

Le' Trawangan



Life is so endlessly delicious.

TUGAS AKHIR (MN 141581)

"ANALISA TEKNIS & EKONOMIS KONVERSI *DECK CARGO BARGE* 250 FT
MENJADI *RESTOBARGE* UNTUK PERAIRAN GILI TRAWANGAN – GILI MENO,
LOMBOK"

DIMAS YANSETYO AKBAR

4112100068

DOSEN PEMBIMBING

IR. HESTY ANITA KURNIAWATI, M.SC.

JURUSAN TEKNIK PERKAPALAN

FAKULTAS TEKNOLOGI KELAUTAN

INSTITUT TEKNOLOGI SEPULUH NOPEMBER

2016



LATAR BELAKANG

Mengutip pernyataan Kepala Dinas Kebudayaan dan Pariwisata NTB, Drs. Muhammad Nasir, Selasa 6 Januari 2015, kunjungan wisatawan ke Lombok mencapai 2.210.527 orang.

Mulai beralih ke SDA alternatif

Tongkang banyak “diparkir”

Banyak tongkang berakhir di mesin *scrap*

Tongkang dialihfungsikan menjadi bentuk lain yang lebih berguna



MAIN SCOPE

|| TUJUAN TUGAS AKHIR

Desain *general arrangement restobarge Le' Trawangan*

Perhitungan stabilitas & freeboard restobarge

Desain *safety plan*

Biaya konversi *deck cargo barge* menjadi *restobarge*

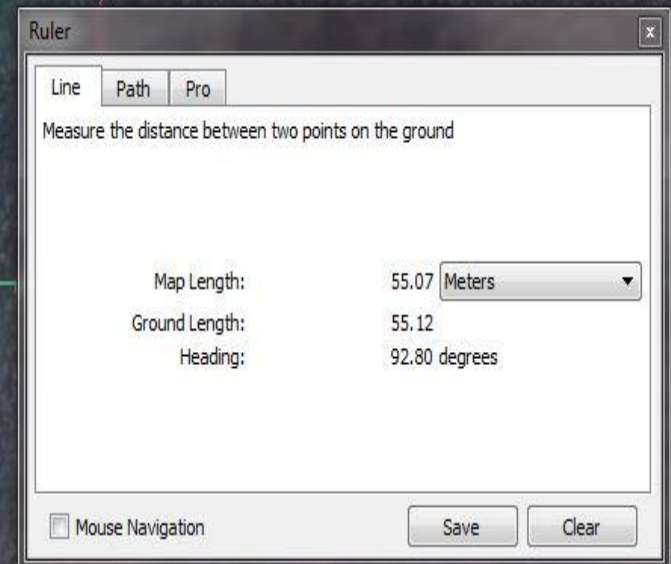
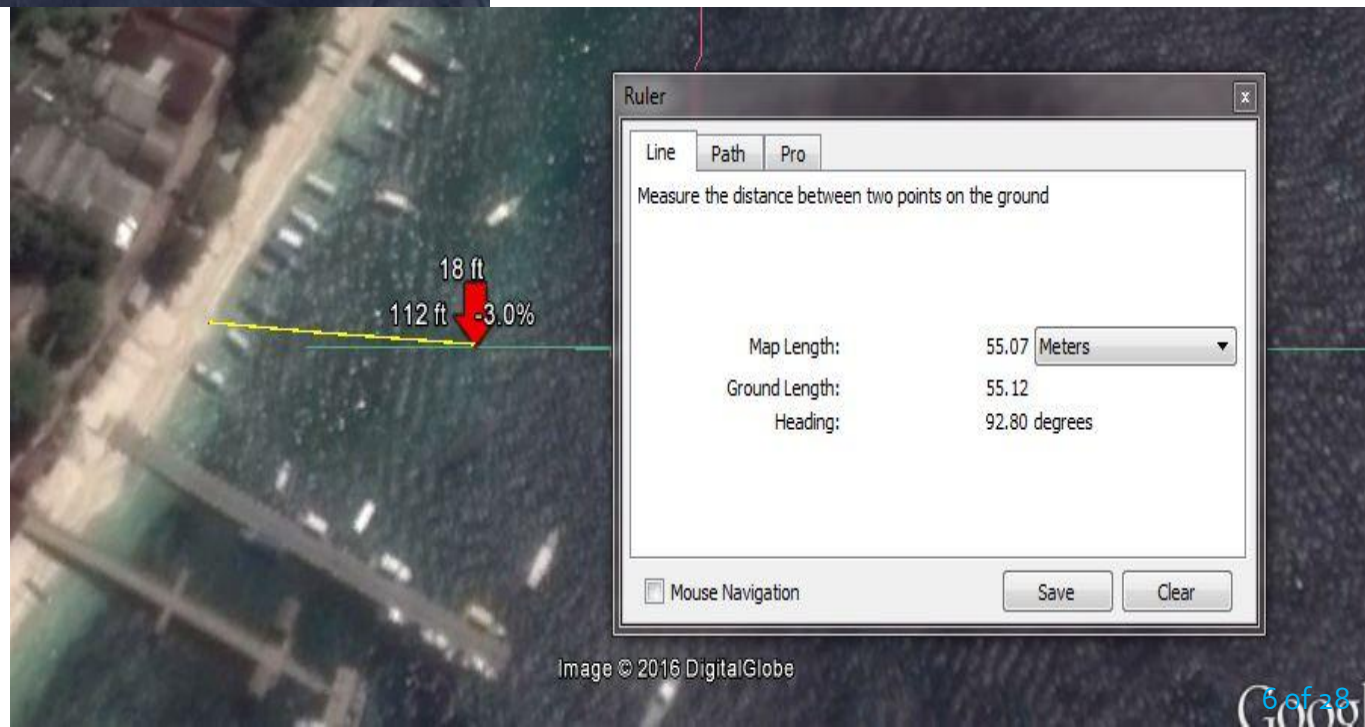
Garbage & Sewage Management

Mooring system's configuration

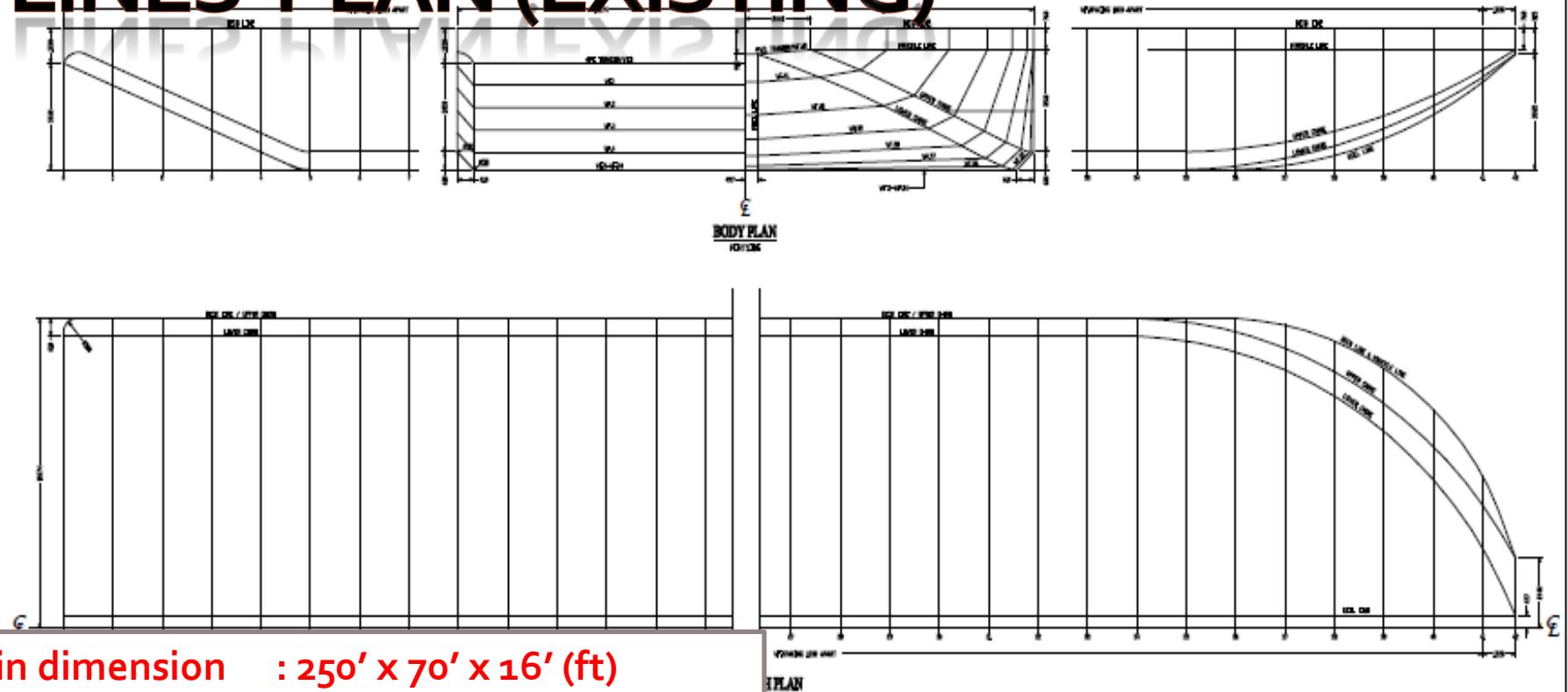
Perhitungan Analisa Ekonomis (BEP, NPV, IRR)



Location Review



LINES PLAN (EXISTING)



Main dimension : 250' x 70' x 16' (ft)
: 76.25 x 21.345 x 4.88 (m)
Displacement (ton) : 5627
DWT (ton) : 4000
LWT (ton) : 1627
Sarat (m) : 3.9

MAIN DIMENSIONS :

LENGTH OVER ALL (LOA) : 76.250 m
 BREADTH (B) : 21.345 m
 DEPTH (D) : 4.880 m
 DRAFT (T) : 3.576 m



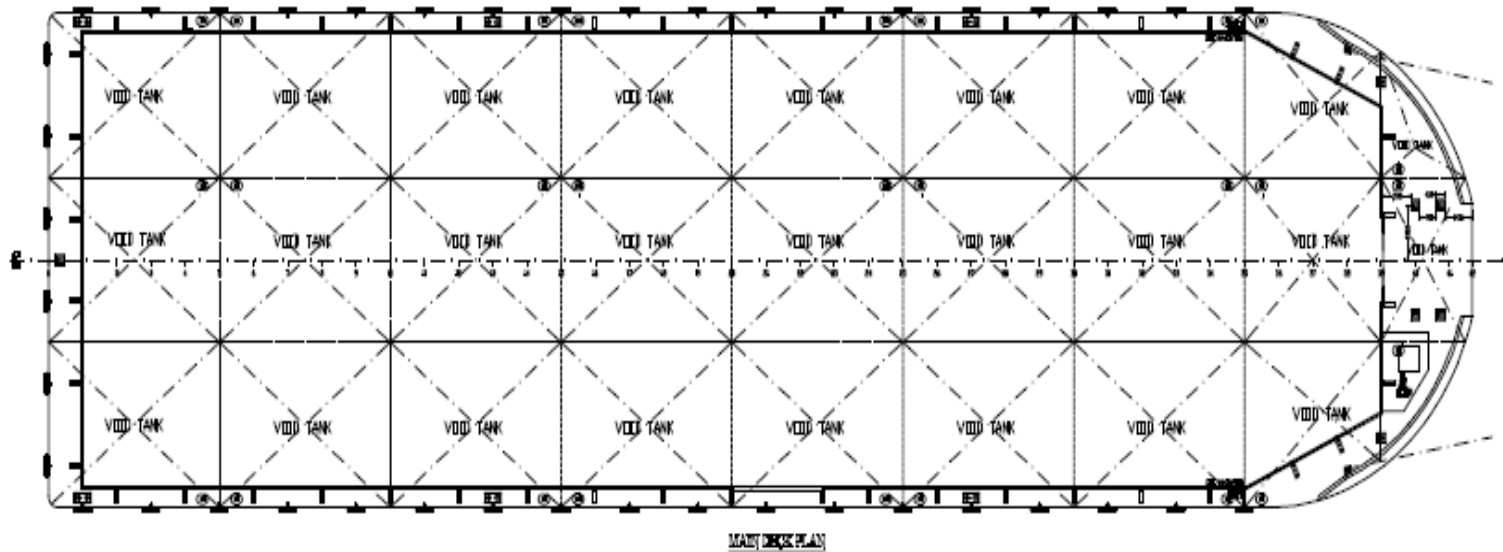
DEPARTMENT OF NAVAL ARCHITECTURE
 FACULTY OF MARINE TECHNOLOGY
 SEPULUH NOPEMBER INSTITUTE OF TECHNOLOGY

RESTOBARGE Le' Trawangan

LINES PLAN

SCALE	DATE	USER
1:1000		
DESIGNED BY	1. Rendi Pradana Mulya	
CHECKED BY	2. Rendi Pradana Mulya	
APPROVED BY	3. Rendi Pradana Mulya	

GENERAL ARRANGEMENT (EXISTING)



Main dimension : 250' x 70' x 16' (ft)
 : 76.25 x 21.345 x 4.88 (m)
 Displacement (ton): 5627
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DEPARTMENT OF NAVAL ARCHITECTURE
 FACULTY OF NAUTICAL SCIENCE
 DIPLOMA IN NAVAL ARCHITECTURE

DECK CARGO BARGE SM 28

GENERAL ARRANGEMENT

NO	ITEM	NO	ITEM	NO
1	STRUCTURE	1	STRUCTURE	1
2	STRUCTURE	2	STRUCTURE	2
3	STRUCTURE	3	STRUCTURE	3

MAXSURF DRAWING RESULTS

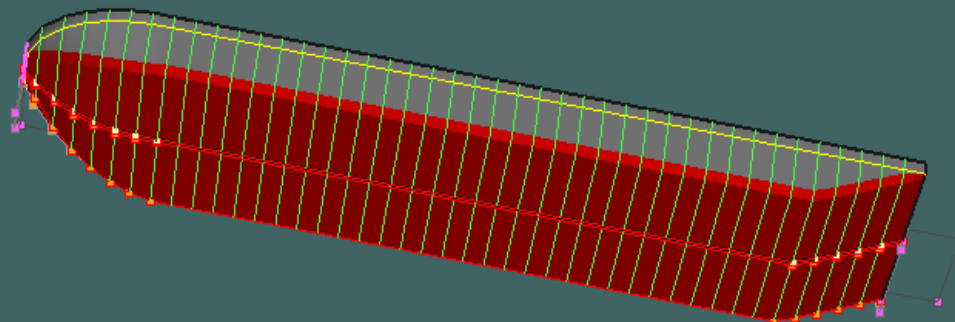
Maxsurf Modeler Advanced - [Perspective]

File Edit View Markers Controls Curves Surfaces Display Data Window Help

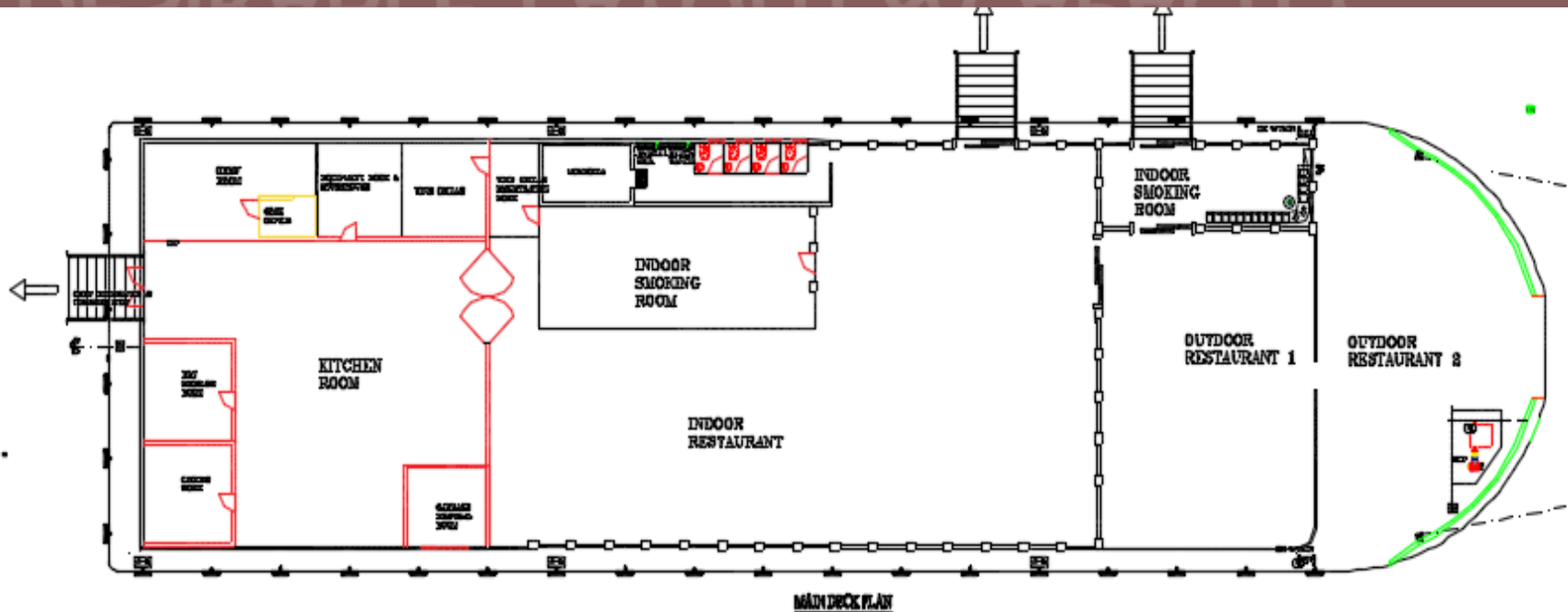


Hydrostatics at DWL

	Measurement	Value	Units
1	Displacement	5681	t
2	Volume (displaced)	5542.050	m^3
3	Draft Amidships	3.904	m
4	Immersed depth	3.904	m
5	WL Length	76.176	m
6	Beam max extents o	21.345	m
7	Wetted Area	2076.973	m^2
8	Max sect. area	82.911	m^2
9	Waterpl. Area	1576.124	m^2
10	Prismatic coeff. (Cp)	0.877	
11	Block coeff. (Cb)	0.873	
12	Max Sect. area coeff	0.995	
13	Waterpl. area coeff.	0.969	
14	LCB length	37.758	from z
15	LCF length	36.964	from z
16	LCB %	49.567	from z
17	LCF %	48.525	from z
18	KB	2.039	m
19	KG fluid	0.000	m
20	BMt	10.476	m
21	BML	130.105	m
22	GMt corrected	12.515	m
23	GML	132.144	m
24	KMt	12.515	m
25	KML	132.144	m
26	Immersion (TPc)	16.155	tonne/c
27	MTc	98.542	tonne.
28	RM at 1deg = GMT.Di	1240.739	tonne.



DESIRABLE LAYOUT & CAPACITY



Luas dapur = 19.3 m x 18.47 m

= 357,23 m²

Luas restoran = 43.8 m x 18.73 m

= 820,4 m²

Displasemen = 5156 ton

DWT restoran = 4471 ton

LWT restoran = 767 ton

Titik Berat *Restobarge*

LCG (m) = 37.66 m

VCG (m) = 2.72 m

TCG (m) = 0.01 m

GENERAL ARRANGEMENT



Dapur hangat	= 151.85 m ²
Dry storage room	= 4.85 x 4.85 m
Cooler room	= 4.85 x 4.85 m
Ruang kru beserta cook's office	= 9.08 x 4.67 m
Equipment room & storehouse	= 4.47 x 4.67 m
Garbage disposal room	= 3.85 x 4.35 m
Wine cellar	= 4.47 x 4.67 m

Jumlah Kursi	= 250
Jumlah Meja	= 71
Jumlah Crew	= 59
Displasemen	= 5156 ton
DWT restoran	= 3268 ton
LWT restoran	= 1888 ton

Ruang inti restobarge terdiri dari:	
Indoor restaurant	= 32.38 x 18.73 m
Indoor smoking restaurant	= 14.61 x 5.82 m
Outdoor restaurant	= 15.44 x 11.73 m
Musholla	= 4.7 x 2.7 m
Toilet	= 6 x 1.5 m
Waiting room	= 11.18 x 3.85 m



MAIN DIMENSIONS	
LENGTH OVER ALL (LOA)	= 74.30m
BEAM (B)	= 21.90m
DRAFT (D)	= 4.80m
DRAFT (D)	= 3.70m

DEPARTMENT OF MARINE	
RESTOBARGE La' Trawangan	
GENERAL ARRANGEMENT	
NO.	1
DATE	2023/01/10
BY	...
CHECKED	...
APPROVED	...

FREEBOARD & TONNAGE

Kondisi Kapal	Freeboard Standard (m)	Freeboard Sebenarnya (m)	Kondisi
Sebelum konversi	0.882	0.98	ACCEPTED
Sesudah konversi	0.882	1.304	ACCEPTED

PERHITUNGAN TONNAGE

- GT = 2645
- NT = 1593

PEMERIKSAAN STABILITAS

LOADCASES

- Loadcase 1 : Kapal sebelum dilakukan konversi
- Loadcase 2 : Kapal setelah dilakukan konversi, dengan *inserted plate* beserta DWT dan LWT 0 ton
- Loadcase 3 : Kapal setelah dilakukan konversi, dengan kondisi tangki air tawar pada level 0 % kapasitas penuh
- Loadcase 4 : Kapal setelah dilakukan konversi, dengan kondisi tangki air tawar pada level 50 % kapasitas penuh
- Loadcase 5 : Kapal setelah dilakukan konversi, dengan kondisi tangki air tawar pada level 50 % kapasitas penuh

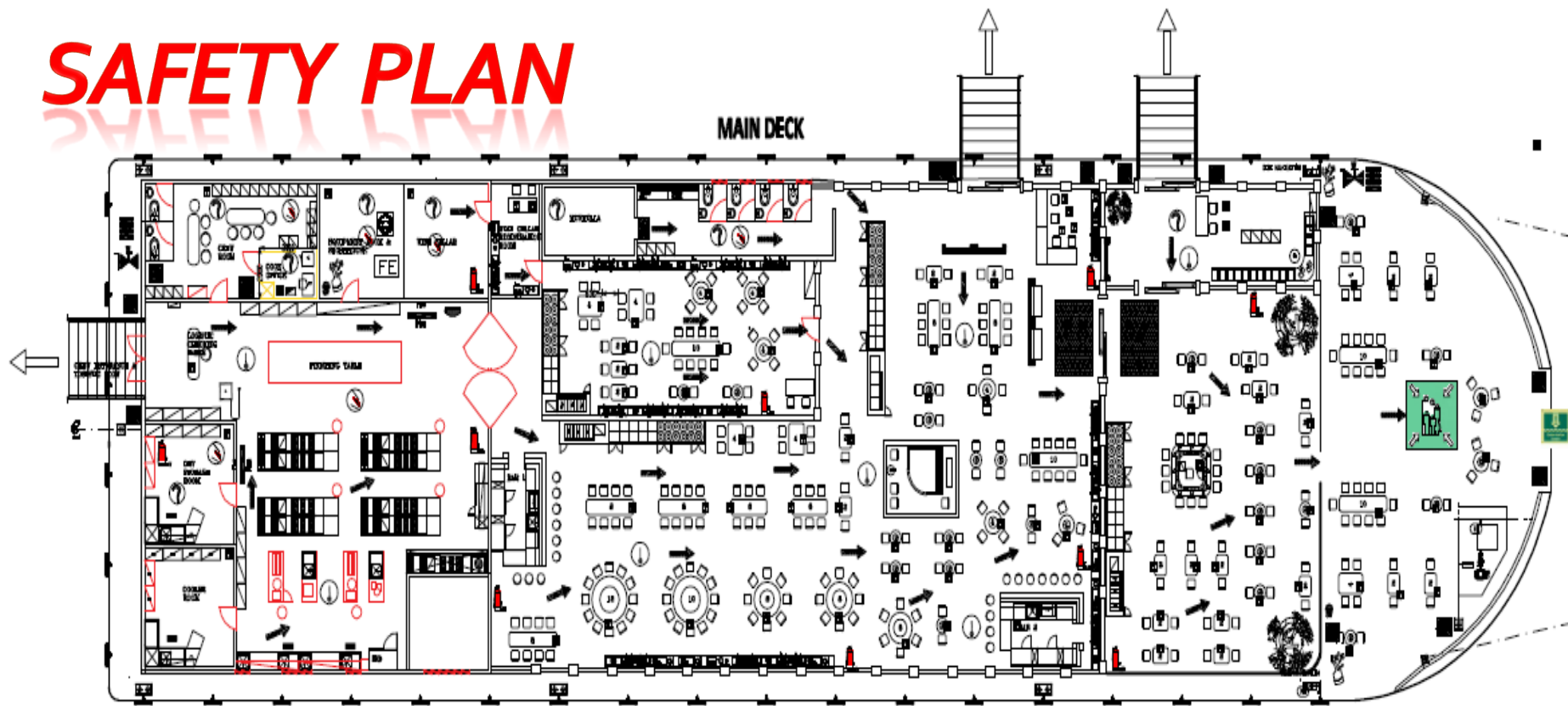
PEMERIKSAAN STABILITAS

No	Criteria	Value	Unit	Actual condition				
				1	2	3	4	5
1	Area 0 to 30 shall be greater than (>)	3.1513	m.deg	139.05	131.51	80.95	64.68	59.19
2	Area 0 to 40 shall be greater than (>)	5.1566	m.deg	196.79	187.01	121.01	97.18	84.17
3	Area 30 to 40 shall be greater than (>)	1.7189	m.deg	57.74	55.51	40.05	32.49	24.98
4	Max GZ at 30 or greater	0.2	m	5.99	5.774	4.18	3.379	2.61
5	Angle of maximum GZ shall not be less than	25	deg	27.3	27.3	25.5	25.5	25.5
6	Initial GMt shall be greater than	0.15	m	29.895	25.85	20.59	14.20	11.05
7	Passanger crowding : angle of equilibrium Angle of steady heel shall be less than	10	deg	0.0	0.0	0.0	0.0	0.1
8	Turning: angle of equilbirium Angle of steady heel shall be less than	10	deg	0.0	0.0	0.0	0.0	0.1
				PASS	PASS	PASS	PASS	PASS

PEMERIKSAAN TRIM

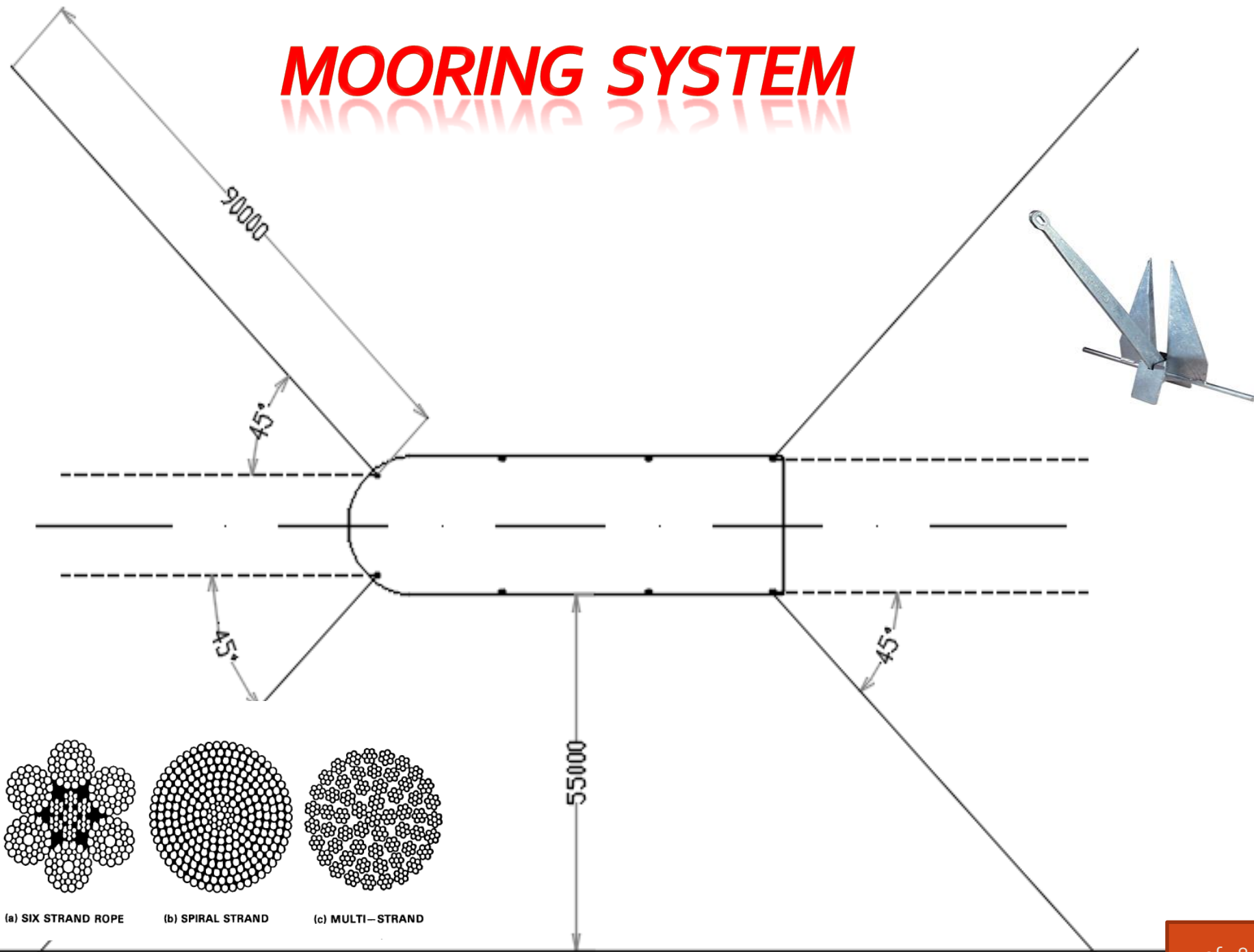
No	Item	Loadcase				
		1	2	3	4	5
1	Draft amidships (m)	1.237	1.421	1.817	2.617	3.388
2	Displacement (ton)	1627	1888.12	2461	3658	5156
3	Draft at FP (m)	1.178	1.351	1.701	2.553	3.39
4	Draft at AP (m)	1.297	1.491	1.934	2.682	3.386
5	Draft at LCF (m)	1.237	1.421	1.818	2.618	3.388
6	Trim (+ve by stern) (m)	0.119	0.14	0.233	0.129	-0.004
7	WL length(m)	65.814	66.657	68.5	71.754	74.636
8	WL beam (m)	21.345	21.345	21.345	21.345	21.345
9	Block coeff.	0.881	0.878	0.86	0.87	0.875
10	LCB from zero pt. (m)	37.604	37.598	37.426	37.749	37.9
11	Trim correction (shall be less than +/- 0.38125)	0.119	0.14	0.233	0.129	-0.04

SAFETY PLAN

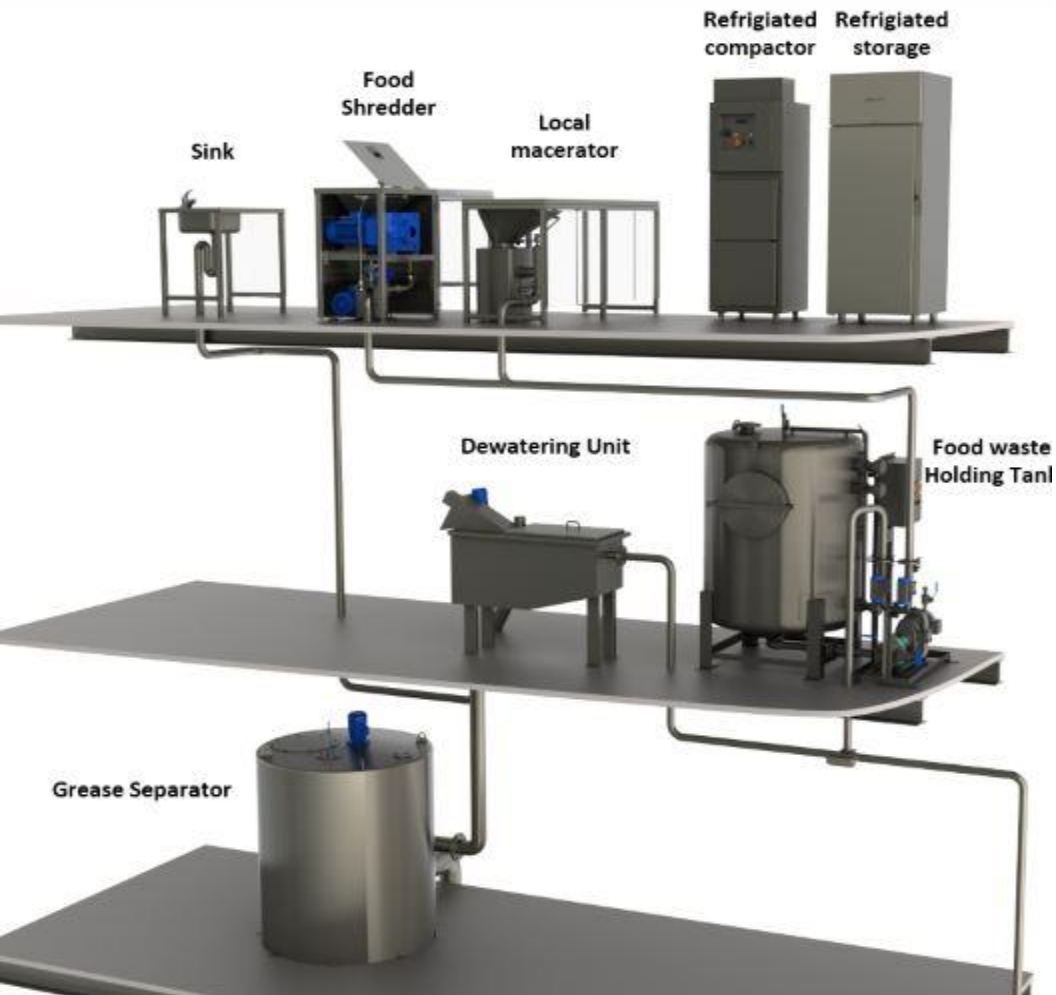


1. 341 *lifejackets*, yang terbagi menjadi 282 *lifejackets* untuk penumpang dan 59 *lifejackets* untuk crew.
2. 12 *lifebuoy* yang terbagi menjadi 3 *lifebuoy*, 1 *lifebuoy with line*, 6 *lifebuoy with self-igniting lights*, 2 *lifebuoy with smoke signal*.
3. 22 *liferafts* yang terbagi menjadi 11 pada *starboard side* dan 11 pada *portside*.

MOORING SYSTEM



GARBAGE-SEWAGE MANAGEMENT



ANALISA EKONOMIS

1. Perhitungan Estimasi Biaya Reparasi Sebelum Konversi
2. Perhitungan Estimasi Lama Waktu Konversi
3. Perhitungan Estimasi Biaya Konversi
4. Perhitungan Estimasi BEP (*Breakeven Point*)
5. Perhitungan Estimasi NPV (*Net Present Value*)
6. Perhitungan Estimasi IRR (*Interest Rate of Return*)

PERHITUNGAN ESTIMASI BIAYA REPARASI

No	item	Unit Quantity		Price per unit (Rp)	Total Price (Rp)
		kg	m ²		
1	Selling Remaining plat that was used as bulwark	54,320.98		24,000.00	1,303,703,424.68
2	Replating Deck plate		1,578.45	27,000.00	-42,618,156.06
3	Blasting		2,077.00	60,000.00	-124,620,000.00
4	Hull Repainting		3,655.45	27,000.00	-98,697,156.06
				Total	1,037,768,112.57

PERHITUNGAN ESTIMASI LAMA WAKTU KONVERSI

No	Parts	Plate dimension (mm)	Weight (ton)	Work Efficiency (ton/day)	Work Hours (day)
1	Deck	6000 x 1500 x 14	88.03	5.21	16.90
2	Roof	6000 x 1500 x 7	88.03	5.21	16.90
3	Starboard & port	6000 x 1500 x 14	43.52	5.21	8.35
4	Back & front	6000 x 1500 x 14	15.83	5.21	3.04
5	Divider between room	6000 x 1500 x 7	25.72	5.21	4.94
				Total	50.12

No	Parts	Plate dimension (mm)	Weight (ton)	Work Efficiency (ton/day)	Work Hours (day)
1	Deck	6000 x 1500 x 14	88.03	5.02	16.90
2	Roof	6000 x 1500 x 7	88.03	5.02	16.90
3	Starboard & port	6000 x 1500 x 14	43.52	5.02	8.35
4	Back & front	6000 x 1500 x 14	15.83	5.02	3.04
5	Divider between room	6000 x 1500 x 7	25.72	5.02	4.94
6	Interior		13.97	5.02	2.78
				Total	54.76

PERHITUNGAN ESTIMASI BIAYA KONVERSI

No	Item	Price (Rp)
1	Ship's price	-10,200,000,000.00
2	Reparation cost	1,037,768,112.57
3	Interior cost	-749,373,429.00
4	Addition Plate cost	-2,133,500,569.20
	Total	-12,045,105,885.63

PERHITUNGAN ESTIMASI BIAYA KONVERSI

No	Item	Price (Rp)
1	Main ship building cost	12,045,105,885.63
2	Construction cost	2,409,021,177.13
3	Machinery part	782,931,882.57
4	Electricity	867,247,623.77
5	Floating dock rent cost	253,672,459.86
6	miscellaneous	240,902,117.71
7	Indirect Cost	782,931,882.57
	Sub Total	17,381,813,029.23

PERHITUNGAN ESTIMASI BIAYA KONVERSI

Sub Total	17,381,813,029.23
Interest rate	0.10
% money to loan	70
Amount of money to loan	12,167,269,120.46
Interest	1,216,726,912.05
Term of loan (year)	5
Interest*year	6,083,634,560.23
Total	23,465,447,589.46

PERHITUNGAN ESTIMASI BEP (BREAKEVEN POINT)

No	Item	income (+) /outcome (-) (Rp)	units
1	Keuntungan kotor	47,250,000.00	/day
2	Keuntungan kotor	1,417,500,000.00	/month
3	Perawatan 40% dari keuntungan	-567,000,000.00	/month
4	Gaji	-302,000,000.00	/month
5	Akomodasi penumpang	-7,500,000.00	/month
6	Biaya tak terduga 15%	-212,625,000.00	/month
7	Keuntungan bersih	-328,375,000.00	/month
	Total	3,940,500,000.00	/year

Year	Keuntungan bersih
0	-23,465,447,589.46
1	-19,524,947,589.46
2	-15,584,447,589.46
3	-11,643,947,589.46
4	-7,703,447,589.46
5	-3,762,947,589.46
6	177,552,410.54
7	4,118,052,410.54
8	8,058,552,410.54

PERHITUNGAN ESTIMASI NPV (NET PRESENT VALUE)

PV

$$= \sum (\text{Keuntungan bersih} \times \text{discount factor})$$

Discount factor

$$= \frac{1}{(1 + \text{interest rate})^{\text{year}}}$$

Year	Keuntungan bersih	Discount Factor (DF)	PV keuntungan bersih
1	3,940,500,000.00	0.909090909	3,582,272,727.27
2	3,940,500,000.00	0.826446281	3,256,611,570.25
3	3,940,500,000.00	0.751314801	2,960,555,972.95
4	3,940,500,000.00	0.683013455	2,691,414,520.87
5	3,940,500,000.00	0.620921323	2,446,740,473.51
6	3,940,500,000.00	0.56447393	2,224,309,521.38
7	3,940,500,000.00	0.513158118	2,022,099,564.89
8	3,940,500,000.00	0.46650738	1,838,272,331.72
9	3,940,500,000.00	0.424097618	1,671,156,665.20
10	3,940,500,000.00	0.385543289	1,519,233,332.00
11	3,940,500,000.00	0.350493899	1,381,121,210.91
12	3,940,500,000.00	0.318630818	1,255,564,737.19
13	3,940,500,000.00	0.28966438	1,141,422,488.35
14	3,940,500,000.00	0.263331254	1,037,656,807.59
15	3,940,500,000.00	0.239392049	943,324,370.54
16	3,940,500,000.00	0.217629136	857,567,609.58
17	3,940,500,000.00	0.197844669	779,606,917.80
18	3,940,500,000.00	0.17985879	708,733,561.64
19	3,940,500,000.00	0.163507991	644,303,237.85
20	3,940,500,000.00	0.148643628	585,730,216.23
21	3,940,500,000.00	0.135130571	532,482,014.75
22	3,940,500,000.00	0.122845974	484,074,558.87
23	3,940,500,000.00	0.111678158	440,067,780.79
24	3,940,500,000.00	0.101525598	400,061,618.90
25	3,940,500,000.00	0.092295998	363,692,380.82
		Total	35,768,076,191.83
		Ship building cost	-23,465,447,589.46
		NPV	12,302,628,602.37

NPV > 0, Investasi boleh dilakukan
 NPV < 0, Investasi tidak disarankan untuk dilakukan

PERHITUNGAN ESTIMASI IRR (INTEREST RATE OF RETURN)

Year	Keuntungan bersih	Bunga 10%		Bunga 11%	
		DF	PV keuntungan bersih	DF	PV keuntungan bersih
1	3,940,500,000.00	0.909	3,582,272,727.27	0.885	3,487,168,141.59
2	3,940,500,000.00	0.826	3,256,611,570.25	0.812	3,198,198,198.20
3	3,940,500,000.00	0.751	2,960,555,972.95	0.731	2,881,259,638.02
4	3,940,500,000.00	0.683	2,691,414,520.87	0.659	2,595,729,403.62
5	3,940,500,000.00	0.621	2,446,740,473.51	0.593	2,338,494,958.21
6	3,940,500,000.00	0.564	2,224,309,521.38	0.535	2,106,752,214.61
7	3,940,500,000.00	0.513	2,022,099,564.89	0.482	1,897,974,968.12
8	3,940,500,000.00	0.467	1,838,272,331.72	0.434	1,709,887,358.66
9	3,940,500,000.00	0.424	1,671,156,665.20	0.391	1,540,439,061.86
10	3,940,500,000.00	0.386	1,519,233,332.00	0.352	1,387,782,938.61
11	3,940,500,000.00	0.350	1,381,121,210.91	0.317	1,250,254,899.65
12	3,940,500,000.00	0.319	1,255,564,737.19	0.286	1,126,355,765.45
13	3,940,500,000.00	0.290	1,141,422,488.35	0.258	1,014,734,923.83
14	3,940,500,000.00	0.263	1,037,656,807.59	0.232	914,175,607.05
15	3,940,500,000.00	0.239	943,324,370.54	0.209	823,581,627.98
16	3,940,500,000.00	0.218	857,567,609.58	0.188	741,965,430.61
17	3,940,500,000.00	0.198	779,606,917.80	0.170	668,437,324.87
18	3,940,500,000.00	0.180	708,733,561.64	0.153	602,195,788.17
19	3,940,500,000.00	0.164	644,303,237.85	0.138	542,518,728.08
20	3,940,500,000.00	0.149	585,730,216.23	0.124	488,755,610.89
21	3,940,500,000.00	0.135	532,482,014.75	0.112	440,320,370.17
22	3,940,500,000.00	0.123	484,074,558.87	0.101	396,685,018.17
23	3,940,500,000.00	0.112	440,067,780.79	0.091	357,373,890.24
24	3,940,500,000.00	0.102	400,061,618.90	0.082	321,958,459.68
25	3,940,500,000.00	0.092	363,692,380.82	0.074	290,052,666.38
Total			35,768,076,191.83	Total	33,123,052,992.71
ship building cost			-23,465,447,589.46	ship building cost	-23,465,447,589.46
NPV 1			12,302,628,602.37	NPV 2	9,657,605,403.25
IRR (%)			16.7		

IRR > Bunga Pinjaman,
Investasi dapat diterima
IRR < 0, Bunga Pinjaman,
Investasi sebaiknya ditolak

$$IRR = \left(P1 - C1 \times \frac{P2 - P1}{C2 - C1} \right)$$

P1 = suku bunga pinjaman 1)

P2 = suku bunga pinjaman 2

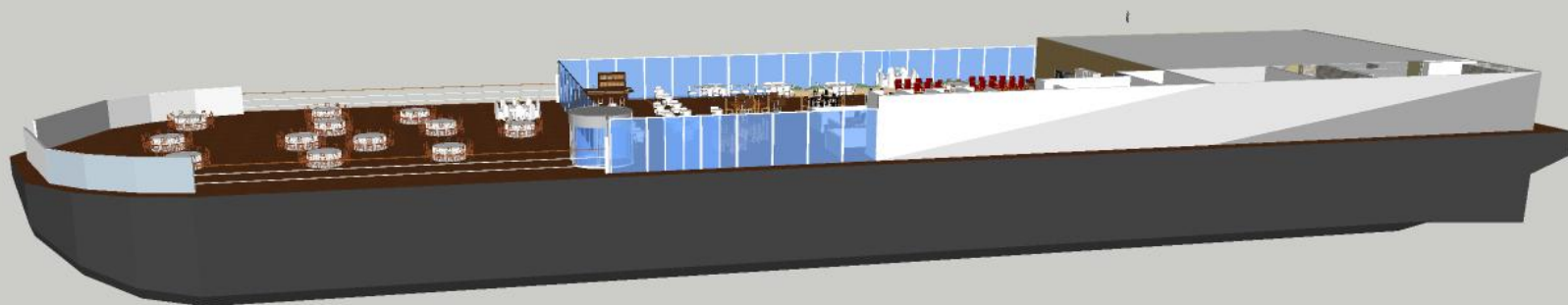
C1 = NPV 1

C2 = NPV 2

KESIMPULAN

- Principal Dimension Restobarge
 - L (m) = 62.16
 - B (m) = 19.5
 - H (m) = 3Dapat mengangkut .pengunjung sebanyak 250 orang yang terbagi ke dalam 71 meja
- Freeboard minimum yang disyaratkan adalah 772 mm dengan sarat maksimum adalah 3.576 m
- Perencanaan keselamatan kapal:
 - 341 lifejackets
 - 12 lifebuoy
 - 22 liferafts
- Garbage management menggunakan compactor untuk sampah plastik serta menggunakan comminuter dan macerator untuk sampah sisa makanan
- Perencanaan sewage management menggunakan chemical methode sewage treatment supaya dapat di-recycle, serta menggunakan comminuter untuk mengolah solid sewage
- Konfigurasi mooring system
 - Spread mooring system with symetric 4 line (45°)
 - Pada portside menggunakan wire rope mooring line, pada starboardside menggunakan chain mooring line
- Besar biaya konversi adalah Rp. 23,465,447,589.46 dengan estimasi terjadinya BEP pada tahun ke 6 operasional. Nilai NPV sebesar Rp. 12,302,628,602.37 dan IRR sebesar 16.7% untuk jangka waktu investasi 5 tahun.







Le' Trawangan



Life is so endlessly delicious.

THANK YOU

No	Item	Berat (ton)
1	Muatan	52.25
2	<i>Provision & store</i>	9.27
3	<i>Crew needs</i>	11.82
4	<i>Fresh water</i>	2394.774
5	<i>Steel weight</i>	1888.12
6	Perlengkapan & peralatan	145
	Total	5156

Price Included
Exclusive Apartment with
: Welcome drink
Water, Large B



PEMERINTAH KABUPATEN LOMBOK UTARA
DINAS PERHUBUNGAN PARIWISATA KOMUNIKASI DAN INFORMATIKA
PELABUHAN BANGSAL PENENANG
KOPERASI ANGKUTAN LAUT
"KARYA BAHARI"
Peraturan Bupati Lombok Utara No. 30 Tahun 2011



JASA RAHARJA
LIFE INSURANCE

TICKET UMUM

Nomor>Nama Kapal : *Bunda*

Nama Penumpang : *[Signature]*

Harga Ticket

1. Gili Air : Rp. 8.000,-

2. Gili Meno : Rp. 9.000,-

3. Gili Trawangan : Rp. 10.000,-

☐☐☐

Petugas.

HARGA TICKET TERMASUK
ASURANSI "JASA RAHARJA"

No Seri

Nomor/Name Kapal : *19*

Nama Penumpang



No	Item	Nama lain
1	Nasi Putih	Nasi Putih
2	Ayam Katamaran	Ayam Bakar Taliwang
3	Patin Camier	Patin Bakar Madu Taliwang
4	Freeboard kangkung	Plecing kangkung
5	Propeller Tahu	Tahu kipas
6	Rudder Tempe	Tempe mendoan
7	Cumi Holtrop	Cumi goreng madu
8	Sayur Bilga	Sayur lebui
9	Banana Cargo	Banana split
10	Es Bulbousbow	Es Kelapa Muda Crystal
11	Es Tanker	Es Jeruk Crystal

No	Item	Nama lain
1	Nasi Putih	Nasi Putih
2	Ayam Trimaran	Ayam Plecingan Lombok
3	Gurame Jangkar	Pepes Gurame Bumbu Rajang
4	Freeboard kangkung	Plecing kangkung
5	Propeller Tahu	Tahu kipas
6	Rudder Tempe	Tempe mendoan
7	Udang van oortmossen	Udang Bakar Madu
8	Sayur Bilga	Sayur lebui
9	Banana Cargo	Banana split
10	Es Guldhamer	Es Kelapa Muda Crystal
11	Es Mooring	Es Soda Gembira