

DAFTAR PUSTAKA

- Abdillah, A. (2014). *TUGAS AKHIR ANALISA TEGANGAN PIPA PADA JALUR PEMIPAAAN GAS*. Universitas Bengkulu.
- ASME. (2019a). *Ferrous Material Specifications (SA-450 to End) SECTION II 2019 A* (pp. 757-1.637). <https://www.asme.org/shop/certification-accreditation>.
- ASME. (2019b). *Ferrous Material Specifications (Beginning to SA-450) SECTION II 2019 A* (pp. 1–754). <https://www.asme.org/shop/certification-accreditation>.
- Azmi, R. N., Dosen, P., Taufik, F., Nugroho, S. E., Mehta Wardhana, S. T., & Kelautan, F. T. (2018). *PIPE STRESS ANALYSIS PADA PIPA HEADER 12 INCHI DI TERMINAL LPG SEMARANG (STUDI KASUS TERJADI PENURUNAN TANAH)*.
- Chamsudi. (2005). DIKTAT PIPING STRESS ANALYSIS. In *Piping Stress Analysis* (pp. 1–86).
- Grinnel. (1963). *PIPING DESIGN and ENGINEERING Sixth Edition*.
- Hariandja, B. (1996). *mekanika_teknik_statika_dalam_analisis_s* (P. W. Indarto & H. Parhusip, Eds.; Vol. 1). Erlangga.
- Husen, A., & Jamaludin, A. (n.d.). ANALISIS TEGANGAN SISTEM PERPIPAAN PADA SISI TEKAN POMPA P-003E. *ISSN 1411 4143*, 8–28.
- Husen, A., Setiyadi, A., & Cholis, N. (2018). *ANALISIS TEGANGAN PIPA 043-GN-31004 PADA SCRUB COLOUMN VESSEL MENUJU VESSEL COLOUMN PROYEK TANGGUH EXPANSION TRAIN 3 PAPUA* (Vol. 14).
- Kannappan, S. P. E. (1985). *INTRODUCTION TO PIPE STRSS ANALYSIS*.
- Mahardhika, P., Choirul Rizal, M., Wirawan, A., & Darul, M. (2021). EVALUASI TEGANGAN PADA SISTEM PERPIPAAN DARI TANGKI AMMONIA PLANT KAPASITAS 40000 MT. *Teknologi Maritim*, 1(5), 2620–7540.
- Mahardhika, P., Husodo, A. W., Kusuma, G. E., Witjonarko, R. D. E., & Budiyanto, E. N. (2021). Analysis of Symmetrical and Nonsymmetrical Vertical Expansion Loop to Increase Flexibility And Reduce Pipe Stress Based On ASME B31.3. *TEKNIK*, 42(1), 63–70. <https://doi.org/10.14710/teknik.v42i1.29244>

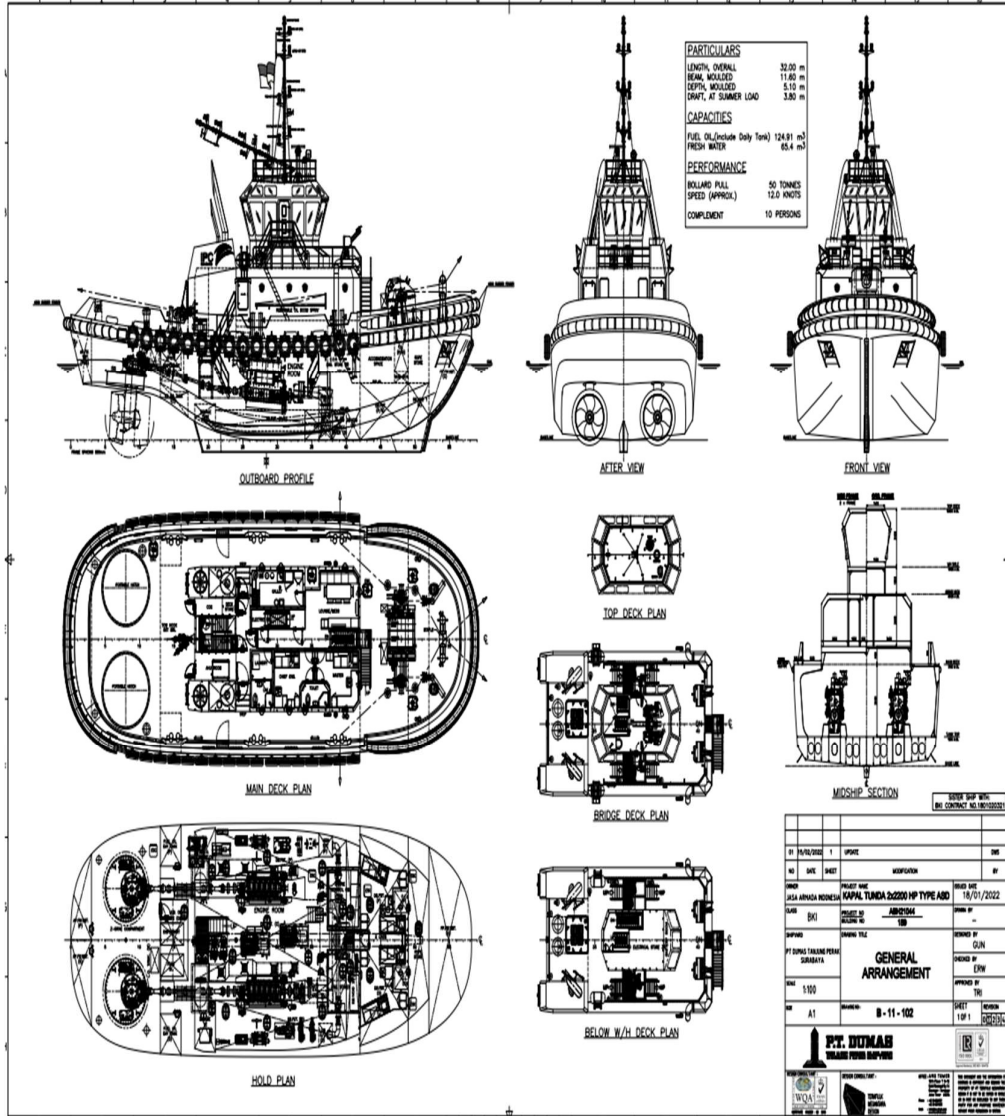
Sherwood, D. (1973). *PIPING-GUIDE*.

W L Z-Bend, H. (n.d.). *Perhitungan dan Desain DATA TEKNIS THERMACOR*.

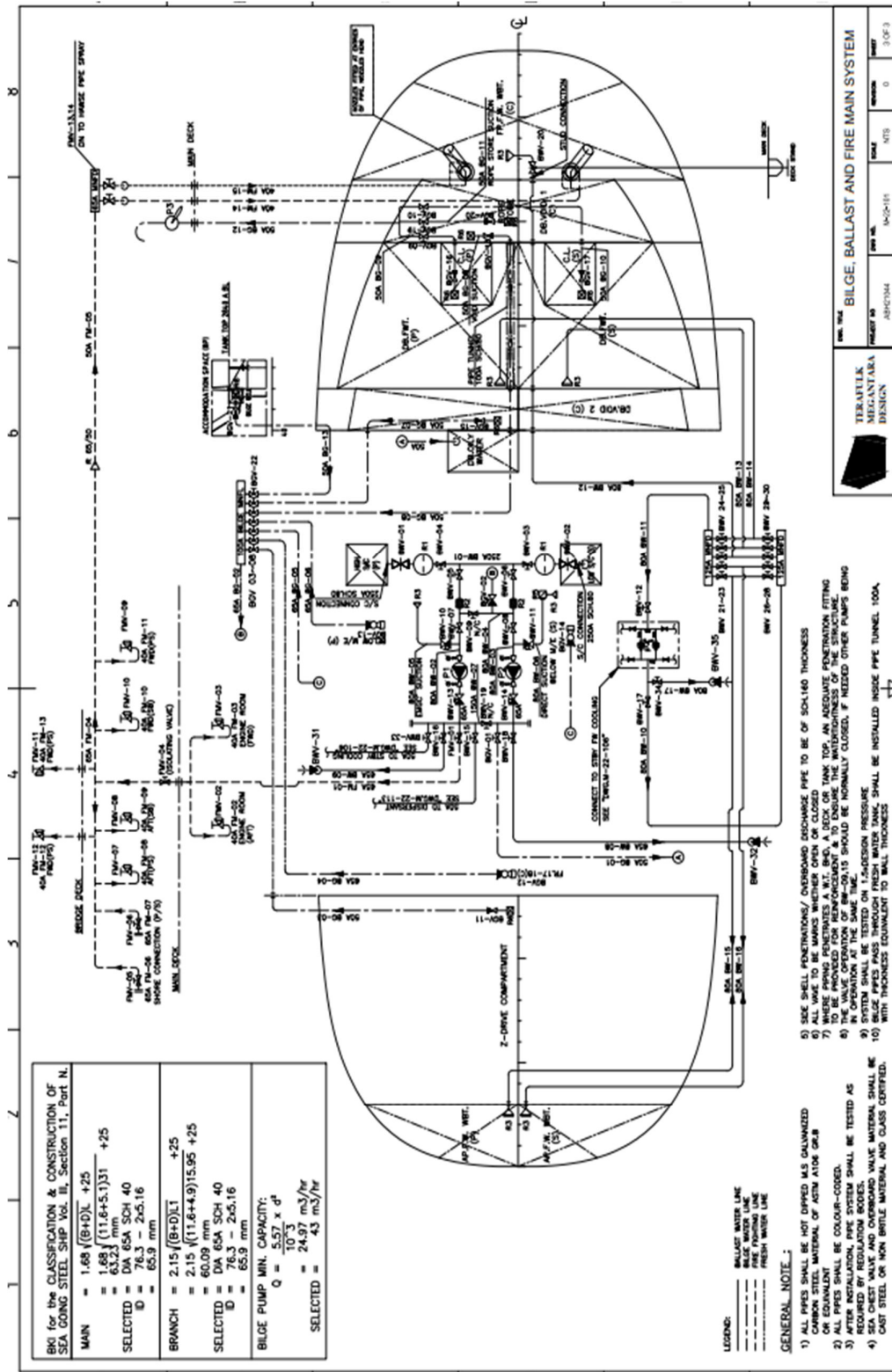
LAMPIRAN

Lampiran 1 Desain kapal dimulai dari general arrangement, gambar instalasi ballast, isometrik desain.

General Arrangement



Sistem Instalasi Pipa Ballast



BKI for the CLASSIFICATION & CONSTRUCTION OF SEA GOING STEEL SHIP Vol. II, Section 11, Part N.

MAIN	= 1.68 √(6+D) L +25
	= 1.68 √(11.6+5.1)31 +25
SELECTED	= 63.23 mm
	= DA 65A SCH 40
	= 76.3 - 2x5.16
	= 65.9 mm
BRANCH	= 2.15 √(6+D) L +25
	= 2.15 √(11.6+4.9)15.95 +25
SELECTED	= 60.09 mm
	= DA 65A SCH 40
	= 76.3 - 2x5.16
	= 65.9 mm
BILGE PUMP MIN. CAPACITY:	
Q =	5.57 x d ³
	10 ⁻³ m ³ /hr
SELECTED	= 24.9 m ³ /hr
	= 43 m ³ /hr

LEGEND:

- BALLAST WATER LINE
- BILGE WATER LINE
- SEA CHEST VALVE LINE
- FRESH WATER LINE

GENERAL NOTE:

- 1) ALL PIPES SHALL BE NOT DIPPED AS GALVANIZED CARBON STEEL MATERIAL OF ASTM A106 GR.B OR EQUIVALENT.
- 2) ALL PIPES SHALL BE COLOUR-CODED.
- 3) AFTER INSTALLATION, PIPE SYSTEM SHALL BE TESTED AS REQUIRED BY REGULATION BODIES.
- 4) SEA CHEST VALVE AND OVERBOARD VALVE MATERIAL SHALL BE CAST STEEL OR NON BRITTLE MATERIAL AND CLASS CERTIFIED.
- 5) SIDE SHELL PENETRATIONS/ OVERBOARD DISCHARGE PIPE TO BE OF SCH160 THICKNESS
- 6) ALL VALVE TO BE MARKED WHETHER OPEN OR CLOSED
- 7) WHEN PIPING IS FINISHED, ALL VALVES TO BE TO BE OPEN AND THE PIPE TO BE AN ABSOLUTE POSITIVE PRESSURE SETTING
- 8) THE VALVE OPERATION OF BWP-09.15 SHOULD BE NORMALLY CLOSED, IF NEEDED OTHER PUMPS BEING IN OPERATION AT THE SAME TIME. LEAKAGE PRESSURE
- 9) BILGE PIPES PASS THROUGH FRESH WATER TANK, SHALL BE INSTALLED INSIDE PIPE TUNNEL 100A WITH THICKNESS EQUIVALENT TO WALL THICKNESS

TERATEK MEGANTARA DESIGN

PROJECT NO: ABE/2014

REV. NO: 0

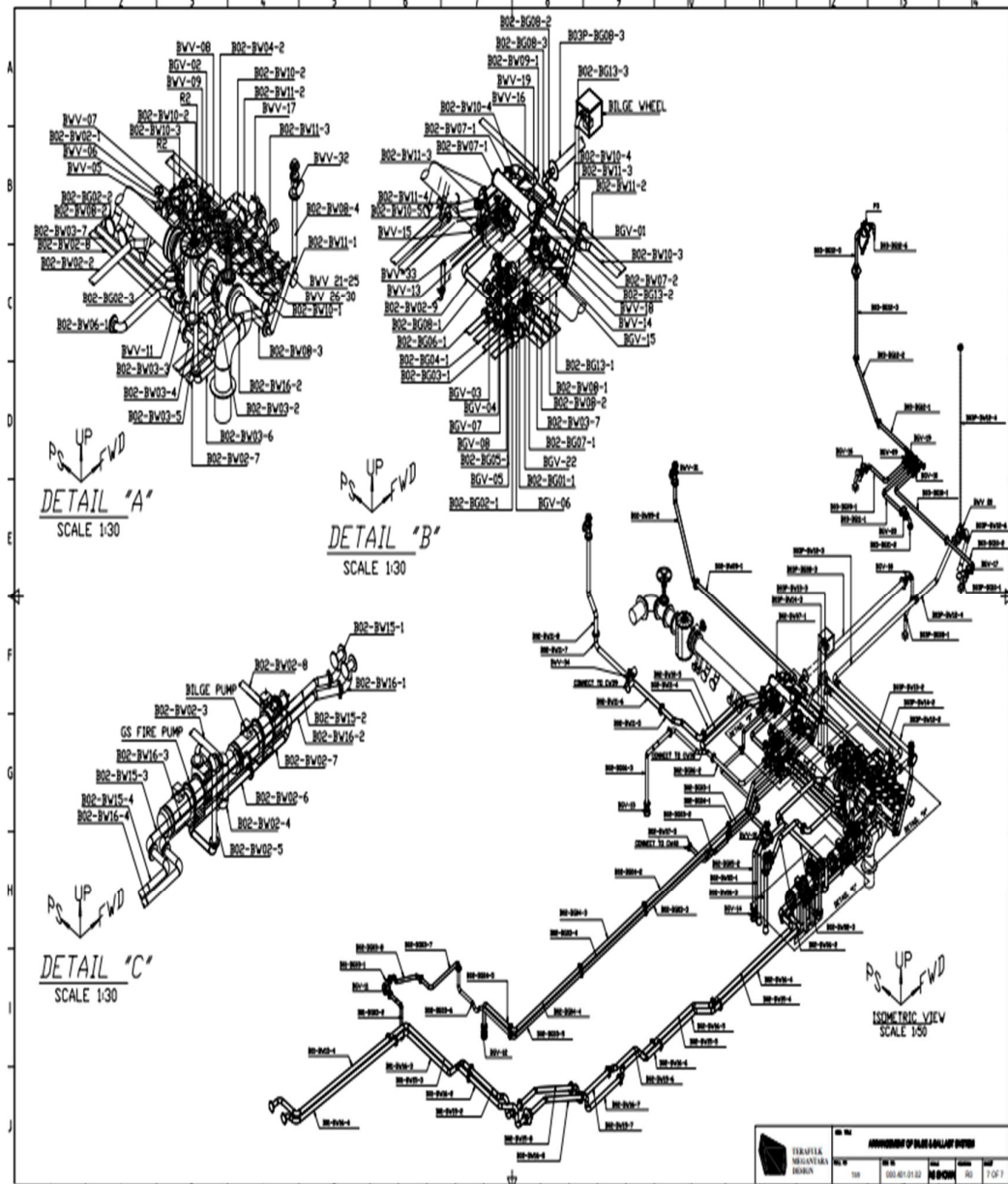
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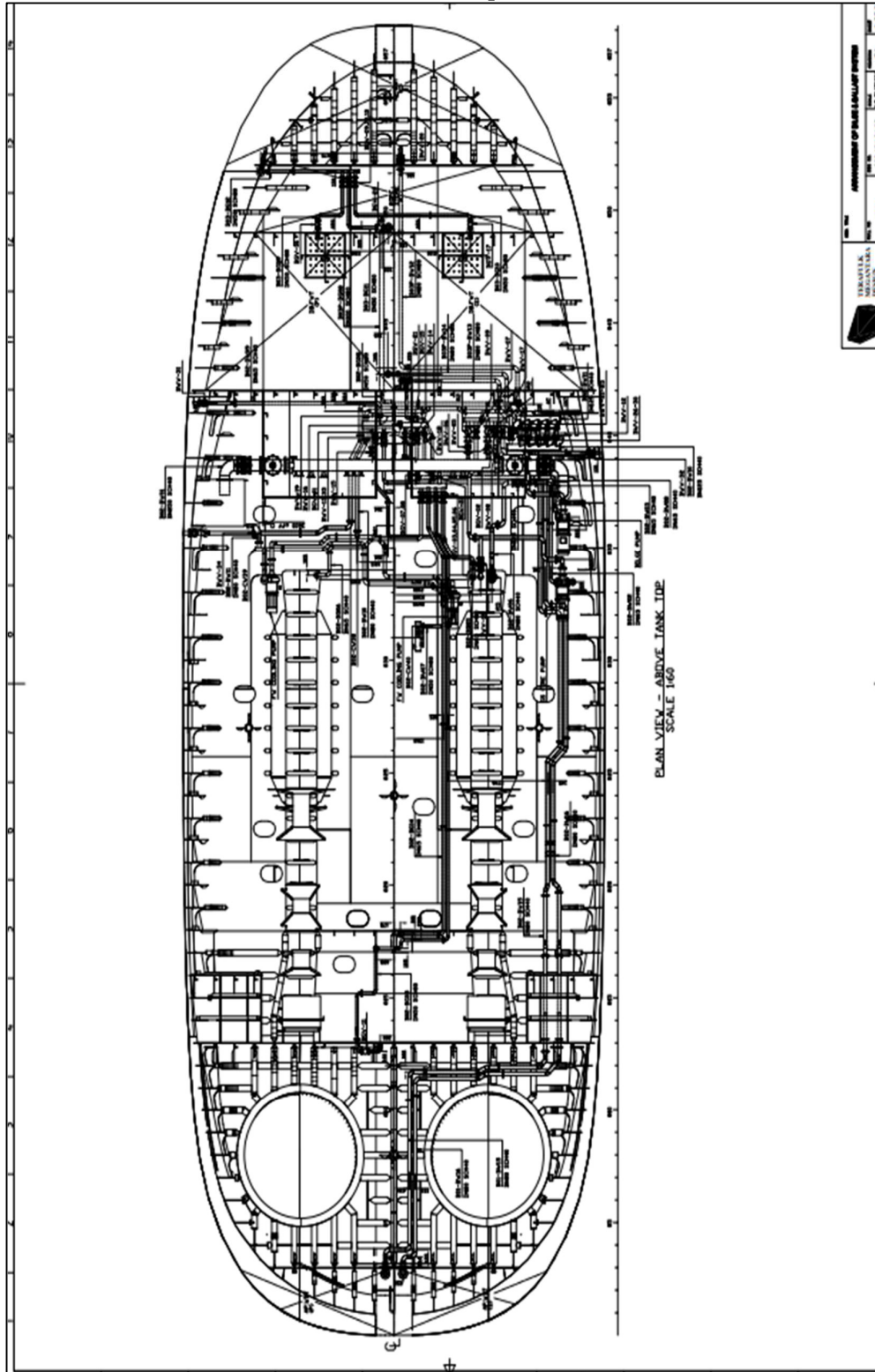
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BILGE, BALLAST AND FIRE MAIN SYSTEM

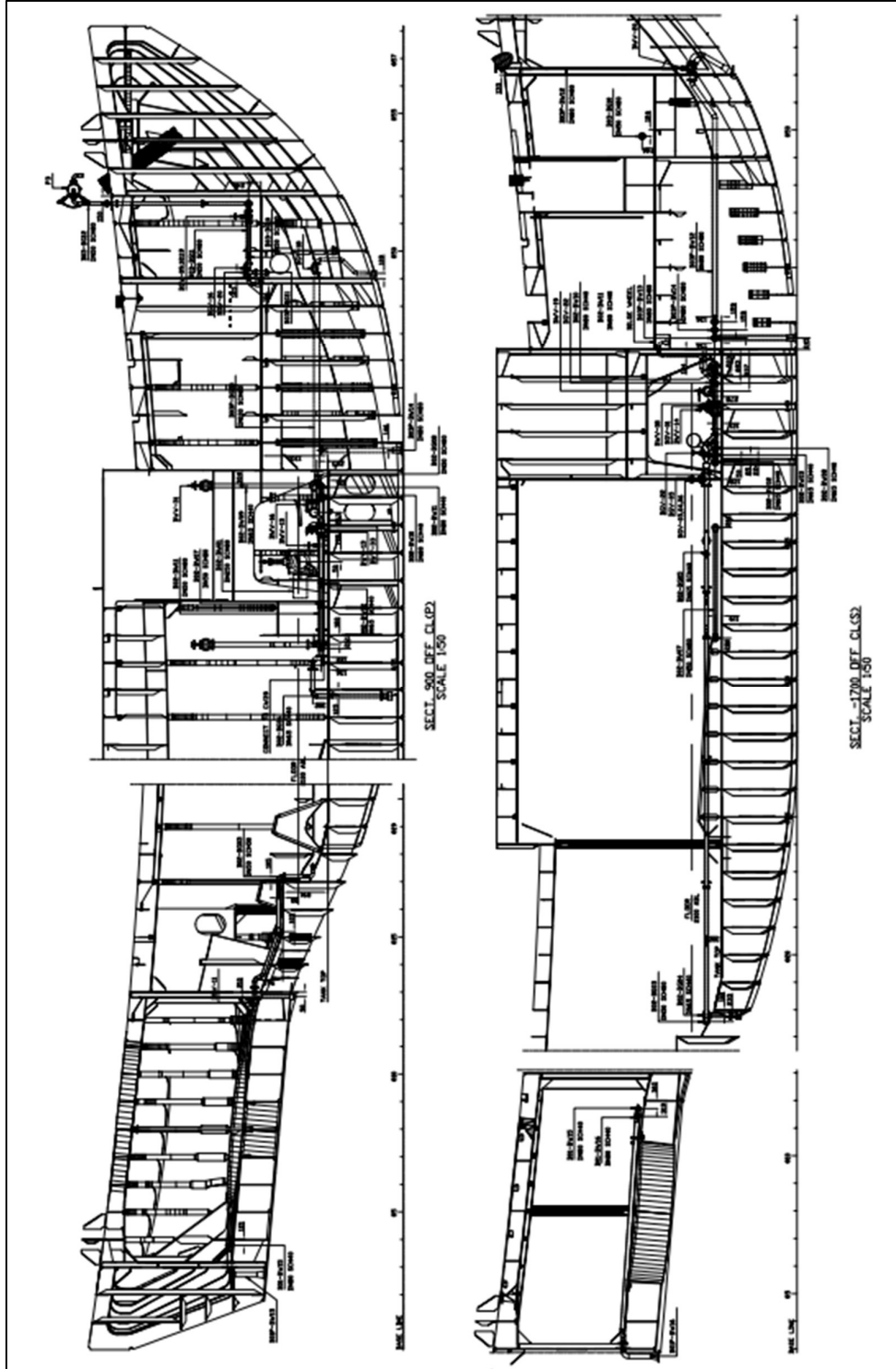
Isometrik Desain



Gambar Kapal



TECHNICAL DRAWING
DRAWING NO. 1000
DATE 10/10/10
SCALE 1:60



Lampiran 2 Data kapal dan spesifikasi pipa

1. MATERIAL																		
BILGE, BALLAST & FIRE MAIN SYSTEM					CLASS OF PIPE III					MATERIAL: SEAMLESS CARBON STEEL								
RATED TEMPERATURE		38°C MAX.																
PRESSURE		WORKING PRESSURE IS 4 BAR																
SIZE		½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"	3"	4"	5"	6"	8"	10"	12"	14"	16"	18"
		15A	20A	25A	32A	40A	50A	65A	80A	100A	125A	150A	200A	250A	300A	350A	400A	450A
PIPING		ASTM A106 GR.B – SCH.80 OR EQUIVALENT							ASTM A106 GR.B – SCH.40 OR EQUIVALENT									
FITTING		ASTM A234 WPB																
		VALVES COMPLY WITH JIS SPECIFICATIONS, CAST STEEL/BRONZE FOR SEA WATER SERVICE																
FLANGE DISCHARGE/SUCTION		JIS B2220																
		PRESSURE: 5 K, TYPE: SLIP ON WELDING FLG.																

2. EQUIPMENT & COMPONENT LIST				
TAG	NAME	SPECIFICATION	QTY.	REMARK
P1	GS/ FIRE PUMP	43 m ³ /h, 40m HEAD	1	HORIZONTAL VOLUTE CASING PUMP.
P2	GS/ BILGE PUMP	43 m ³ /h, 40m HEAD	1	HORIZONTAL VOLUTE CASING PUMP.
P3	BILGE HAND PUMP	25 ltr/min.	1	FOR ROPE STORE & CHAIN LOCKER
P4	STBY. FW. COOLING PUMP/ FW. BALLAST PUMP	60 m ³ /hr x 30m Head (TO BE AS PER MAKER RECOMMENDATION	2	CAS:CAST IRON, IMP:BRONZE CASTING, SHAFT: STAINLESS ST.
R1	SW STRAINER	250A, FAB. M.S. GALV'D. STEEL	2	C/W JIS 5K FLG
R2	SW STRAINER	80A, FAB. M.S. GALV'D. STEEL	2	C/W JIS 5K FLG
R3	BELLMOUTH	CONCENTRIC REDUCER, SCH.40	7	125A x 80A
R5	MUD BOX	80A	1	
R6	STRUM BOX	50A	7	

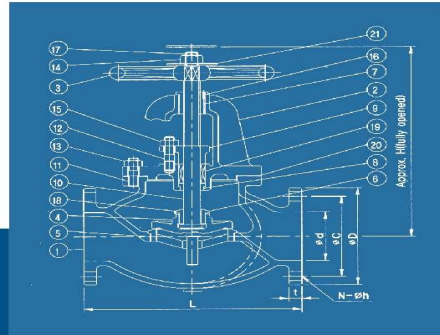
3. VALVE LIST							
NO.	SYMBOL	TAG VALVE	NAME VALVE	MATERIAL	SIZE	PRESS.	QTY.
1	☒	BWV-01,02	GATE VALVE	CAST STEEL	250A	10K	2
2		BWV-20	GATE VALVE	CAST STEEL	80A	5K	1
3	☒	BWV-03,04	BUTTERFLY VALVE (FLANGED)	CAST IRON	250A	5K	2
4		BWV-19	BUTTERFLY VALVE	CAST IRON	100A	5K	1
5		BWV-09; 17; 21~23;24~25 BWV-26~28;29~30,34	BUTTERFLY VALVE	CAST IRON	80A	5K	13
6		BWV-16;18; FMV-01,04	BUTTERFLY VALVE	CAST IRON	65A	5K	4
7	☒	BWV-10,11	S.D.N.R VALVE	CAST IRON	80A	5K	2
8		BWV-13,14; BGV-02;	S.D.N.R VALVE	CAST IRON	65A	5K	3
9	☒	BWV-35	ANGLE S.D.N.R VALVE	CAST STEEL	80A	10K	1
10		BWV-31,32	ANGLE S.D.N.R VALVE	CAST STEEL	65A	10K	2
11	☒	BWV-05,06,07,08,12	GLOBE VALVE	CAST IRON	80A	5K	5
12		BGV-04,05,06	GLOBE VALVE	CAST IRON	65A	5K	3
13		BGV-01;03; 07~10;BGV-19,22 BWV-15,33	GLOBE VALVE	CAST IRON	50A	5K	10
14		FMV-13,14	GLOBE VALVE	CAST IRON	40A	5K	2
15	☒	BGV-12,13,14	FOOT VALVE	CAST IRON	65A	5K	3
16	☒	BGV-11,15,16,17,18,20,21	CHECK VALVE	CAST IRON	50A	5K	7
17	☒	FMV-02,03	HYDRANT VALVE (ANGLED) C/W FIRE HOSE 15m	BRONZE	40A	5K	2
18		FMV-07~12	HYDRANT VALVE (ANGLED) C/W FIRE HOSE 20m	BRONZE	40A	5K	6

Lampiran 3 Katalog Valve, Flange, Tabel ASME B31.3

Globe Valve

F7305

TECHNICAL DATA

GLOBE VALVE
CAST IRON - 5K

FLUID CONDITION & MAX. WORKING PRESSURE

Rating Fluid Condition	JIS 5K up to 200A		JIS 5K 250A to 400A Class B
	Class B	Class S	
Steam up to 230°C	-	0.49 (5)	-
Steam up to 205°C	0.49 (5)	-	-
Saturated steam			
Air and gas	0.49 (5) up to 300A		
Oil and pulsation water	0.49 (5)		
Non-shock water up to 120°C	0.69 (7) up to 300A		0.59 (6)

DIMENSIONS

Rating	size (mm)	Ød (mm)	ØD (mm)	ØC (mm)	N-Øh (mm)	t (mm)	L (mm)	H (mm)	Weight (kg)
JIS 5K	50A	50	130	105	4-15	16	210	270	14.7
(JIS F7305)	65A	65	155	130	4-15	18	250	300	21.3
	80A	80	180	145	4-19	18	280	310	27.7
	100A	100	200	165	8-19	20	340	360	40.8
	125A	125	235	200	8-19	20	410	390	57.6
	150A	150	265	230	8-19	22	480	445	80.3
	200A	200	320	280	8-23	24	570	530	139
	250A	250	385	345	12-23	26	740	650	246
	300A	300	430	390	12-23	28	840	740	377
	350A	335	480	435	12-25	30	940	840	462
	400A	380	540	495	16-25	30	1050	940	647

TECHNICAL FEATURES

Screw Down Non Return
(SDNR)

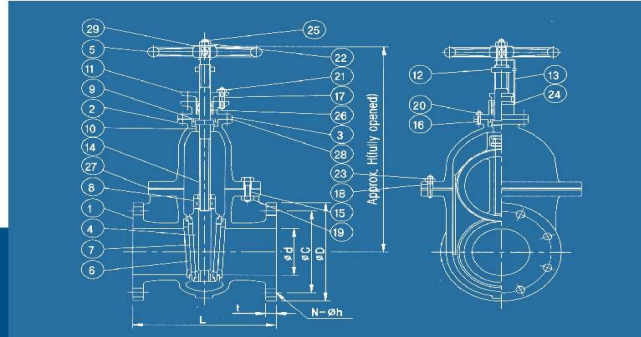
1	body	cast iron
2	bonnet	cast iron
3	handwheel	cast iron
4	disc	bronze / ss
5	valve seat	bronze / ss
6	disc nut	bronze / ss
7	screw bonnet bush	bronze / ss
8	bonnet bush	bronze / ss
9	packing gland	bronze
10	stem	brass / ss
11	stud bolt	steel
12	stud bolt	steel
13	hexagon nut	steel
14	hexagon nut	steel
15	hexagon nut	steel
16	lock pin	steel
17	split pin	brass
18	disc lock washer	brass
19	packing gasket	non asbestos
20	gasket	non asbestos
21	washer	steel

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TECHNICAL DATA

GATE VALVE CAST IRON - 5K



FLUID CONDITION & MAX. WORKING PRESSURE

Fluid Condition	Max. working pressure JIS 5K		
	Up to 200A	250 to 400A	450 to 600A
Saturated steam	0.29(3)	0.20(2)	
Oil and pulsation water	0.49(5)		
Non-Shock Water up to 120°C	0.69(7)	0.49(5)	
Fluid condition	JIS 16K		
	300A to 400A		
Oil and pulsation water	1.57(16)		

DIMENSIONS

Rating	Size	Ød (mm)	ØD (mm)	ØC (mm)	n-0h (mm)	t (mm)	L (mm)	H (mm)	Weight (kg)
JIS 5K	50A	50	130	105	4-15	16	180	285	13.5
	65A	65	155	130	4-15	18	190	330	19.6
	80A	80	180	145	4-19	18	200	380	24.2
	100A	100	200	165	8-19	20	230	430	35.3
	125A	125	235	200	8-19	20	250	495	48.1
	150A	150	265	230	8-19	22	270	560	65.3
	200A	200	320	280	8-23	24	290	680	103
	250A	250	385	345	12-23	26	330	800	164
	300A	300	430	390	12-23	28	370	920	236
	350A	335	480	435	12-25	30	410	1000	307
	400A	380	540	495	16-25	30	470	1100	405

TECHNICAL FEATURES

1	body	cast iron
2	bonnet	cast iron
3	stuffing box	cast iron
4	disc	cast iron
5	handwheel	cast iron
6	valve seat of body	bronze / ss
7	valve seat of disc	bronze / ss
8	screwed piece	bronze / ss
9	guide bush	bronze / ss
10	guide bush	bronze / ss
11	packing gland	bronze
12	indicator	brass
13	indicator plate	brass
14	stem	brass / ss
15	stud bolt	steel
16	stud bolt	steel
17	stud bolt	steel
18	taper pin with thread	stainless steel
19	hexagon nut	steel
20	hexagon nut	steel
21	hexagon nut	steel
22	hexagon nut	steel
23	hexagon nut	steel
24	machine screw	steel
25	split pin	brass
26	packing	non asbestos
27	gasket	non asbestos
28	gasket	non asbestos
29	washer	steel

www.wosupply.com

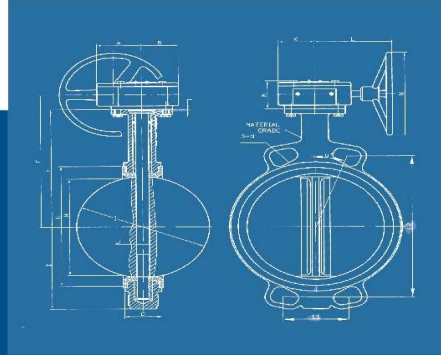
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Butterfly Valve

UNIVERSAL WAFER TYPE

TECHNICAL DATA

BUTTERFLY WAFER TYPE
5K - 10K - PN10

FEATURES

Nominal Pressure		1.6MPa
Test pressure	SEAT	1.76MPa
	SHELL	2.4MPa
Working temp.	NBR	-12°C to 82°C



TECHNICAL FEATURES

1	body	ASTM A536 65-45-12 / ductile iron
2	long bushing	PTFE
3	stem	SS416
4	seat	ASTM D2000 NBR/viton/EPDM
5	disc	ASTM C95400/CF 8M
6	name plate	aluminium
7	plate rivet	aluminium
8	short bushing	PTFE
9	"O" ring	ASTM D2000 NBR
10	bolts	steel
11	spring spacer	AISI 1566
12	circlip	steel
13	washer	steel
14	retaining ring	steel
15	gearbox	30:1

Remark:

1. Face to face dimensions conform to EN558 series 20
2. Dimensions for topwork conform to ISO5211
3. Dimensions for mounting flange conform to DIN PN10, PN16, JIS 5K, JIS 10K.

DIMENSIONS

PN10 5K/10K (mm)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)	P1 (mm)	P2 (mm)	P3 (mm)	P4 (mm)	P5 (mm)	Ø (mm)	L1 (mm)	L2 (mm)
DIN40	72	55	33	75	157	120	76	30.5	90	70	55	4-Ø10	11	110	78	77.78
DIN50	72	55	43	80	161	124	86	32.3	90	70	55	4-Ø10	11	125	88	88.39
DIN65	72	55	46	80	161	124	86	32.3	90	70	55	4-Ø10	11	145	103	102.53
DIN80	72	55	46	95	178	141	114	64.4	90	70	55	4-Ø10	11	160	113	113.14
DIN100	72	55	52	114	193	156	141	86.3	92	70	55	4-Ø10	11	180	69	116.3
DIN125	72	55	56	140	221	184	197	135	92	70	55	4-Ø10	14	210	80	194.01
DIN150	72	55	56	140	221	184	197	135	92	70	55	4-Ø10	14	240	92	221.73
DIN200	90	87	60	175	258	213	239	192	125	102	70	4-Ø12	17	295	113	272.54
DIN250	90	87	68	220	289	244	300	242	125	102	70	4-Ø12	22	350	91	338.07
DIN300	116	82	78	255	327	283	360	292	125	102	70	4-Ø12	22	400	104	386.37
DIN350	116	82	78	267	412	368	388	322	150	125	85	4-Ø14	31.6	460	90	451.16
DIN400	116	82	102	267	412	368	388	322	150	125	85	4-Ø14	31.6	515	100	505.1
DIN450	160	130	114	328	486	422	491	425	197	140	100	4-Ø18	41	565	88	558.04
DIN500	120	138	127	361	551	480	535	473	197	140	100	4-Ø18	44.2	620	97	612.37
DIN600	120	138	152	367	633	562	654	528	276	165	130	4-Ø22	54.7	725	113	716.07

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Katalog Flange

WELLGROW INDUSTRIES CORP.

JIS Flanges



BLIND FLANGE



PLATE FLANGE

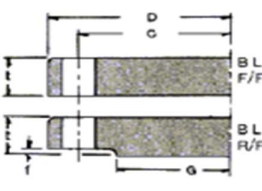
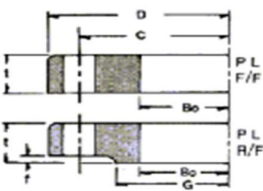
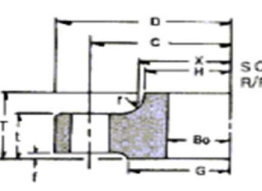


SLIP-ON FLANGE

Tel: 886-4-23112576 Fax: 886-4-23112578 E-mail: wellgrow@ms18.hinet.net

Tabel ASME B31.3

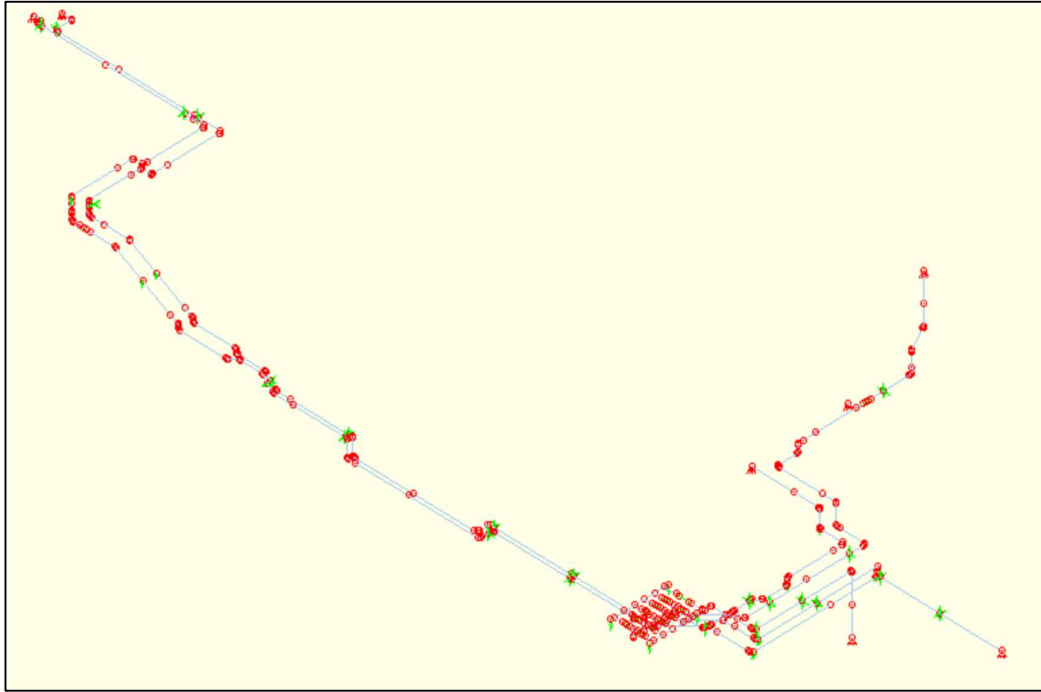
JIS Flanges 5 kg/cm²

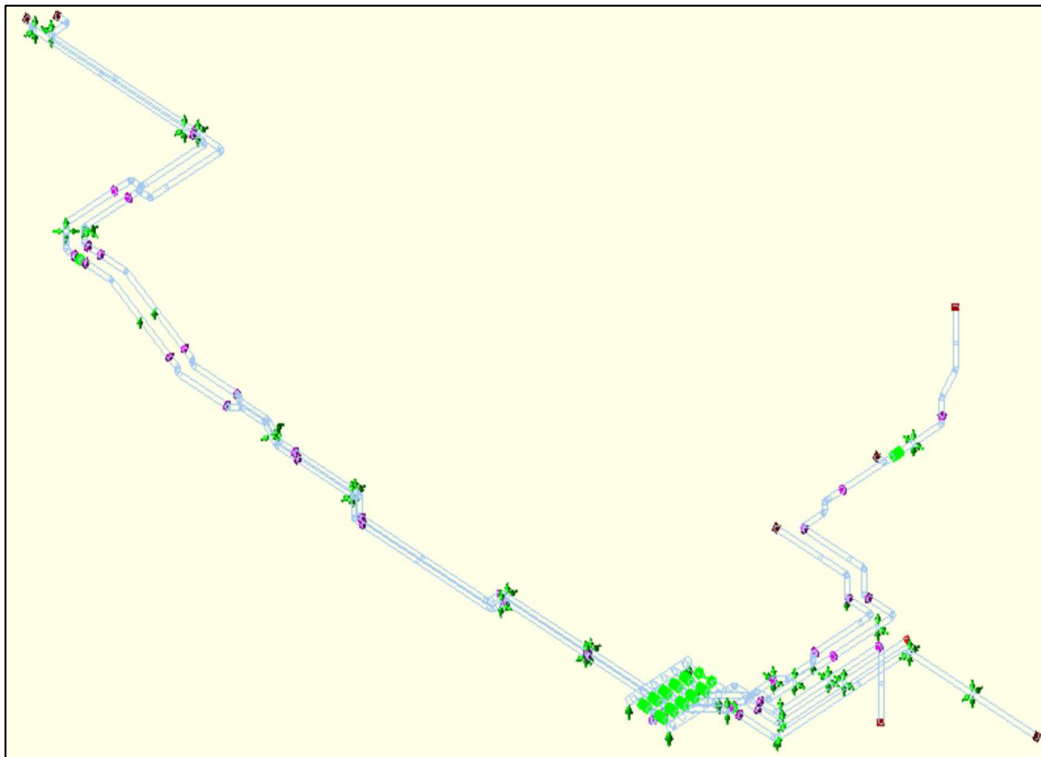
Blind
Plate
Slip-On

Pipe Inch | mm	Pipe	Bo	D	t	T	G	f	r	H	X	C	Holes	Bolt Dia.	
3/8	10	17.3	17.8	75	9	-	42	1	-	-	-	55	4 12	
1/2	15	21.7	22.2	80	9	-	48	1	-	-	-	60	4 12	
3/4	20	27.2	27.7	85	10	-	52	1	-	-	-	65	4 12	
1	25	34.0	34.5	95	10	-	62	1	-	-	-	75	4 12	
1-1/4	32	42.7	43.2	115	12	-	72	2	-	-	-	90	4 15	
1-1/2	40	48.6	49.1	120	12	-	78	2	-	-	-	95	4 15	
2	50	60.5	61.1	130	14	-	88	2	-	-	-	105	4 15	
2-1/2	65	76.3	77.1	155	14	-	112	2	-	-	-	130	4 15	
3	80	89.1	90.0	180	14	-	125	2	-	-	-	145	4 19	
3-1/2	90	101.6	102.6	190	14	-	135	2	-	-	-	155	4 19	
4	100	114.3	115.4	200	16	-	145	2	-	-	-2.0	165	8 19	
5	125	139.8	141.2	235	16	-	180	2	-	-	-0	200	8 19	
6	150	165.2	166.6	265	18	-	210	2	-	+2.0	-	230	8 19	
7	175	190.7	192.1	300	18	-	235	2	-	-	-	260	8 23	
8	200	216.3	218.0	320	20	-	255	2	-	-	-	280	8 23	
9	225	241.8	243.7	345	20	-	280	2	-	-	-	305	12 23	
10	250	267.4	269.5	385	+1.5	22	320	2	5	286	290	345	±0.6	
12	300	318.5	321.0	430	-0	22	34	365	3	5	338	342	390	12 23
14	350	355.6	358.1	480	24	36	405	3	5	378	382	435	12 25	
16	400	406.4	409.0	540	24	36	465	3	5	432	436	495	16 25	
18	450	457.2	460.0	+1.5	605	24	40	525	3	5	495	500	555	16 25
20	500	508.0	511.0	-0	655	24	40	575	3	5	546	552	605	20 25
22	550	558.8	562.0	720	26	42	630	3	5	597	603	665	20 27	
24	600	609.6	613.0	+1.0	770	26	44	680	3	5	648	654	715	±0.8
26	650	660.4	664.0	+2.0	825	26	48	735	3	5	702	708	770	24 27
28	700	711.2	715.0	-0	875	26	48	785	3	5	751	758	820	24 27
30	750	762.0	766.0	945	28	52	840	3	5	802	810	880	24 33	
32	800	812.8	817.0	+2.5	995	28	52	890	3	5	854	862	930	24 33
34	850	863.6	868.0	-0	1045	28	54	940	3	5	904	912	980	24 33
36	900	914.4	919.0	+2.5	1095	30	56	990	3	5	956	964	1030	24 33
40	1000	1016.0	1021.0	-0	1195	+2.5	32	1090	3	5	1058	1066	1130	±1.0
44	1100	1117.6	1123.0	+3.0	1305	32	-	1200	3	-	-	-	1240	28 33
48	1200	1219.2	1224.0	-0	1420	34	-	1305	3	-	-	+3.5	1350	32 33
54	1350	1371.6	1377.0	+3.0	1575	34	-	1460	3	-	-	-	1505	32 33
60	1500	1524.0	1529.0	-0	1730	36	-	1615	3	-	-	-	1660	±1.5

Lampiran 4 Geometri model Caesar II



Lampiran 5 Silhouette Model Caesar II



Lampiran 6 Dimensi Pipa pada ASME-B36.10M WELDED AND SEAMLESS
WROUGHT STEEL PIPE 2015

Table 1 Dimensions and Weights of Welded and Seamless Wrought Steel Pipe (Cont'd)

NPS [Note (1)]	Customary Units			Identification [Standard (STD), Extra-Strong (XS), or Double Extra Strong (XXS)]	Schedule No.	DN [Note (2)]	SI Units		
	Outside Diameter, in.	Wall Thickness, in.	Plain End Weight, lb/ft				Outside Diameter, mm	Wall Thickness, mm	Plain End Mass, kg/m
2	2.375	0.065	1.61	...	5	50	60.3	1.65	2.39
2	2.375	0.083	2.03	...	...	50	60.3	2.11	3.03
2	2.375	0.109	2.64	...	10	50	60.3	2.77	3.93
2	2.375	0.125	3.01	...	30	50	60.3	3.18	4.48
2	2.375	0.141	3.37	...	...	50	60.3	3.58	5.01
2	2.375	0.154	3.66	STD	40	50	60.3	3.91	5.44
2	2.375	0.172	4.05	...	...	50	60.3	4.37	6.03
2	2.375	0.188	4.40	...	...	50	60.3	4.78	6.54
3	3.500	0.141	5.06	...	...	80	88.9	3.58	7.53
3	3.500	0.156	5.58	...	...	80	88.9	3.96	8.30
3	3.500	0.172	6.12	...	...	80	88.9	4.37	9.11
3	3.500	0.188	6.66	...	30	80	88.9	4.78	9.92
3	3.500	0.216	7.58	STD	40	80	88.9	5.49	11.29
3	3.500	0.250	8.69	...	...	80	88.9	6.35	12.93
3	3.500	0.281	9.67	...	...	80	88.9	7.14	14.40
3	3.500	0.300	10.26	XS	80	80	88.9	7.62	15.27
3	3.500	0.438	14.34	...	160	80	88.9	11.13	21.35
3	3.500	0.600	18.60	XXS	...	80	88.9	15.24	27.68

Lampiran 7 Tabel Tegangan Izin ASME B31.3

Numbers in Parentheses Refer to Notes for Appendix A Tables; Specifications Are ASTM Unless Otherwise Indicated																			
Basic Allowable Stress, S, MPa, at Metal Temperature, °C [Notes (1) and (4b)]																			
Line No.	Min. Temp. to 40	65	100	150	200	250	300	325	350	375	400	425	450	475	500	525	550	575	600
1	103	103	101	97.5	94.6	90.8	86.1	83.6	81.1	78.6	73.3	64.0	55.8	43.9	40.7	...	...	...	...
2	103	103	101	97.5	94.6	90.8	86.1	83.6	81.1	78.6	73.3	64.0	55.8	43.9	31.7	21.4	14.2	9.40	6.89
3	103	103	103	102	98.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	103	103	103	102	98.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	108	108	108	106	102	98.3	93.3	90.6	87.8	84.3	73.3	64.0	55.8	43.9	31.7	21.4	14.2	9.40	6.89
6	110	110	110	110	110	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7	110	110	110	110	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	110	110	110	110	110	110	108	105	97.0	84.3	73.3	64.0	55.8	54.5	...	...	...	...	...
9	110	110	110	110	110	110	108	105	97.0	84.3	73.3	64.0	55.8	43.9	31.7	21.4	14.2	9.40	6.89
10	110	110	110	110	110	110	108	105	97.0	84.3	73.3	64.0	55.8	43.9	31.7	21.4	14.2	9.40	6.89
11	110	110	110	110	110	110	108	105	97.0	84.3	73.3	64.0	55.8	43.9	31.7	21.4	14.2	9.40	6.89
12	110	110	110	110	110	110	108	105	97.0	84.3	73.3	64.0	55.8	43.9	31.7	21.4	14.2	9.40	6.89
13	110	110	110	110	110	110	108	105	97.0	84.3	73.3	64.0	55.8	43.9	31.7	21.4	14.2	9.40	6.89
14	115	115	113	110	106	102	96.9	94.1	91.2	84.3	73.3	64.0	55.8	43.9	40.7	...	...	...	...
15	115	115	113	110	106	102	96.9	94.1	91.2	84.3	73.3	64.0	55.8	43.9	31.7	21.4	14.2	9.40	6.89
16	126	126	126	122	118	113	108	105	101	98.3	89.0	75.3	62.1	45.0	40.7	...	...	...	...
17	126	126	126	122	118	113	108	105	101	98.3	89.0	75.3	62.1	45.0	31.7	21.4	17.2	...	...
18	126	126	126	122	118	113	108	105	101	98.3	89.0	75.3	62.1	45.0	31.7	21.4	14.2	9.40	6.89
19	126	126	126	122	118	113	108	105	101	98.3	89.0	75.3	62.1	45.0	31.7	21.4	14.2	9.40	6.89
20	126	126	126	122	118	113	108	105	101	98.3	89.0	75.3	62.1	45.0	31.7	21.4	14.2	9.40	6.89
21	126	126	126	122	118	113	108	105	101	98.3	89.0	75.3	62.1	45.0	31.7	21.4	14.2	9.40	6.89
22	126	126	126	122	118	113	108	105	101	98.3	89.0	75.3	62.1	45.0	31.7	21.4	14.2	9.40	6.89
23	138	138	134	130	126	121	115	111	108	105	95.1	79.5	62.6	45.0	31.7	21.4	17.2	...	...
24	138	138	134	130	126	121	115	111	108	105	95.1	79.5	62.6	45.0	31.7	21.4	14.2	9.40	6.89
25	138	138	134	130	126	121	115	111	108	105	95.1	79.5	62.6	45.0	31.7	21.4	14.2	9.40	6.89
26	138	138	134	130	126	121	115	111	108	105	95.1	79.5	62.6	45.0	31.7	21.4	14.2	9.40	6.89
27	138	138	138	138	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	138	138	138	138	138	132	126	122	118	113	95.1	79.5	62.6	45.0	31.7	21.4	17.2	...	...
29	138	138	138	138	138	132	126	122	118	113	95.1	79.5	62.6	45.0	31.7	21.4	17.2	...	...
30	138	138	138	138	138	132	126	122	118	113	95.1	79.5	62.6	45.0	31.7	21.4	14.2	9.40	6.89
31	138	138	138	138	138	132	126	122	118	113	95.1	79.5	62.6	45.0	31.7	21.4	14.2	9.40	6.89
32	138	138	138	138	138	132	126	122	118	113	95.1	79.5	62.6	45.0	31.7	21.4	14.2	9.40	6.89

Lampiran 8 Tabel Specified Minimum Tensile Strength Pada ASME B31.3

Table A-1M Basic Allowable Stresses in Tension for Metals (SI Units) (Cont'd)													
Numbers in Parentheses Refer to Notes for Appendix A Tables; Specifications Are ASTM Unless Otherwise Indicated													
Line No.	Nominal Composition	Product Form	Spec. No.	Type/Grade	UNS No.	Class/Cond./Temper	Size, mm	P-No. (5)	Notes	Min. Temp., °C (6)	Min. Tensile Str., MPa	Min. Yield Str., MPa	Max. Use Temp., °C
1	Carbon steel	Pipe & tube	A134	...	...	...	...	1	(8b)(57)	B	310	165	482
2	Carbon steel	Pipe & tube	A672	A45	K01700	...	...	1	(57)(59)(67)	B	310	165	593
3	Carbon steel	Pipe & tube	API 5L	A25	...	...	...	1	(8a)(77)	-29	310	172	204
4	Carbon steel	Pipe & tube	API 5L	A25	...	...	...	1	(57)(59)(77)	B	310	172	204
5	Carbon steel	Pipe & tube	A179	...	K01200	...	...	1	(57)(59)	-29	324	179	593
6	Carbon steel	Pipe & tube	A53	A	K02504	...	...	1	(8a)	-7	331	207	204
7	Carbon steel	Pipe & tube	A139	A	...	...	...	1	(8b)	A	331	207	149
8	Carbon steel	Pipe & tube	A587	...	K11500	...	...	1	(57)(59)	-29	331	207	454
9	Carbon steel	Pipe & tube	A53	A	K02504	...	...	1	(57)(59)	B	331	207	593
10	Carbon steel	Pipe & tube	A106	A	K02501	...	...	1	(57)	B	331	207	593
11	Carbon steel	Pipe & tube	A135	A	...	...	...	1	(57)(59)	B	331	207	593
12	Carbon steel	Pipe & tube	A369	FPA	K02501	...	...	1	(57)	B	331	207	593
13	Carbon steel	Pipe & tube	API 5L	A	...	...	...	1	(57)(59)	B	331	207	593
14	Carbon steel	Pipe & tube	A134	...	...	...	...	1	(8b)(57)	B	345	186	482
15	Carbon steel	Pipe & tube	A672	A50	K02200	...	...	1	(57)(59)(67)	B	345	186	593
16	Carbon steel	Pipe & tube	A134	...	...	...	...	1	(8b)(57)	A	379	207	482
17	Carbon steel	Pipe & tube	A524	II	K02104	...	...	1	(57)	-29	379	207	538
18	Carbon steel	Pipe & tube	A333	1	K03008	...	...	1	(57)(59)	-46	379	207	593
19	Carbon steel	Pipe & tube	A334	1	K03008	...	...	1	(57)(59)	-46	379	207	593
20	Carbon steel	Pipe & tube	A671	CA55	K02801	...	...	1	(59)(67)	A	379	207	593
21	Carbon steel	Pipe & tube	A672	A55	K02801	...	...	1	(57)(59)(67)	A	379	207	593
22	Carbon steel	Pipe & tube	A672	C55	K01800	...	...	1	(57)(67)	C	379	207	593
23	Carbon steel	Pipe & tube	A671	CC60	K02100	...	...	1	(57)(67)	C	414	221	538
24	Carbon steel	Pipe & tube	A671	CB60	K02401	...	...	1	(57)(67)	B	414	221	593
25	Carbon steel	Pipe & tube	A672	B60	K02401	...	...	1	(57)(67)	B	414	221	593
26	Carbon steel	Pipe & tube	A672	C60	K02100	...	...	1	(57)(67)	C	414	221	593
27	Carbon steel	Pipe & tube	A139	B	K03003	...	...	1	(8b)	A	414	241	149
28	Carbon steel	Pipe & tube	A135	B	K03018	...	...	1	(57)(59)	B	414	241	538
29	Carbon steel	Pipe & tube	A524	I	K02104	...	...	1	(57)	-29	414	241	538
30	Carbon steel	Pipe & tube	A53	B	K03005	...	...	1	(57)(59)	B	414	241	593
31	Carbon steel	Pipe & tube	A106	B	K03006	...	...	1	(57)	B	414	241	593

Lampiran 9 Tabel Properti Pipa Dari Buku Sam Kannapan

TABLE (Continued)
Properties and Weights of Pipe

Nominal Size Outside Diameter	Weight Designation and/or Schedule Number	Average Wall Thickness	Minimum Wall Thickness (= t_m)	Inside Diameter	Cross-Sectional Metal Area	Moment of Inertia	Section Modulus	Bend Characteristic per Unit Bend Radius	Radius of Gyration	Weight of			
										Pipe	Water		
inches D		inches t	inches t_m	inches d	sq. inches A	inches ⁴ I	inches ³ Z	1/ft h/R	inches r_g	w_p lb per ft	w_w lb per		
2"	2.375	XS 80	80S	0.218	0.191	1.939	1.48	0.568	0.731	2.25	0.77	5.02	1.28
			160	0.343	0.300	1.689	2.19	1.16	0.979	3.99	0.73	7.45	0.97
		XXS	0.436	0.382	1.503	2.66	1.31	1.10	5.57	0.70	9.03	0.77	
			5S	0.083	0.073	2.709	0.73	0.710	0.494	0.511	0.99	2.48	2.50
			10S	0.120	0.105	2.635	1.04	0.988	0.687	0.759	0.98	3.53	2.36
		Std.	40 40S	0.203	0.178	2.469	1.70	1.53	1.03	1.37	0.95	5.79	2.08
2½"	2.875	XS 80	80S	0.276	0.242	2.323	2.25	1.93	1.34	1.96	0.92	7.66	1.84
			160	0.375	0.328	2.125	2.95	2.35	1.64	2.88	0.89	10.0	1.54
		XXS	0.552	0.483	1.771	4.03	2.87	2.00	4.91	0.84	13.7	1.07	
			5S	0.083	0.073	3.334	0.89	1.30	0.744	0.341	1.21	3.03	3.78
			10S	0.120	0.105	3.260	1.27	1.82	1.04	0.504	1.20	4.33	3.61
		Std.	40 40S	0.216	0.189	3.068	2.23	3.02	1.72	0.961	1.16	7.55	3.20
3.500	XS 80	80S	0.300	0.263	2.900	3.02	3.90	2.23	1.41	1.14	10.3	2.86	
		160	0.438	0.382	2.624	4.21	5.04	2.88	2.24	1.09	14.3	2.34	

Lampiran 10 Tabel Modulus Elastisitas

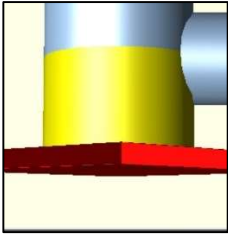
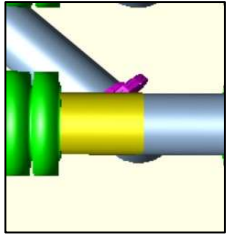
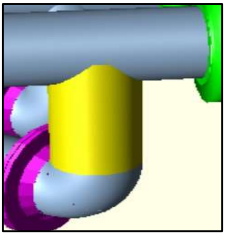
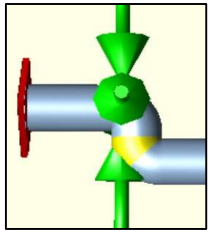
Table C-6 Moduli of Elasticity for Metals

$E = \text{Modulus of Elasticity, psi (Multiply Tabulated Values by } 10^6 \text{) [Note (1)]}$

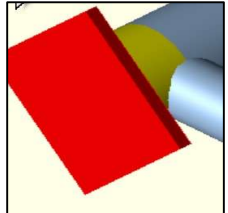
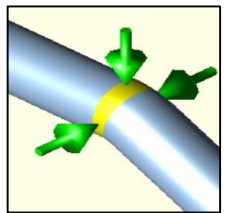
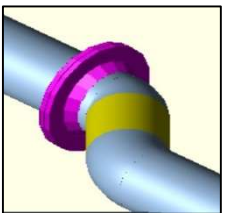
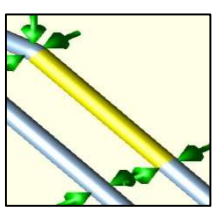
Material	Temperature, °F																		
	-425	-325	-200	-100	70	200	300	400	500	600	700	800	900	1,000	1,100	1,200	1,300	1,400	1,500
Carbon steels with carbon content 0.30% or less	31.9	31.4	30.8	30.3	29.4	28.8	28.3	27.4	27.3	26.5	25.5	24.2	22.5	20.4	18.0	...	...	...	...
Carbon steels with carbon content above 0.30%	31.7	31.2	30.6	30.1	29.2	28.6	28.1	27.7	27.1	26.4	25.3	24.0	22.3	20.2	17.9	15.4	...	...	...
Carbon-molybdenum steels	31.7	31.1	30.5	30.0	29.0	28.5	28.0	27.6	27.0	26.3	25.3	23.9	22.2	20.1	17.8	15.3	...	...	...
Nickel steels, Ni 2% to 9%	30.1	29.6	29.0	28.6	27.8	27.1	26.7	26.2	25.7	25.1	24.6	23.9	23.2	22.4	21.5	20.4	19.2	17.7	...
Chromium steels:																			
½Cr through 2Cr	32.1	31.6	30.9	30.5	29.6	29.0	28.5	28.0	27.4	26.9	26.2	25.6	24.8	23.9	23.0	21.8	20.5	18.9	...
2½Cr through 3Cr	33.1	32.6	31.9	31.4	30.6	29.9	29.4	28.8	28.3	27.7	27.0	26.3	25.6	24.7	23.7	22.5	21.1	19.4	...
5Cr through 9Cr	33.4	33.0	32.4	31.9	31.0	30.3	29.7	29.2	28.6	28.1	27.5	26.9	26.2	25.4	24.4	23.3	22.0	20.5	...
Austenitic stainless steels:																			
Type 304, 18Cr-8Ni	30.8	30.3	29.7	29.2	28.3	27.5	27.0	26.4	25.9	25.3	24.8	24.1	23.5	22.8	22.0	21.2	20.3	19.2	18.1
Type 310, 25Cr-20Ni	30.8	30.3	29.7	29.2	28.3	27.5	27.0	26.4	25.9	25.3	24.8	24.1	23.5	22.8	22.0	21.2	20.3	19.2	18.1
Type 316, 16Cr-12Ni-2Mo	30.8	30.3	29.7	29.2	28.3	27.5	27.0	26.4	25.9	25.3	24.8	24.1	23.5	22.8	22.0	21.2	20.3	19.2	18.1
Type 321, 18Cr-10Ni-Ti	30.8	30.3	29.7	29.2	28.3	27.5	27.0	26.4	25.9	25.3	24.8	24.1	23.5	22.8	22.0	21.2	20.3	19.2	18.1
Type 347, 18Cr-10Ni-Cb	30.8	30.3	29.7	29.2	28.3	27.5	27.0	26.4	25.9	25.3	24.8	24.1	23.5	22.8	22.0	21.2	20.3	19.2	18.1
Type 309, 23Cr-12Ni	30.8	30.3	29.7	29.2	28.3	27.5	27.0	26.4	25.9	25.3	24.8	24.1	23.5	22.8	22.0	21.2	20.3	19.2	18.1
Straight chromium stainless steels (12Cr, 17Cr, 27Cr)	31.8	31.2	30.7	30.2	29.2	28.4	27.9	27.3	26.8	26.2	25.5	24.5	23.2	21.5	19.2	16.5
Gray iron	13.4	13.2	12.9	12.6	12.2	11.7	11.0	10.2
Nickel Alloys																			

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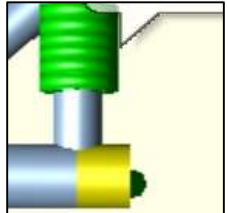
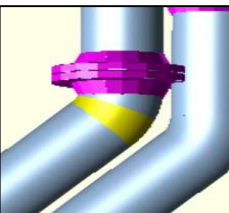
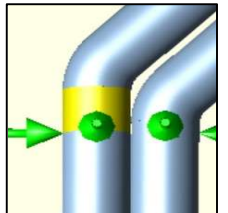
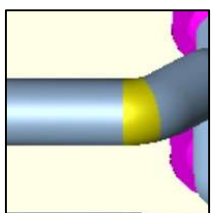
Lampiran 11 Node tegangan tertinggi pada desain tanpa suport

Node 20	Node 110	Node 458	Node 780
			

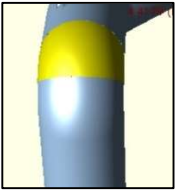
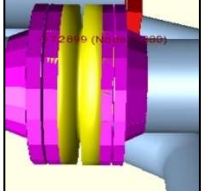
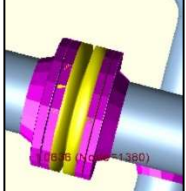
Lampiran 12 Node tegangan tertinggi desain sebelum modifikasi

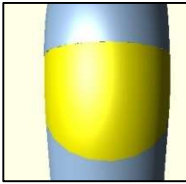
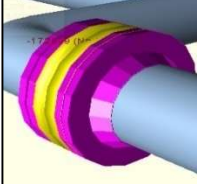
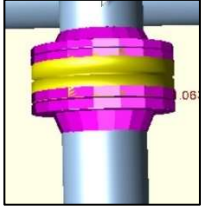
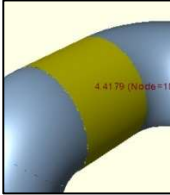
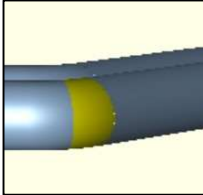
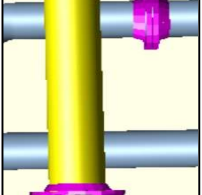
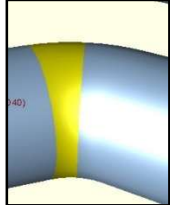
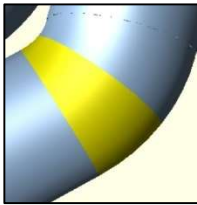
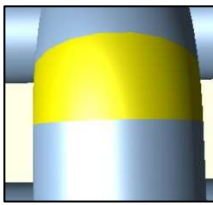
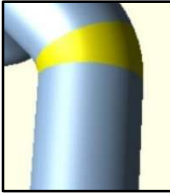
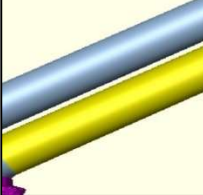
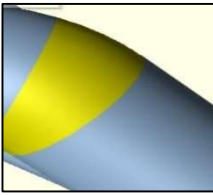
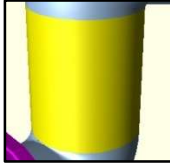
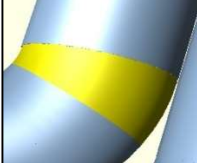

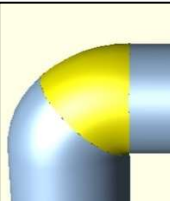
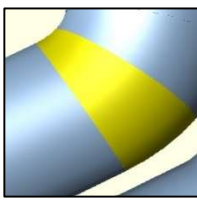
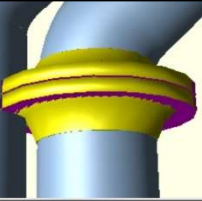
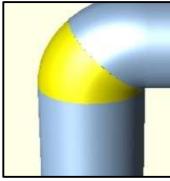
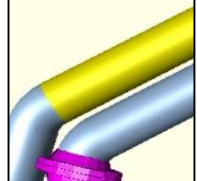
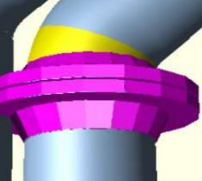
Node 20	Node 655	Node 948	Node 988
			

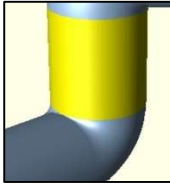
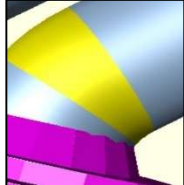
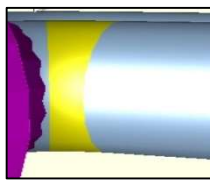
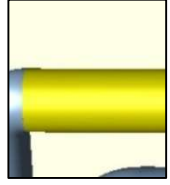
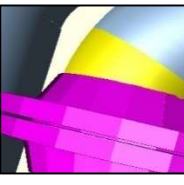
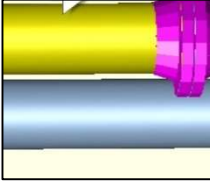
Lampiran 13 Node tegangan tertinggi setelah modifikasi

Node 20	Node 890	Node 905	Node 1050
			

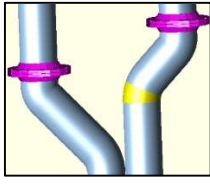
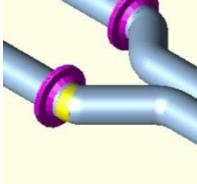
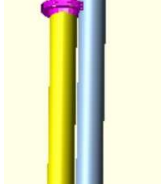
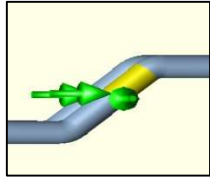
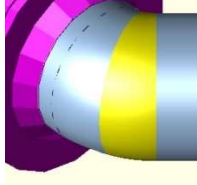

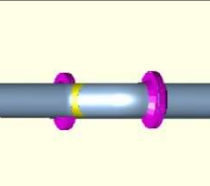

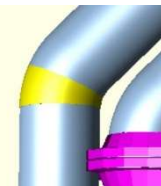
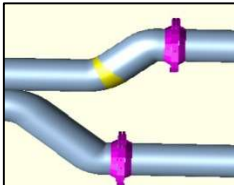
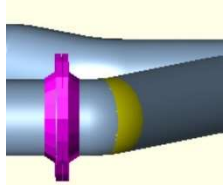
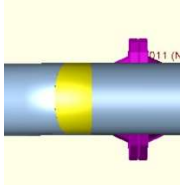
Lampiran 14 Node Defleksi Tertinggi pada desain tanpa support

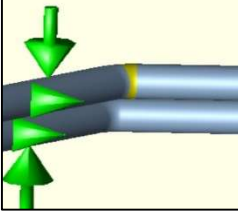
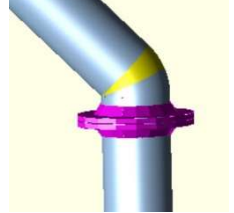
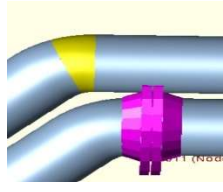
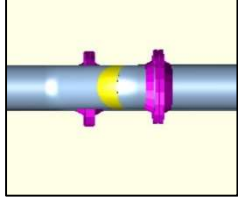
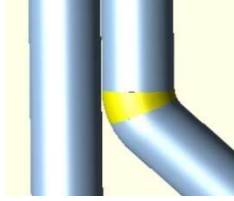
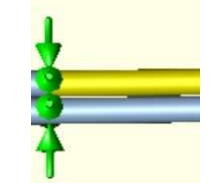
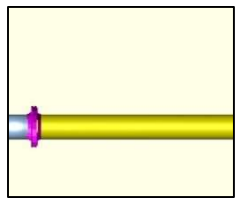
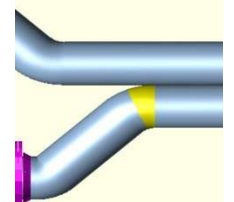
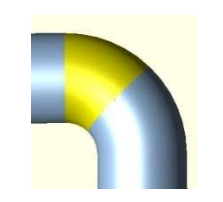
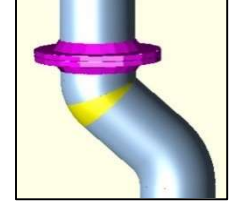
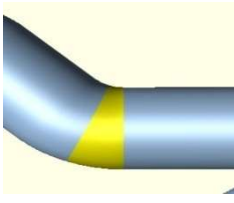
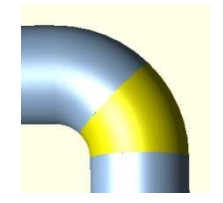
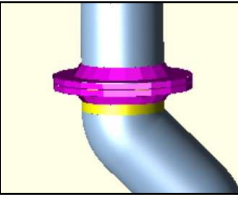
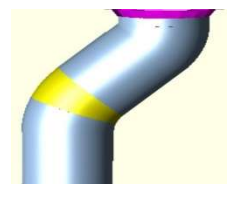
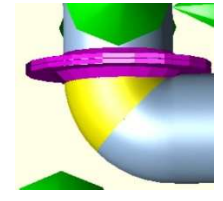
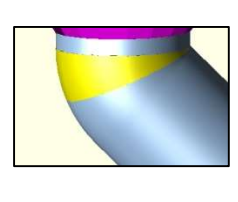
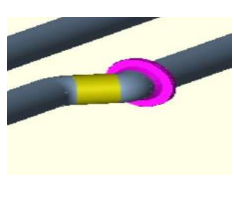
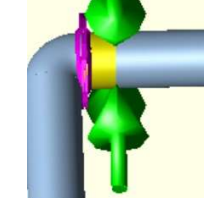
1040		1380		1380	
------	---	------	---	------	---

1039		1385		1385	
1048		900		1388	
1049		899		1389	
1050		898		1390	
1038		550		1100	
710		549		770	
709		548		618	

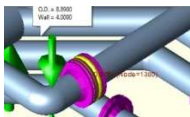
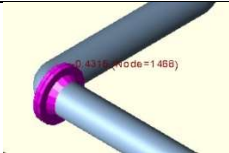
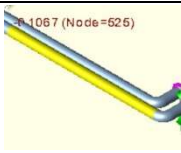
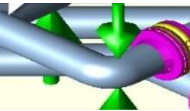
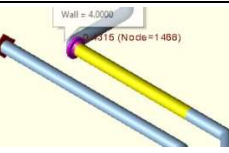
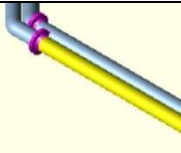
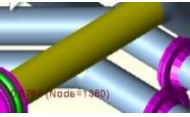
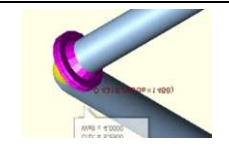
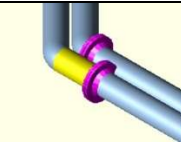
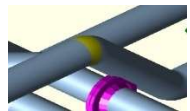
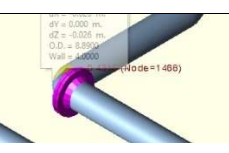
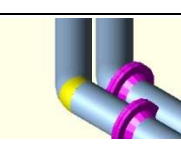
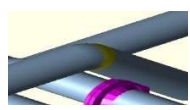
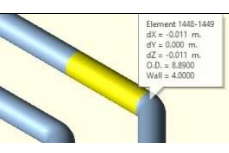
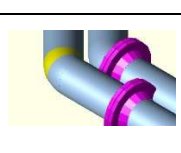
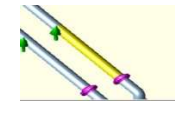
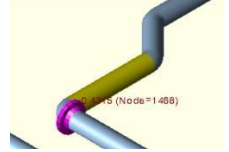
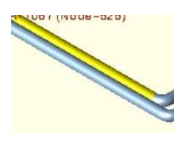
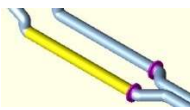
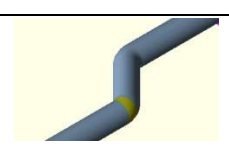
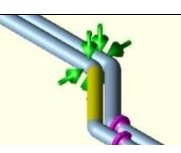
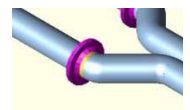
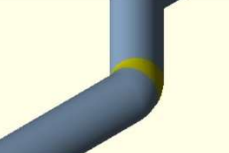
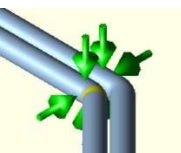
708		890		619	
718		889		760	

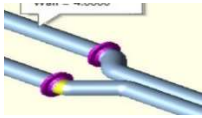
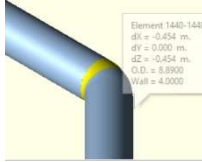
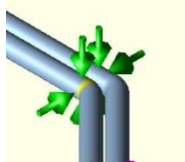
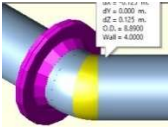
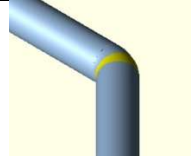
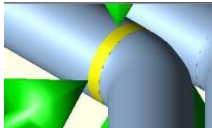
Lampiran 15 Node defleksi tertinggi desain sebelum modifikasi

	DX		DY		DZ
938		600		525	
930		599		530	
939		610		538	
940		598		539	

929		590		540	
948		589		520	
968		588		519	
949		938		518	
960		939		500	
950		940		510	

Lampiran 16 Node defleksi tertinggi desain setelah modifikasi

	DX		DY		DZ
1380		1468		525	
1385		1460		530	
1388		1469		538	
1389		1470		539	
1390		1455		540	
995		1478		875	
618		1479		548	
610		1480		549	

600		1450	 <p>Element 1440-1448 dx = -0.454 m. dy = 0.000 m. dz = -0.454 m. O.D. = 8.8900 Wall = 4.0000</p>	550	
599	 <p>dx = 0.000 m. dy = 0.000 m. dz = 0.135 m. O.D. = 8.8900 Wall = 4.0000</p>	1449		555	



KEMENTERIAN PENDIDIKAN KEBUDAYAAN,
RISET DAN TEKNOLOGI
UNIVERSITAS HASANUDDIN

Jalan Perintis Kemerdekaan Km. 10, Makassar 90245
Telepon (0411) 586200, (6 Saluran), 584200, Fax (0411) 585188

Laman: www.unhas.ac.id

SURAT IZIN UJIAN SKRIPSI

Nomor 04622/UN4.1.1.1/PK.03.02/2023

Berdasarkan Peraturan Rektor Universitas Hasanuddin tentang Penyelenggaraan Program Sarjana Nomor 2781/UN4.1/KEP/2018 tanggal 16 Juli 2018, dengan ini menerangkan bahwa:

Nama : REZKY PRATAMA SISANDE
NIM : D091171506
Tempat/Tanggal Lahir : POLEWALI/29 AGUSTUS 1998
Fakultas : TEKNIK
Program Studi : TEK. SISTEM PERKAPALAN

Telah memenuhi syarat untuk Ujian Skripsi Strata I (S1). Demikian Surat Persetujuan ini dibuat untuk digunakan dalam proses pelaksanaan ujian skripsi, dengan ketentuan dapat mengikuti wisuda jika **persyaratan kelulusan/wisuda telah dipenuhi**. Terima Kasih.

Makassar, 3 Februari 2023

a.n. Direktur Pendidikan

Kepala Subdirektorat Administrasi Pendidikan,



Susy Asteria Irafany, S.T., M.Si.

NIP 197403132009102001

Keterangan online wisuda:

User : D091171506

Password : 2162888

Alamat Web : <http://wisuda.unhas.ac.id>



No. : 25823/UN4.7.7/TD.06/2022
Lamp : -
Hal : Penugasan Bimbingan Tugas Akhir

Kepada Yth : **Wakil Dekan Bidang Akademik dan
Kemahasiswaan Fakultas Teknik Unhas
di-
Gowa**

Dengan hormat,
Kiranya dosen pembimbing tugas akhir (skripsi) dari mahasiswa :

Nama : Rezky Pratama Sisande
Stambuk : D091171506
Program Studi : Teknik Sistem Perkapalan

Dengan judul Tugas Akhir:

Analisa Tegangan Pada Sistem Instalasi Pipa Ballast Kapal Dengan Pendekatan Software Caesar Ii

Dosen Pembimbing :

1. Baharuddin, S.T., M.T.
2. Muhammad Iqbal Nikmatullah, S.T., M.T.

Dapat dibuatkan Surat Penugasan Bimbingan Tugas Akhir

Demikian penyampaian kami, atas perhatian dan kerjasamanya diucapkan terima kasih.

G o w a, 16 November 2022

Ketua Departemen Teknik Sistem Perkapalan



Dr.Eng. Faisal Mahmuddin,S.T, M.Inf.Tech., M.Eng

Nip. 19810211 200501 1 003



SURAT PENUGASAN

No.25824/UN4.7.1/TD.06/2022

Dari : Dekan Fakultas Teknik Universitas Hasanuddin

Kepada : 1. **Baharuddin, S.T., M.T.** **Pemb. I**
2. **Muhammad Iqbal Nikmatullah, S.T., M.T.** **Pemb. II**

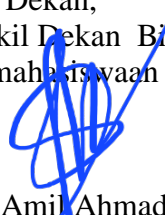
Isi : 1. Bahwa berdasarkan peraturan Akademik Universitas Hasanuddin Tahun 2018 Pasal 16 (SK. Rektor Unhas nomor : 2784/UN4.1/KEP/2018), dengan ini menugaskan Saudara sebagai PEMBIMBING MAHASISWA, maka dengan ini kami menugaskan untuk membimbing penulisan Skripsi/Tugas Akhir mahasiswa Teknik Sistem Perkapalan Fakultas Teknik Universitas Hasanuddin di bawah ini :

Nama : **Rezky Pratama Sisande** No. Stambuk : **D091171506**

Judul Skripsi/Tugas Akhir :
Analisa Tegangan Pada Sistem Instalasi Pipa Ballast Kapal Dengan Pendekatan Software Caesar Ii

2. Surat penugasan pembimbing ini mulai berlaku sejak tanggal ditetapkannya dan berakhir sampai selesainya penulisan Skripsi/Tugas Akhir Mahasiswa tersebut.
3. Agar surat penugasan ini dilaksanakan sebaik - baiknya dengan penuh rasa tanggung jawab.

Ditetapkan di Gowa,
Pada tanggal, 16 November 2022
a.n Dekan,
Wakil Dekan Bidang Akademik dan
Kemahasiswaan Fakultas Teknik UH


Dr. Amil Ahmad Ilham, S.T., M.IT.
Nip. 19731010 199802 1 001

Tembusan :

1. Dekan FT-UH.
2. Ketua Departemen Teknik Sistem Perkapalan FT-UH.
3. Mahasiswa yang bersangkutan



CERTIFICATE NO. JKT 36788



KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET, DAN TEKNOLOGI

DEPARTEMEN TEKNIK SISTEM PERKAPALAN

FAKULTAS TEKNIK UNIVERSITAS HASANUDDIN

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No. : 6052/UN4.7.7/TD.06/2023
Lamp : -
Hal : Penerbitan Surat Penugasan Panitia
Ujian Sarjana Strata Satu (S1)

Kepada Yth : **Wakil Dekan Bidang Akademik,
dan Kemahasiswaan Fakultas Teknik Unhas
di -
Gowa**

Dengan hormat,

Berdasarkan Persetujuan Pembimbing Mahasiswa, Bersama ini diusulkan susunan Panitia Ujian Sarjana Strata Satu (S1) bagi mahasiswa Departemen Teknik Sistem Perkapalan Fakultas Teknik Universitas Hasanuddin atas nama :

Nama : Rezky Pratama Sisande
Stambuk : D091171506

Maka dengan ini kami sampaikan Susunan Panitia Ujian Sarjana Strata Satu (S1) sebagai berikut :

Ketua : Baharuddin, S.T., M.T.
Sekretaris : Muhammad Iqbal Nikmatullah, S.T., M.T.
Anggota : 1. Ir. Syerly Klara, M.T.
2. Ir. Zulkifli, M.T.

Judul Tugas Akhir mahasiswa yang bersangkutan adalah :

Analisa Tegangan Pada Sistem Instalasi Pipa Ballast Kapal Dengan Pendekatan Software Caesar Ii

Untuk dapat diterbitkan surat penugasannya.

Demikian penyampaian kami, atas perhatian dan kerjasamanya diucapkan terima kasih.

G o w a, 16 Maret 2023

Ketua Departemen Teknik Sistem Perkapalan



Dr.Eng. Faisal Mahmuddin,S.T, M.Inf.Tech., M.Eng

Nip. 19810211 200501 1 003



SURAT PENUGASAN

No. 6053/UN4.7.1/TD.06/2023

Dari : Dekan Fakultas Teknik Universitas Hasanuddin
Kepada : Mereka yang tercantum namanya dibawah ini.

Isi : 1. Bahwa berdasarkan peraturan Akademik Universitas Hasanuddin Tahun 2018 pasal 19 (SK. Rektor Unhas nomor : 2781/UN4.1/KEP/2018), dengan ini menugaskan Saudara sebagai PANITIA UJIAN SARJANA Program Strata Satu (S1) Teknik Sistem Perkapalan Fakultas Teknik Universitas Hasanuddin dengan susunan sebagai berikut :

Ketua : Baharuddin, S.T., M.T.
Sekretaris : Muhammad Iqbal Nikmatullah, S.T., M.T.
Anggota : 1. Ir. Syerly Klara, M.T.
2. Ir. Zulkifli, M.T.

Untuk menguji bagi mahasiswa tersebut dibawah ini :

Nama/Nim : Rezky Pratama Sisande / D091171506

Departemen : Teknik Sistem Perkapalan

Judul Thesis/Skripsi :

Analisa Tegangan Pada Sistem Instalasi Pipa Ballast Kapal Dengan Pendekatan Software Caesar Ii

2. Waktu ujian ditetapkan oleh Panitia Ujian Akhir Program Strata Satu (S1).
3. Agar surat penugasan ini dilaksanakan sebaik-baiknya dengan penuh rasa tanggung jawab.
4. Surat penugasan ini berlaku sejak tanggal ditetapkan sampai dengan berakhirnya Ujian Sarjana tersebut, dengan ketentuan bahwa segala sesuatunya akan ditinjau dan diperbaiki sebagaimana mestinya apabila dikemudian hari ternyata terdapat kekeliruan dalam keputusan ini.

Ditetapkan di Gowa,
Pada tanggal , 16 Maret 2023
a.n Dekan,
Wakil Dekan Bidang Akademik dan
Kemahasiswaan,



Dr. Amil Ahmad Ilham, S.T., M.IT.
Nip.19731010 199802 1 001

Tembusan :

1. Dekan FT-UH.
2. Ketua Departemen Teknik Sistem Perkapalan FT-UH.
3. Kasubag Umum dan Perlengkapan FT-UH



CERTIFICATE NO. JKT 90788



KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET, DAN TEKNOLOGI

DEPARTEMEN TEKNIK SISTEM PERKAPALAN

FAKULTAS TEKNIK UNIVERSITAS HASANUDDIN

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Telp/Fax:+62-411- 588400, Email:marine.eng@unhas.ac.id

Nomor : 6052/UN4.7.7/TD.06/2023
Lamp : -
Hal : Undangan Ujian Akhir

16 Maret 2023

Kepada

Yth. : 1. Baharuddin, S.T., M.T.
2. Muhammad Iqbal Nikmatullah, S.T., M.T.
3 Ir. Syerly Klara, M.T.
4 Ir. Zulkifli, M.T.

Dengan hormat,

Kami mengundang Saudara/saudari kiranya berkenan hadir untuk menyaksikan/bertindak selaku penguji Ujian Akhir Strata Satu Fakultas Teknik Universitas Hasanuddin yang akan diselenggarakan pada :

Hari / Tanggal : Senin, 20 Maret 2023

Jam : 13.00 wita-selesai

Tempat : Ruang Sidang Teknik Sistem Perkapalan (Daring/Luring)

Dibawakan oleh :

Nama / Stambuk : Rezky Pratama Sisande

/ D091171506

Atas kesedian dan kehadiran Saudara/Saudari diucapkan terima kasih.

Ketua Departemen Teknik Sistem Perkapalan,



Dr.Eng. Faisal Mahmuddin, S.T., M.Inf.Tech., M.Eng.
Nip. 19810211 200501 1 003



KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET, DAN TEKNOLOGI
UNIVERSITAS HASANUDDIN
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☎ (0411) 586015, 586262 Fax. (0411) 586015.
<http://eng.unhas.ac.id>. ✉ E-mail: teknik@unhas.ac.id

BERITA ACARA UJIAN SARJANA

Terhadap Mahasiswa

Nama : Rezky Pratama Sisande
Stambuk : D091171506
Judul : *Analisa Tegangan Pada Sistem Instalasi Pipa Ballast Kapal Dengan Pendekatan Software Caesar Ii*
Hari/Tanggal : Senin, 20 Maret 2023
Waktu : 13.00 wita-selesai
Tempat : Ruang Sidang Teknik Sistem Perkapalan (Daring/Lur)
Keputusan Sidang / Catatan : 90 (A)

PANITIA UJIAN

No.	Susunan Panitia	Nama	Tanda Tangan
1	Ketua/Anggota	Baharuddin, S.T., M.T.	1.....
2	Sekretaris/Anggota	Muhammad Iqbal Nikmatullah, S.T., M.T.	2.....
3	Anggota	Ir. Syerly Klara, M.T.	3.....
4	Anggota	Ir. Zulkifli, M.T.	4.....

Ketua Sidang,

Baharuddin, S.T., M.T.

Nip. 19720202 199802 1 001

Gowa ,

Sekretaris Sidang,

Muhammad Iqbal Nikmatullah, S.T., M.T.

Nip. 19870131 201903 1 007

2022