



ENGINEERING SPECIFICATIONS
TEXAS DIVISION

PLAINTIFF'S EXHIBIT

DOW-2400

E8S204012

PIPING SPEC 46-581

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HYDROCARBON PROCESS PIPING
275 PSIG MAX @ -20 TO +100F
150 PSIG MAX @ 100 TO +450F

ITEM	SIZE	DESCRIPTION
N-228		1 SCREWED FITTINGS SHALL NOT BE USED IN PIPING SYSTEMS WHERE VIBRATION IS PRESENT, I.E., COMPRESSOR PIPING, ETC.
N-1		2 ALL 1/2 NPT NIPPLES USED FOR INSTRUMENT, AND TEST CONNECTIONS SHALL BE HEAVY HEX BAR STOCK WITH A MINIMUM WALL THICKNESS OF 0.151 INCH, (0.400 I.D.).
N-213		3 PIPING SHALL BE INSTALLED IN ACCORDANCE WITH ENGR SPEC 47-110.
N-18		4 ALL NIPPLES USED FOR DRAINS AND VENTS SHALL BE SCH. 80 OR HEAVIER.
NOTE		5 G-44 GASKET TO BE USED ONLY WHERE SPECIFIED ON PIPING DRAWINGS.
N-212		6 USE EXTRA STRONG PIPE WHEN THREADED. LESSER SCHEDULES AS NOTED ARE OPTIONAL WHEN WELDED.
PIPE		
P-288	1/2 THRU 1 1/2	ASTM A-106 GR B, EX STRONG SEAMLESS STEEL PIPE.
P-278	1/2 THRU 1 1/2	ASTM A-106 GR B, STD WEIGHT SEAMLESS STEEL PIPE.
P-38	2 THRU 24	ASTM A-53 OR API-5L GR B, STD WEIGHT SEAMLESS STEEL PIPE.
P-32C	16 THRU 54	ASTM A-135 GR C50 OR C55 CLASS 1, 0.375 WALL ELECTRIC FUSION WELDED STEEL PIPE.
FITTINGS		
ELTX-65	1/2 THRU 1 1/2	2000-LB THREADED FORGED STEEL FITTINGS, ASTM A-105, ANSI B16.11.
N-234		3000-LB FITTINGS MAY BE SUBSTITUTED FOR 2000-LB FITTINGS.
C-3C	1/2 THRU 1 1/2	3000-LB THREADED FORGED STEEL COUPLING,

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ITEM	SIZE	DESCRIPTION
		ASTM A-105, ANSI B16.11.
C-145	1/2 THRU 1 1/2	3000-LB FORGED STEEL SOCKOLET, ASTM A-105.
C-41	1 THRU 20	STD WEIGHT STEEL WELDOLET, ASTM A-105,
R-22	1/2 THRU 1 1/2	EX STRONG STEEL SWAGED NIPPLE, ASTM A-105 OR A-53 GR B, OR AISI C-1025 BARSTOCK, THREADED, BEVELED, PLAIN OR ANY COMBINATION OF ENDS.
C-54	1/2 THRU 1 1/2	3000-LB THREADED FORGED STEEL NIPPLET, ASTM A-105, DIMENSIONS PER BONNEY FORGE CATALOG W-8, PG. 29.
U-2	1/2 THRU 1 1/2	3000-LB THREADED FORGED STEEL UNION, ASTM A-105, AAR DIMENSIONS, STEEL TO STEEL SEAT, PETRO AAR OR VOGT 1931.
PC-2	1/2 THRU 1 1/2	THREADED SOLID STEEL HEX HEAD PLUG, ASTM A-105, ANSI B16.11.
PC-26	1/2 THRU 1 1/2	3000-LB THREADED FORGED STEEL CAP, ASTM A-105, ANSI B16.11.
ELT-64	1/2 THRU 1 1/2	3000-LB SOCKET WELDING FORGED STEEL FITTINGS, ASTM A-105, ANSI B16.11.
C-14	1/2 THRU 1 1/2	3000-LB SOCKET WELDING FORGED STEEL COUPLING, ANSI B16.11, OR 3000-LB SOCKOLET, ASTM A-105, FOR WELDING IN.
C-545	1/2 THRU 1 1/2	3000-LB SOCKET WELDING FORGED STEEL NIPPLET, ASTM A-105, DIMENSIONS PER BONNEY FORGE CATALOG W-8, PG.29.
PC-27	1/2 THRU 1 1/2	3000-LB SOCKET WELD FORGED STEEL CAP, ASTM A-105.
U-18	1/2 THRU 1 1/2	FOR UNION USE SOCKET WELDING FLANGES.
ELTR-15B	2 THRU 24	STD WEIGHT SEAMLESS STEEL WELDING FITTINGS, ASTM A-234 GR WPB, ANSI B16.9.
N-233		REDUCING ELLS 6 INCH AND SMALLER SHALL BE SEAMLESS. REDUCING ELLS 8 INCH AND LARGER SHALL HAVE WELDS RADIOGRAPHED PER THE REQUIREMENTS OF ASTM A-234 AND PARAGRAPH UW-51 OF SECTION VIII OF ASME BOILER AND PRESSURE VESSEL CODE, FOR 100 PER CENT JOINT



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ITEM	SIZE	DESCRIPTION
		EFFICIENCY.
PC-51B	2 THRU 24	STD WEIGHT SEAMLESS STEEL WELDING CAP, ASTM A-234 GR WPB, ANSI B16.9.
PC-51BW	26 THRU 48	STD WEIGHT STEEL WELDING CAP, ASTM A-234 GR WPB, ANSI B16.9.
FLANGES		
F-19-RF	1/2 THRU 1 1/2	150-LB RAISED FACE THREADED FLANGE, ASTM A-105, ANSI B16.5.
F-14-RF	1/2 THRU 1 1/2	150-LB RAISED FACE SOCKET WELDING FLANGE, ASTM A-105, ANSI B16.5.
F-1-RF	2 THRU 24	150-LB RAISED FACE SLIP-ON FLANGE, ASTM A-105, ANSI B16.5.
F-24-RF	2 THRU 24	150-LB RAISED FACE WELDING NECK FLANGE, ASTM A-105, ANSI B16.5, BORE TO MATCH WELDING FITTINGS.
F-98A	26 THRU 54	CLASS 175 LARGE DIA RAISED FACE SLIP-ON FLANGE, ASTM A-105. FLANGE OVER 3 INCH THICK TO BE NORMALIZED. DIMENSIONS TO BE IN ACCORDANCE WITH TAYLOR FORGE CATALOG 722 PAGE 32, CRANE CATALOG 61 PAGE 103, TUBE TURN PART NO 713 (OD) OR LADISH PART NO 506, BORE TO MATCH OD PIPE.
F-3-RF	1/2 THRU 24	150-LB RAISED FACE BLIND FLANGE, ASTM A-105, ANSI B16.5.
F-98B	26 THRU 54	CLASS 175 LARGE DIA RAISED FACE BLIND FLANGE, ASTM A-105. FLANGE OVER 3 INCH THICK TO BE NORMALIZED. DIMENSIONS TO BE IN ACCORDANCE WITH TAYLOR FORGE CATALOG 722 PAGE 32, CRANE CATALOG 61 PAGE 103, TUBE TURN PART NO 723 (OD) OR LADISH PART NO 507.
N-66		REDUCING FLANGES SHALL BE SLIP-ON TYPE EXCEPT ON SIZES WHERE THREADED FITTINGS ARE SPECIFIED, THREADED REDUCING FLANGES MAY BE USED.
BRANCH CONNECTIONS		
BC-7S		FOR SOCKET WELDING AND THREADED PIPING, USE STRAIGHT SIZE TEE ONLY. USE SOCKET WELDING

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ITEM	SIZE	DESCRIPTION
		REDUCER INSERT OR SWAGE NIPPLE WHEN BRANCH IS SMALLER THAN HEADER.
BC-112		FOR WELDED PIPING, USE STRAIGHT SIZE OR REDUCING TEE. WELDLET OR REINFORCING PAD MAY BE USED ON REDUCING BRANCH CONNECTIONS IN PLACE OF REDUCING TEE. FOR 3/4 INCH AND SMALLER, USE SOCKLET WELDED TO HEADER.
GASKETS		
G-40		SPIRAL-WOUND, 304 STAINLESS STEEL-ASBESTOS GASKET, FLEXITALLIC CS, GARLOCK CR, LAMONS WR, JM-913 OR STERLING GR.
G-44		SPIRAL-WOUND 304 STAINLESS STEEL-ASBESTOS GASKET WITH STAINLESS STEEL INNER AND OUTER COMPRESSION-GAUGE RINGS, ID SAME AS SCH 8S PIPE, FLEXITALLIC CS, GARLOCK CR, LAMONS WRI, JM-913-IR OR STERLING GR-19.
JOINT COMPOUND		
JC-15		TEFLON TAPE 1/2 INCH BY 3 MIL THICKNESS.
FLANGE BOLTS		
B-A193B70		ASTM A-193 GR B7 QUENCHED AND TEMPERED ALLOY STEEL STUD BOLTS WITH ASTM A-194 GR 2H HEAVY HEX NUTS.
N-231		APPLY BOLT LUBRICANT TO THE FULL LENGTH OF THREADS.
BOLT LUBRICANT		
BL-2		FEL PRO C5-A.
VALVES		
* V-367	1/2 THRU 1 1/2	800-LB SCREWED OS/Y SOLID WEDGE GATE VALVE, CARBON STEEL BODY, 13 CHROME ALLOY STEEL TRIM WITH HARD-FACED SEAT RINGS, BOLTED BONNET.
* V-674	1/2 THRU 1 1/2	800-LB SOCKET WELDING OS/Y GATE VALVE, CARBON STEEL BODY, HARD-FACED SEAT RINGS, WELDED BONNET.

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ITEM	SIZE	DESCRIPTION
V-474	1/2 THRU 1 1/2	800-LB SOCKET WELDING OS/Y SOLID WEDGE GATE VALVE, CARBON STEEL BODY, 13 CHROME ALLOY STEEL TRIM WITH HARD FACED SEAT RINGS, BOLTED BONNET.
* V-517	1/2 THRU 1 1/2	150-LB FLANGED OS/Y GATE VALVE, CARBON STEEL BODY, 13 CHROME ALLOY STEEL TRIM WITH HARD-FACED SEATS.
* V-56	2 THRU 24	150-LB FLANGED OS/Y WEDGE GATE VALVE, CARBON STEEL BODY, 13 CHROME ALLOY STEEL TRIM WITH NICKEL ALLOY SEAT RINGS.
V-56F	2 THRU 24	150-LB FLANGED OS/Y FLEXIBLE DISC GATE VALVE, CARBON STEEL BODY, 13 CHROME ALLOY STEEL TRIM WITH NICKEL ALLOY SEAT RINGS.
NOTE		V-56F TO HAVE BLEED VALVE BETWEEN SEATS. VALVE SHALL BE TESTED FOR DOUBLE BLOCK AND BLEED SERVICE.
V-224	30 THRU 54	150-LB RF FLANGED GATE VALVE, CARBON STEEL BODY AND GATE, 316 STAINLESS STEEL STEM, SEAT, SEAT RING AND SPRING. FLANGE CONNECTIONS TO BE DRILLED AND TAPPED TO MATCH CLASS 175 FLANGES PER TAYLOR FORGE CATALOG NO. 722, PAGE 32. VALVE TO HAVE METAL TO METAL SEATS WHICH ARE INTERCHANGEABLE WITH STANDARD SEATS AND DISC. MAXIMUM VALVE LEAKAGE RATE OF 25CC PER HOUR PER INCH OF VALVE DIAMETER OF WATER AT FULL DIFFERENTIAL PRESSURE AT AMBIENT TEMP. ALL PARTS TO BE INERT TO AROMATIC HYDROCARBONS.
V-471	1/2 THRU 1 1/2	600-LB SCREWED OS/Y FLOCONTROL TYPE GLOBE VALVE, CARBON STEEL BODY, CHROME STAINLESS TRIM.
V-472	1/2 THRU 1 1/2	600-LB SOCKET WELDING OS/Y FLOCONTROL TYPE GLOBE VALVE, CARBON STEEL BODY, CHROME STAINLESS TRIM.

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ITEM	SIZE	DESCRIPTION
* V-36	2 THRU 12	150-LB FLANGED OS/Y GLOBE VALVE, CARBON STEEL BODY, 13 CHROME ALLOY STEEL TRIM.
* V-102	1/2 THRU 1 1/2	600-LB SCREWED HORIZONTAL LIFT CHECK VALVE, CARBON STEEL BODY, 13 CHROME ALLOY STEEL TRIM, BOLTED CAP.
V-394	1/2 THRU 1 1/2	600-LB SOCKET WELDING HORIZONTAL LIFT CHECK VALVE, CARBON STEEL BODY, 13 CHROME ALLOY STEEL TRIM, BOLTED CAP.
* V-46	1 THRU 16	150-LB FLANGED HORIZONTAL SWING CHECK VALVE, CARBON STEEL BODY, 13 CHROME ALLOY STEEL TRIM, BOLTED CAP.
V-399	10 THRU 24	150-LB RF WAFER CHECK VALVE WITH EXTENDED BODY AND PIN STOP, CARBON STEEL BODY AND DISC, EXTRA HEAVY INTEGRAL HINGE LUGS, METAL SEAT, INCONEL SPRING.
V-3828	1/2 THRU 1 1/2	800-LB FEMALE SOCKET WELDING BY SCREWED OS/Y GATE VALVE, CARBON STEEL BODY, HARD-FACED SEAT RINGS, BOLTED BONNET.
NCTE		V-453, V-459, AND V-487 HAVE A MAXIMUM TEMP. OF 350F.
* V-458	2	150-LB FLANGED, 3-WAY, 2-PORT, 90 DEG TURN, TRANSFLO TYPE PLUG VALVE WITH TAPERED PLUG, CARBON STEEL, WRENCH OPERATED, LUBRICATED.
V-459	3 THRU 4	150-LB FLANGED, 3-WAY, 2-PORT, 90 DEG TURN, TRANSFLO TYPE PLUG VALVE WITH TAPERED PLUG, CARBON STEEL, WRENCH OPERATED, LUBRICATED.
V-487	6 THRU 8	150-LB FLANGED, 3-WAY, 2-PORT, 90 DEG TURN, TRANSFLO TYPE PLUG VALVE WITH TAPERED PLUG, CARBON STEEL, WORM GEAR OPERATED, LUBRICATED.

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ITEM	SIZE	DESCRIPTION
V-401B	2 THRU 16	150-LB WELD END 3-BOLT LINE BLIND VALVE, CARBON STEEL BODY AND SPECTACLE PLATE. SAFETY LOCKING PIN, SJNA-N PACKED PLATE, BORE TO MATCH PIPE.
V-401V	2 THRU 16	150-LB WELD END 3-BOLT LINE BLIND VALVE, CARBON STEEL BODY AND SPECTACLE PLATE. SAFETY LOCKING PIN, VITON-PACKED PLATE, BORE TO MATCH PIPE.
V-401T	2 THRU 16	150-LB WELD END 3-BOLT LINE BLIND VALVE. CARBON STEEL BODY AND SPECTACLE PLATE. SAFETY LOCKING PIN, TEFLON-PACKED PLATE, BORE TO MATCH PIPE.

*

Asterisk indicates M & S Stock items. See Engr.
Spec. 48-902 for stock numbers.

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Date 46-581

Specification number _____

Approved for printing B. H. H.

Approved as noted _____

Please return to Reva Young
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If approved as noted; A typographical error - I will make correction but will not
return for another approval.

Content change - I will make change and return to you
for approval.

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