWIVEL PLUG DISC, OS & Y, BOLTED BONNET, HANDWHEEL, SOUR SERVICE	API 602 + ASME B16.34	BODY: ASTM A105N TRIM: ALLOY 825 +HF	16,23,75
GLOBE	2	12	RF	CL.150, FLGD TO B16.5, SWIVEL PLUG DISC, OS & Y, BOLTED BONNET, HANDWHEEL / GEAR, SOUR SERVICE	API 623 + ASME B16.34	BODY: ASTM A216 GR.WCB TRIM: ALLOY 825 +HF	16,23,75

PIPING CLASS: AC1S4C-FA

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
VALVES- CONT, D (NOTE -81)							
BUTTERFLY	14	48	RF	CL.150, TRIPLE OFFSET, DOUBLE FLGD TO B16.5 / B16.47-A, GEAR, SOUR SERVICE	API 609, CAT.B	BODY: ASTM A216 GR.WCB TRIM & SEAT: ALLOY 825 +HF	16,23,71 ,75, 87
BALL	½	1 ½	RF	CL.150, FLGD TO B16.5, FULL BORE, FLOATING BALL, LEVER, SOUR SERVICE	API 6D	BODY: ASTM A105N TRIM: ALLOY 825 SEAT: RPTFE	16,23,58 ,75
BALL	2	6	RF	CL.150, FLGD TO B16.5, REDUCED BORE, FLOATING BALL, LEVER / GEAR, SOUR SERVICE	API 6D	BODY: ASTM A216 GR. WCB TRIM: ALLOY 825 SEAT: RPTFE	16,23,58 ,75
BALL	8	36	RF	CL.150, FLGD TO B16.5 / B16.47-A, REDUCED BORE, TRUNNION MOUNTED, GEAR, SOUR SERVICE	API 6D	BODY: ASTM A216 GR. WCB TRIM: ALLOY 825 SEAT: RPTFE	16,23,58 ,75
BALL	42	48	RF	CL.150, FLGD TO B16.47-A, REDUCED BORE, TRUNNION MOUNTED, GEAR, SOUR SERVICE	API 6D + MANF STD	BODY: ASTM A216 GR. WCB TRIM: ALLOY 825 SEAT: RPTFE	16,23,58 ,75
BALL	2	4	RF	CL.150, FLGD TO B16.5, FULL BORE, FLOATING BALL, LEVER, SOUR SERVICE	API 6D	BODY: ASTM A216 GR. WCB TRIM: ALLOY 825 SEAT: RPTFE	16,23,58 ,71,75
BALL	6	36	RF	CL.150, FLGD TO B16.5 / B16.47-A, FULL BORE, TRUNNION MOUNTED, GEAR, SOUR SERVICE	API 6D	BODY: ASTM A216 GR. WCB TRIM: ALLOY 825 SEAT: RPTFE	16,23,58 ,71,75
BALL	42	48	RF	CL.150, FLGD TO B16.47-A, FULL BORE, TRUNNION MOUNTED, GEAR, SOUR SERVICE	API 6D + MANF STD	BODY: ASTM A216 GR. WCB TRIM: ALLOY 825 SEAT: RPTFE	16,23,58 ,71,75

PIPING CLASS: AC1S4C-FA

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
VALVES- CONT, D (NOTE -81)							
IDBB VALVE (FLG X FLG)	¾	2	RF	CL. 150, BALL TYPE BLOCK, REDUCING BODY DESIGN, FLOATING BALL AND ½" NEEDLE TYPE BLEED VALVE, LEVER OPERATED, SOUR SERVICE MIN.14MM BORE	API 6D + MANF STD	BODY: ASTM A105N / ASTM A216 GR. WCB TRIM: ALLOY 825 BALL SEAT: RPTFE BLEED VALVE: BODY-ASTM A105N, TRIM-ALLOY825 +HF	16,23,75 ,90