

## PIPING CLASS: AF1S0E-FA

### SECTION 1.0 – GENERAL

<b>PIPE CLASS:</b>	<b>AF1S0E-FA</b>	<b>DESIGN CODE:</b>	ASME B31.3
<b>RATING:</b>	150	<b>PWHT:</b>	NOTE 5
<b>FLANGE FACE:</b>	RF	<b>VALVE TRIM:</b>	SDSS
<b>BASIC MATERIAL:</b>	NPS ½ – 3: SDSS (GROUP 2.8) NPS 3 – 24: CS-FBE LINED (GROUP 1.1)	<b>SOUR:</b>	YES (NOTE 4 & 13)
<b>CORROSION ALLOWANCE:</b>	0 MM	<b>SPECIAL REQUIREMENT:</b>	NACE AND NOTES: 102, 103, 104, 106

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

<b>TEMP.</b>	-29	0	38	50	100
<b>PRESS.</b>	19.6	19.6	19.6	19.2	17.7

### SERVICE

REFER TO PIPING CLASS INDEX

### SIZE RANGE, PIPE WALL THICKNESS (MM) TABLE (NOTE-36,80)

<b>NPS</b>	½	¾	1	1 ½	2	3
<b>SCHEDULE</b>	80S	80S	80S	80S	40S	10S
<b>THICKNESS</b>	3.73	3.91	4.55	5.08	3.91	3.05

<b>NPS</b>	3	4	6	8	10	12	14	16	18	20	24
<b>SCHEDULE</b>	40	40	40	20	20	20	20	20	20	20	20
<b>THICKNESS</b>	5.49	6.02	7.11	6.35	6.35	6.35	7.92	7.92	7.92	9.53	9.53

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### **SECTION 2.0 - NOTES**

#### **GENERAL NOTES**

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 SPECIFICATION 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).
11. FOR SDSS MATERIAL PREN SHALL BE >40
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).
19. PRESSURE -TEMPERATURE RATING & BRANCH FITTINGS FOR THE UNLISTED MATERIALS SHALL BE VERIFIED WITH VENDOR.
22. ALL PIPING COMPONENTS UPTO NPS 24 SHALL BE DESIGNED FOR VACUUM CONDITION. FOR HIGHER SIZES VACUUM DESIGN SHALL BE APPLICABLE IF INDICATED IN THE LINELIST.
33. TO BE USED FOR FLANGED CLASS 300 RF CONNECTION.
36. PRESSURE-TEMPERATURE RATINGS FOR MIXED PIPE CLASSES OF LOWER PRESSURE TEMPERATURE RATING AS PER APPLICABLE GROUP.
54. COMPLETE ORIFICE ASSEMBLY SHALL BE SUPPLIED WITH PAIR OF ORIFICE FLANGES EACH HAVING ONE NPS ½ FLANGED TAP (RATING SAME AS PIPE CLASS).
70. LOW STRESS SPIRAL WOUND GASKET.
71. TO BE USED ONLY WHEN INDICATED ON THE P&ID.
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.
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.
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.
102. WELDING IS NOT PERMITTED ON ANY INTERNAL FBE COATED PIPING COMPONENT.
103. FLANGED PIPING SPOOLS LENGTH ARE TO BE SPECIFIED BY THE COATING APPLICATOR.
104. ALL WETTED SURFACES ARE TO BE FULLY LINED, INCLUDING FLANGE FACE.

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- 165. PREFABRICATED PIPE SPOOLS SHALL HAVE FLANGED ENDS AND BE LIMITED TO L AND Z SHAPES, AND SHALL BE INTERNALLY COATED, BAKED ON EPOXY PHENOLIC RESIN FBE (FUSION BONDED EPOXY). WELDS SHALL NOT BE ALLOWED AFTER INTERNAL COATING. LINE SHALL BE INTERNALLY COATED WITH FBE AS PER A-5 OF AGES-SP-07-004 OR AS PER APPROVED PROJECT SPECIFICATION.
- 203. MATING FLANGE FACING WITH FBE LINED SHALL BE FLAT FACE ONLY.

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### SECTION 3.0 – BRANCH TABLE

#### 90° BRANCH CONNECTIONS – SDSS (NOTE 19)

BRANCH PIPE (NPS)										
	3						E			
	2					E	T			
	1 ½				E	T	T			
	1			E	T	T	W			
	¾		E	T	T	T	W			
	½	E	T	T	T	TR	W			
		½	¾	1	1 ½	2	3			
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

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### 90° BRANCH CONNECTIONS – CS-FBE LINED (NOTE-19)

BRANCH PIPE (NPS)													
	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	W	W	W	W	W	W	W	W	W	W	
		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
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### SECTION 4.0 – PIPING COMPONENTS

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
PIPE (NOTE 11)							
PIPE	½	3	BE	SEAMLESS	B36.19	ASTM A790 UNS S32760, SOUR SERVICE	1,85
PIPE	3	24	BE	SEAMLESS	B36.10	ASTM A106 GR B – FBE LINED, SOUR SERVICE	102,103,165
NIPPLE	1	2	BE	AS PIPE, L=100mm	B36.19	ASTM A790 UNS S32760, SOUR SERVICE	85
FITTINGS (NOTE 11)							
ELBOW	½	3	BE	90 DEGREE, LR, WROUGHT, SEAMLESS	B16.9	ASTM A815 WP-S UNS S32760, SOUR SERVICE	2
ELBOW	3	24	BE	90 DEGREE, LR, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB – FBE LINED, SOUR SERVICE	2,102,165
ELBOW	½	3	BE	45 DEGREE, LR, WROUGHT, SEAMLESS	B16.9	ASTM A815 WP-S UNS S32760, SOUR SERVICE	2
ELBOW	3	24	BE	45 DEGREE, LR, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB - FBE LINED, SOUR SERVICE	2,102,165
REDUCER	¾	3	BE	CONCENTRIC, WROUGHT, SEAMLESS	B16.9	ASTM A815 WP-S UNS S32760, SOUR SERVICE	2
REDUCER	4	24	BE	CONCENTRIC, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB - FBE LINED, SOUR SERVICE	2,83,102,165
REDUCER	¾	3	BE	ECCENTRIC, WROUGHT, SEAMLESS	B16.9	ASTM A815 WP-S UNS S32760, SOUR SERVICE	2
REDUCER	4	24	BE	ECCENTRIC, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB - FBE LINED, SOUR SERVICE	2,83,102,165
CAP	½	3	BE	WROUGHT, SEAMLESS	B16.9	ASTM A815 WP-S UNS S32760, SOUR SERVICE	2

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COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
FITTINGS – CONT'D (NOTE 11)							
CAP	3	24	BE	WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB - FBE LINED, SOUR SERVICE	2,102,165
BRANCH FITTINGS (NOTE 11)							
TEE	½	3	BE	EQUAL, WROUGHT, SEAMLESS	B16.9	ASTM A815 WP-S UNS S32760, SOUR SERVICE	2
TEE	3	24	BE	EQUAL, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB - FBE LINED, SOUR SERVICE	2,102,165
TEE	¾	3	BE	REDUCING, WROUGHT, SEAMLESS	B16.9	ASTM A815 WP-S UNS S32760, SOUR SERVICE	2
TEE	4	24	BE	REDUCING, WROUGHT, SEAMLESS	B16.9	ASTM A234 GR. WPB - FBE LINED, SOUR SERVICE	2,102,165
WELDOLET	½	3	BE	FORGED, SCH AS PIPE	MSS SP- 97	ASTM A182 F55, SOUR SERVICE	
WELDOLET	3	8	BE	FORGED, SCH AS PIPE	MSS SP- 97	ASTM A105N - FBE LINED, SOUR SERVICE	2,102,165
FLANGES (NOTE 11)							
WELDNECK	½	3	RF	CL.150	B16.5	ASTM A182 F55, SOUR SERVICE	2
WELDNECK	3	24	FF	CL.150	B16.5	ASTM A105N - FBE LINED, SOUR SERVICE	2,102,103, 165
WELDNECK	½	3	RF	CL.300	B16.5	ASTM A182 F55, SOUR SERVICE	2,33
BLIND	½	3	RF	CL.150	B16.5	ASTM A182 F55, SOUR SERVICE	
BLIND	3	24	FF	CL.150	B16.5	ASTM A105N - FBE LINED, SOUR SERVICE	102,103, 165

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COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
FLANGES (NOTE 11) – CONT'D							
ORIFICE	2	3	RF	CL.300	B16.36	ASTM A182 F55, SOUR SERVICE	2,54
ORIFICE	3	24	FF	CL.300	B16.36	ASTM A105N - FBE LINED, SOUR SERVICE	2,54,165
LINE BLINDS (NOTE 11)							
LINE BLIND	½	3	RF	CL.150, SPECTACLE BLIND	B16.48	ASTM A240 UNS S32760, SOUR SERVICE	3
LINE BLIND	3	10	FF	CL.150, SPECTACLE BLIND	B16.48	ASTM A516 GR.70 - FBE LINED, SOUR SERVICE	3,102
LINE BLIND	12	24	FF	CL.150, SPADE & SPACER	B16.48	ASTM A516 GR.70 - FBE LINED, SOUR SERVICE	3,102
GASKETS (NOTE 11)							
GASKET	½	3	-	CL.150, SPIRAL WOUND, 4.5MM THK.	B16.20/ B16.5	SP. WINDING + INNER RING: UNS S31254, FILLER: GRAPHITE, OUTER RING: SS316, LOW STRESS, SOUR SERVICE	70
GASKET	3	24	-	CL.150, NON-METALLIC FLAT FACE, 3.0MM THK	B16.21/ B16.5	NEOPRENE, SHORE-A, MIN. HARDNESS 60, SOUR SERVICE	
GASKET	3	24	-	CL.300, NON-METALLIC FLAT FACE, 3.0MM THK	B16.21/ B16.5	NEOPRENE, SHORE-A, MIN. HARDNESS 60, SOUR SERVICE	
BOLTS							
STUD BOLT & NUTS	½	24	-	STUD BOLT C/W 2 HEAVY HEX. NUTS PTFE COATED	B18.2.1/ B18.2.2	STUD: ASTM A193 GR. B7M ASTM A194 GR. 2HM	15



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### SECTION 5.0 – VALVES

COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
VALVES (NOTE – 11 ,81)							
CHECK	½	1½	RF	CL.150, FLGD TO B16.5, SPRING LOADED LIFT CHECK, BOLTED COVER, SOUR SERVICE	BS1868 + ASME B16.34	BODY: ASTM A182 F55 TRIM: SDSS+HF	
CHECK	2	3	RF	CL.150, DUAL PLATE, TYPE A, RF DOUBLE FLGD TO B16.5, SOUR SERVICE	API 594	BODY: ASTM A995-6A TRIM: SDSS+HF	
CHECK	3	24	FF	CL.150, DUAL PLATE, TYPE A, RF DOUBLE FLGD TO B16.5, SOUR SERVICE	API 594	BODY: ASTM A995-6A TRIM: SDSS+HF	
CHECK	2	3	RF	CL.150, SWING CHECK FLGD TO B16.5, SOUR SERVICE	API 6D	BODY: ASTM A995-6A TRIM: SDSS+HF	
CHECK	3	24	FF	CL.150, SWING CHECK FLGD TO B16.5, SOUR SERVICE	API 6D	BODY: ASTM A995-6A TRIM: SDSS+HF	
GATE	½	1½	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 A182 F55 TRIM: SDSS+HF	16
GATE	2	3	RF	CL.150, FLGD TO B16.5, FLEXIBLE WEDGE, STD PORT, OS&Y, BOLTED BONNET, HANDWHEEL SOUR SERVICE	API 603 + ASME B16.34	BODY: ASTM A995-6A TRIM: SDSS+HF	16
GATE	3	24	FF	CL.150, FLGD TO B16.5, FLEXIBLE WEDGE, STD PORT, OS&Y, BOLTED BONNET, HANDWHEEL / GEAR SOUR SERVICE	API 603 + ASME B16.34	BODY: ASTM A995-6A TRIM: SDSS+HF	16
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 A182 F55 TRIM: SDSS+HF	16

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COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
VALVES (NOTE – 11,81) – CONT'D							
GLOBE	2	3	RF	CL.150, FLGD TO B16.5, SWIVEL PLUG DISC, OS&Y, BOLTED BONNET, HANDWHEEL, SOUR SERVICE	API 623 + ASME B16.34	BODY: ASTM A995-6A TRIM: SDSS+HF	16
GLOBE	3	12	FF	CL.150, FLGD TO B16.5, SWIVEL PLUG DISC, OS&Y, BOLTED BONNET, HANDWHEEL / GEAR, SOUR SERVICE	API 623 + ASME B16.34	BODY: ASTM A995-6A TRIM: SDSS+HF	16
BUTTERFLY	14	24	FF	CL.150, TRIPLE OFFSET, METAL SEATED, DOUBLE FLGD TO B16.5, GEAR, SOUR SERVICE	API 609, CAT.B	BODY: ASTM A995-6A TRIM & SEAT: SDSS+HF	16,71,87
BALL	2	3	RF	CL.150, FLGD TO B16.5, REDUCED BORE, FLOATING BALL, LEVER, SOUR SERVICE	API 6D	BODY: ASTM A995-6A TRIM: SDSS SEAT: RPTFE	16
BALL	3	6	FF	CL.150, FLGD TO B16.5, REDUCED BORE, FLOATING BALL, LEVER / GEAR, SOUR SERVICE	API 6D	BODY: ASTM A995-6A TRIM: SDSS SEAT: RPTFE	16
BALL	8	24	FF	CL.150, FLGD TO B16.5, REDUCED BORE, TRUNNION MOUNTED, GEAR, SOUR SERVICE	API 6D	BODY: ASTM A995-6A TRIM: SDSS SEAT: RPTFE	16
BALL	½	1½	RF	CL.150, FLGD TO B16.5, FULL BORE, FLOATING BALL, LEVER, SOUR SERVICE	API 6D	BODY: ASTM A182 F55 TRIM: SDSS SEAT: RPTFE	16
BALL	2	3	RF	CL.150, FLGD TO B16.5, FULL BORE, FLOATING BALL, LEVER, SOUR SERVICE	API 6D	BODY: ASTM A995-6A TRIM: SDSS SEAT: RPTFE	16,71

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COMPONENT (TYP)	NPS (INCH)		END	DESCRIPTION	DIM/ MFG STD.	MATERIAL STD.	NOTES
	FROM	TO					
VALVES (NOTE – 11,81) – CONT'D							
BALL	3	4	FF	CL.150, FLGD TO B16.5, FULL BORE, FLOATING BALL, LEVER, SOUR SERVICE	API 6D	BODY: ASTM A995-6A TRIM: SDSS SEAT: RPTFE	16,71
BALL	6	24	FF	CL.150, FLGD TO B16.5, FULL BORE, TRUNNION MOUNTED, GEAR, SOUR SERVICE	API 6D	BODY: ASTM A995-6A TRIM: SDSS SEAT: RPTFE	16,71
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 A182 F55 / ASTM A995 4A/6A TRIM: SDSS BALL SEAT: RPTFE BLEED VALVE: BODY: ASTM A182 F55 TRIM: SDSS+HF	16,90