PIPING CLASS: AC1A3B-FA

SECTION 1.0 – GENERAL

PIPE CLASS:	**AC1A3B-FA**	**DESIGN CODE:**	ASME B31.3
RATING:	150	**PWHT:**	NOTE-52
FLANGE FACE:	RF	**VALVE TRIM:**	13Cr+HF/ SS316
BASIC MATERIAL:	CARBON STEEL (GROUP 1.1)	**SOUR:**	NO
CORROSION ALLOWANCE:	3.0 MM	**SPECIAL REQUIREMENT:**	NO

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	160	160	160	160	80	80	40	30	30	30
THICKNESS	7.47	5.56	6.35	7.14	8.74	7.62	8.56	7.11	7.04	7.80	8.38

NPS	14	16	18	20	24
SCHEDULE	20	20	20	20	20
THICKNESS	7.92	7.92	7.92	9.53	9.53

PIPING CLASS: AC1A3B-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.

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 UP TO NPS 24 SHALL BE DESIGNED FOR VACUUM CONDITION AT AMBIENT TEMPERATURE. FOR HIGHER SIZES VACUUM DESIGN SHALL BE APPLICABLE IF INDICATED IN THE LINE LIST.
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.
33. TO BE USED FOR FLANGED CLASS 300 RF CONNECTION.
39. DELETED.
52. PWHT SHALL BE BASED ON ASME B31.3 AND THE REQUIREMENTS OF SPECIFICATION AGES-SP-09-002 PIPING MATERIAL SPECIFICATION INDEX.
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.
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.
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.
91. TO BE USED FOR NON-HYDROCARBON AND NON VIBRATING UTILITY SERVICE ONLY.

PIPING CLASS: AC1A3B-FA

SECTION 3.0 – BRANCH TABLE

90^0 BRANCH CONNECTIONS

BRANCH PIPE (NPS)	1/2	3/4	1	1 ½	2	3	4	6	8	10	12	14	16	18	20	24
24																E
20															E	T
18														E	T	T
16													E	T	T	T
14												E	T	T	T	T
12											E	T	T	T	T	T
10										E	T	T	T	T	T	T
8									E	T	T	T	T	T	T	W
6								E	T	T	T	T	T	W	W	W
4							E	T	T	T	W	W	W	W	W	W
3						E	T	T	W	W	W	W	W	W	W	W
2					E	T	T	W	W	W	W	W	W	W	W	W
1 ½				E	T	T	T	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S
1			E	T	T	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S
3/4		E	T	T	T	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S
1/2	E	T	T	T	T/R	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S	W/S
	1/2	3/4	1	1 ½	2	3	4	6	8	10	12	14	16	18	20	24
	HEADER PIPE (NPS)															

LEGEND (STANDARD SYMBOLOGY)

C	CALCULATION IN ACCORDANCE WITH ASME B31.3
E	EQUAL TEE
T	REDUCING TEE
TR	REDUCING TEE + REDUCER
W	WELDOLET
W/S	WELDOLET (HYDROCARBON SERVICE) / SOCKOLET(NON-HYDROCARBON ,UTILITY SERVICE)

PIPING CLASS: AC1A3B-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	1,27, 85
PIPE	18	24	BE	WELDED	B36.10	ASTM A672 GR.C65 CL.22	27,82
NIPPLE	1	2	BE	AS PIPE, L=100mm	B36.10	ASTM A106 GR B	27,85
FITTINGS							
ELBOW	½	16	BE	90 DEGREE, LR, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB-S	2,27
ELBOW	18	24	BE	90 DEGREE, LR, WROUGHT, WELDED	B16.9	ASTM A234 GR. WPB-W	2,27, 82
ELBOW	½	16	BE	45 DEGREE, LR, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB-S	2,27
ELBOW	18	24	BE	45 DEGREE, LR, WROUGHT, WELDED	B16.9	ASTM A234 GR. WPB-W	2,27, 82
REDUCER	¾	16	BE	CONCENTRIC, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB-S	2,27
REDUCER	18	24	BE	CONCENTRIC, WROUGHT, WELDED	B16.9	ASTM A234 GR. WPB-W	2,27, 82,83
REDUCER	¾	16	BE	ECCENTRIC, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB-S	2,27
REDUCER	18	24	BE	ECCENTRIC, WROUGHT, WELDED	B16.9	ASTM A234 GR. WPB-W	2,27, 82,83
CAP	½	24	BE	WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB-S	2,27
BRANCH FITTINGS							
TEE	½	16	BE	EQUAL, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB-S	2,27
TEE	18	24	BE	EQUAL WROUGHT, WELDED	B16.9	ASTM A234 GR. WPB-W	2,27, 82

PIPING CLASS: AC1A3B-FA

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
BRANCH FITTINGS- CONT, D							
TEE	¾	16	BE	REDUCING, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB-S	2,27
TEE	18	24	BE	REDUCING, WROUGHT, WELDED	B16.9	ASTM A234 GR. WPB-W	2,27, 82
WELDOLET	½	8	BE	FORGED, SCH AS PIPE	MSS SP-97	ASTM A105N	27
FLANGES							
WELDNECK	½	24	RF	CL.150	B16.5	ASTM A105N	2,27
WELDNECK	½	24	RF	CL.300	B16.5	ASTM A105N	2,27, 33
NIPOFLANGE	1	2	RF	CL.150, L=150 MM	B16.5	ASTM A105N	2,27, 73
BLIND	½	24	RF	CL.150	B16.5	ASTM A105N	27
ORIFICE	2	24	RF	CL.300	B16.36	ASTM A105N	2,27, 54
LINE BLINDS							
LINE BLIND	½	10	RF	CL.150, SPECTACLE BLIND	B16.48	ASTM A516 GR.70	3,27
LINE BLIND	12	24	RF	CL.150, SPADE & SPACER	B16.48	ASTM A516 GR.70	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	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	33

PIPING CLASS: AC1A3B-FA

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
GASKETS- CONT, D							
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	86
BOLTS							
STUD BOLT & NUTS	½	24	-	STUD BOLT C/W 2 HEAVY HEX. NUTS	B18.2.1/ B18.2.2	STUD: ASTM A193 GR. B7 ASTM A194 GR. 2H	15

PIPING CLASS: AC1A3B-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	BS1868 + ASME B16.34	BODY: ASTM A105N TRIM: 13Cr+HF	
CHECK	2	24	RF	CL.150, DUAL PLATE, TYPE A, RF DOUBLE FLGD TO B16.5	API 594	BODY: ASTM A216 GR.WCB TRIM: 13Cr+HF	
CHECK	2	24	RF	CL.150, SWING CHECK FLGD TO B16.5	API 6D	BODY: ASTM A216 GR.WCB TRIM: 13Cr+HF	
CHECK	2	24	RF	CL.150, DUAL PLATE, WAFER TYPE, TO FIT BETWEEN B16.5 FLANGES	API 594	BODY: ASTM A216 GR.WCB TRIM: 13Cr+HF	91
GATE	½	1 ½	RF	CL.150, FLGD TO B16.5, SOLID WEDGE, STD PORT, OS & Y, BOLTED BONNET, HANDWHEEL	API 602 + ASME B16.34	BODY: ASTM A105N TRIM: 13Cr+HF	16
GATE	2	24	RF	CL.150, FLGD TO B16.5, FLEXIBLE WEDGE, STD PORT, OS & Y, BOLTED BONNET, HANDWHEEL / GEAR	API 600 + ASME B16.34	BODY: ASTM A216 GR.WCB TRIM: 13Cr+HF	16
GLOBE	½	1 ½	RF	CL.150, FLGD TO B16.5, SWIVEL PLUG DISC, OS & Y, BOLTED BONNET, HANDWHEEL	API 602 + ASME B16.34	BODY: ASTM A105N TRIM: 13Cr+HF	16
GLOBE	2	12	RF	CL.150, FLGD TO B16.5, SWIVEL PLUG DISC, OS & Y, BOLTED BONNET, HANDWHEEL / GEAR	API 623 + ASME B16.34	BODY: ASTM A216 GR.WCB TRIM: 13Cr+HF	16
BUTTERFLY	14	24	RF	CL.150, TRIPLE OFFSET, DOUBLE FLGD TO B16.5, GEAR	API 609, CAT.B	BODY: ASTM A216 GR.WCB TRIM & SEAT: 13Cr+HF	16,71 87

PIPING CLASS: AC1A3B-FA

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
VALVES (NOTE-81)							
BUTTERFLY	2	24	RF	CL.150, DOUBLE OFFSET, WAFER LUG TYPE TO FIT BETWEEN B16.5 FLANGES, LEVER/ GEAR	API 609, CAT.B	BODY: ASTM A216 GR.WCB TRIM: SS316 SEAT: RPTFE	16,91
BALL	2	6	RF	CL.150, FLGD TO B16.5, REDUCED BORE, FLOATING BALL, LEVER / GEAR	API 6D	BODY: ASTM A216 GR. WCB TRIM: SS316 SEAT: RPTFE	16,58
BALL	8	24	RF	CL.150, FLGD TO B16.5, REDUCED BORE, TRUNNION MOUNTED, GEAR.	API 6D	BODY: ASTM A216 GR. WCB TRIM: SS316 SEAT: RPTFE	16,58
BALL	½	1 ½	RF	CL.150, FLGD TO B16.5, FULL BORE, FLOATING BALL, LEVER	API 6D	BODY: ASTM A105N TRIM: SS316 SEAT: RPTFE	16,58
BALL	2	4	RF	CL.150, FLGD TO B16.5, FULL BORE, FLOATING BALL, LEVER	API 6D	BODY: ASTM A216 GR. WCB TRIM: SS316 SEAT: RPTFE	16,58, 71
BALL	6	24	RF	CL.150, FLGD TO B16.5, FULL BORE, TRUNNION MOUNTED, GEAR	API 6D	BODY: ASTM A216 GR. WCB TRIM: SS316 SEAT: RPTFE	16,58, 71

PIPING CLASS: AC1A3B-FA

SECTION 6.0 – ALTERNATIVE COMPONENT MATERIAL DESCRIPTIONS (SOCKET WELDED)

SECTION 6.1 – PIPING COMPONENTS (NOTE-91)

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
PIPE							
PIPE	½	1 ½	PE	SEAMLESS	B36.10	ASTM A106 GR B	1,27, 85
NIPPLE	1	2	PE	SEAMLESS, SCH 80	B36.10	ASTM A106 GR B	27,85
ECC.SWAGE NIPPLE	¾	1 ½	PE	ECC. SWAGE NIPPLE, PBE	MSS-SP-95	ASTM A234 GR. WPB	27,85
CONC.SWAGE NIPPLE	¾	1 ½	PE	CONC. SWAGE NIPPLE, PBE	MSS-SP-95	ASTM A234 GR. WPB	27,85
FITTINGS							
ELBOW	½	1 ½	SW	90 DEGREE, LR, CL.6000 FORGED	B16.11	ASTM A105N	27
ELBOW	½	1 ½	SW	45 DEGREE, LR, CL.6000 FORGED	B16.11	ASTM A105N	27
CAP	½	1 ½	SW	CL.6000, FORGED	B16.11	ASTM A105N	27
REDUCER COUPLING	¾	1 ½	SW	CL.6000, REDUCER COUPLING FORGED	B16.11	ASTM A105N	27
FULL COUPLING	½	1 ½	SW	CL.6000, COUPLING FORGED	B16.11	ASTM A105N	27
CAP	½	1 ½	THD	CL.6000, FORGED	B16.11	ASTM A105N	27
PLUG	½	1 ½	THD	HEXAGONAL HEADED PLUG, CL.6000, FORGED	B16.11	ASTM A105N	27
BRANCH FITTINGS							
TEE	½	1 ½	SW	EQUAL, FORGED, CL.6000	B16.11	ASTM A105N	27
TEE	¾	1 ½	SW	REDUCING, FORGED, CL.6000	B16.11	ASTM A105N	27
SOCKOLET	½	1 ½	SW	FORGED, CL.6000	MSS-SP-97	ASTM A105N	27

PIPING CLASS: AC1A3B-FA

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
FLANGES							
SOCKETWELD	½	1 ½	RF	CL.150	B16.5	ASTM A105N	27
SOCKETWELD	½	1 ½	RF	CL.300	B16.5	ASTM A105N	27,33
SOCKETWELD	½	1 ½	RF	CL.600	B16.5	ASTM A105N	27,39

SECTION 6.2 – VALVES (NOTE-91)

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
VALVES (NOTE-81)							
CHECK	½	1 ½	SW	CL.800, SW TO B16.11, SPRING LOADED LIFT CHECK,BOLTED COVER	API 602 + ASME B16.34	BODY: ASTM A105N TRIM: 13Cr+HF	
GATE	½	1 ½	SW	CL.800, SW TO B16.11, SOLID WEDGE, STD PORT, OS & Y, BOLTED BONNET,HANDWHEEL	API 602 + ASME B16.34	BODY: ASTM A105N TRIM: 13Cr+HF	
GLOBE	½	1 ½	SW	CL.800, SW TO B16.11, SWIVEL PLUG DISC, OS&Y,BOLTED BONNET,HANDWHEEL	API 602 + ASME B16.34	BODY: ASTM A105N TRIM: 13Cr+HF	
BALL	½	1 ½	PE	CL.800, SW TO B16.11, INTREGRAL NIPPLE, FLOATING TYPE BALL VALVE, FULL PORT	BS EN ISO 17292 / API 608	BODY: ASTM A105N TRIM: SS316 SEAT: PTFE	