BAB III
PENUTUP

Dengan selesainya penyusanan tugas Pra Rancangan ini, maka penulis dapat mengambil kesimpulan yang berhubungan dengan perencanaan kapal Tunda 2 x 850 tipe Harbour, sebagai sarana penunjang armada perkapalan diindonesia.

Adapun kesimpulan penulisan tersebut adalah sebagai berikut :

1. Ringkasan spesifikasi teknis kapal :
   - Panjang seluruhnya (Loa) = 29.00 m
   - Panjang antara garis tegak (Lpp) = 26.00 m
   - Lebar (B) = 8.5 m
   - Tinggi (H) = 4.2 m
   - Sarat air (T) = 3.2 m
   - Koefisien blok (Cb) = 0.56
   - Koefisien prismatic (Cp) = 0.659
   - Koefisien garis air (Cw) = 0.81
   - Koefisien tengah kapal (Cm) = 0.849
   - Displacent (Δ) = 405.932 Ton
   - Jumlah anak buah kapal = 7 orang
   - Kecepatan dinas = 10 knot
   - Alat penggerak yang digunakan
     - Merk : Wartsila
     - Tipe : UD 25
     - Daya : 2 x 850 HP
     - Putaran mesin : 1650 rpm
     - Gear ratio : 1 : 3.21
     - Bore x Stroke : 150 mm x 180 mm
     - Ukuran : Panjang x Lebar x Tinggi
       2711 mm x 1624 mm x 1570 mm
     - Jumlah : 2 (dua) buah
     - Berat : 4.9 Ton

2. Dalam rancangan, kapal dikontrol terhadap stabilitas , trim, panjang genangan dan rencana pemuatan serta berat kapal, dimana semua hasil perhitungan harus memenuhi ketentuan yang berlaku.
3. Dalam menentukan ukuran utama yang diambil dalam perancanaan kapal terlebih dahulu perlu diadakan pertimbangan-peertimbangan secara umum terutama dalam hal yang berhubungan dengan tahanan, stabilitas, Free board, ruang muatan, kekuatan kapal, ekonomi dan teknologi pembuatanya.
4. Jumlah sekat kedap air ditentukan berdasarkan aturan dalam klasifikasi yang digunakan.

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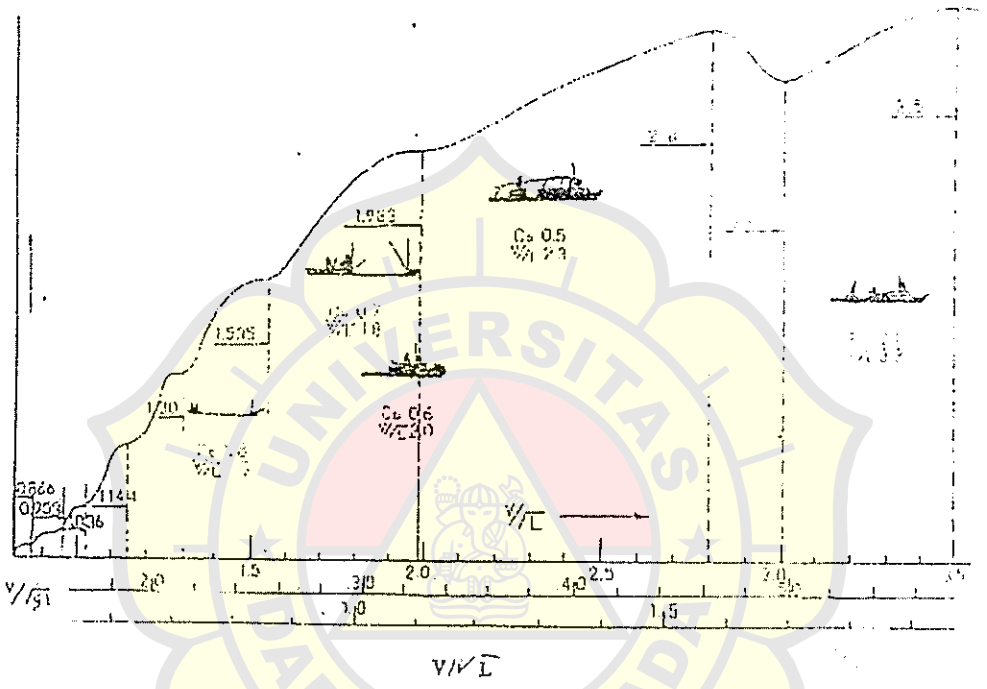
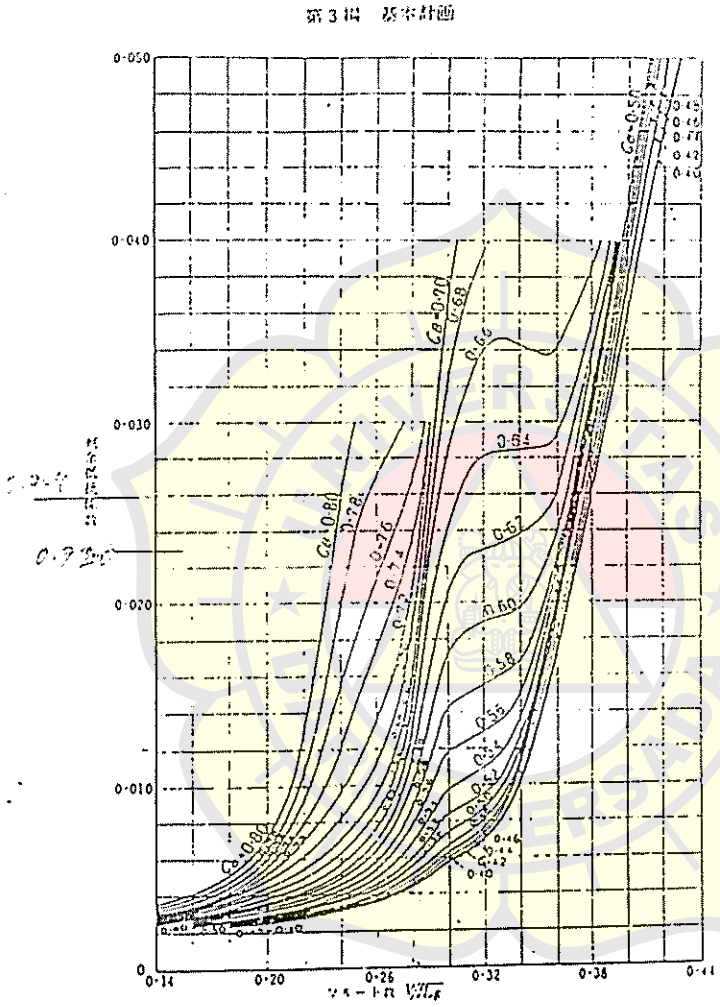
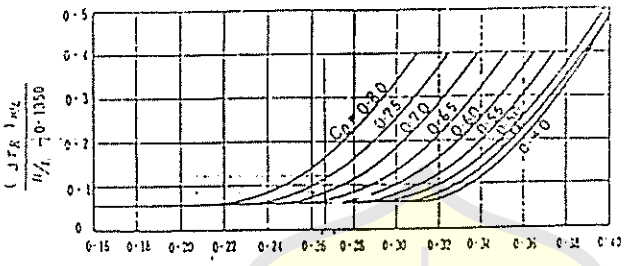
Lampiran 1. Diagram Speed Length Ration.



Lampiran 2. Grafik Untuk Menentukan Hambatan Sisa (C_R') oleh Dr. Yamagata



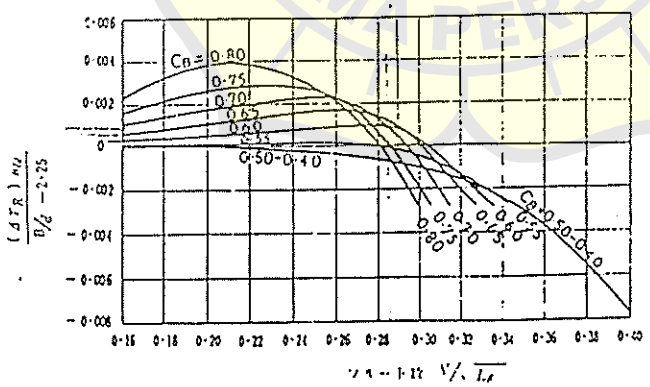
Lampiran 3. Grafik Dr. Yamagata Untuk $\dfrac{(\Delta C_R')_{B/LWL}}{(B/LWL)-0{,}1350}$



フルード数 $V/\sqrt{Lg}$

図 48 B/L が標準値と異なる場合の修正（曲線の使い方）

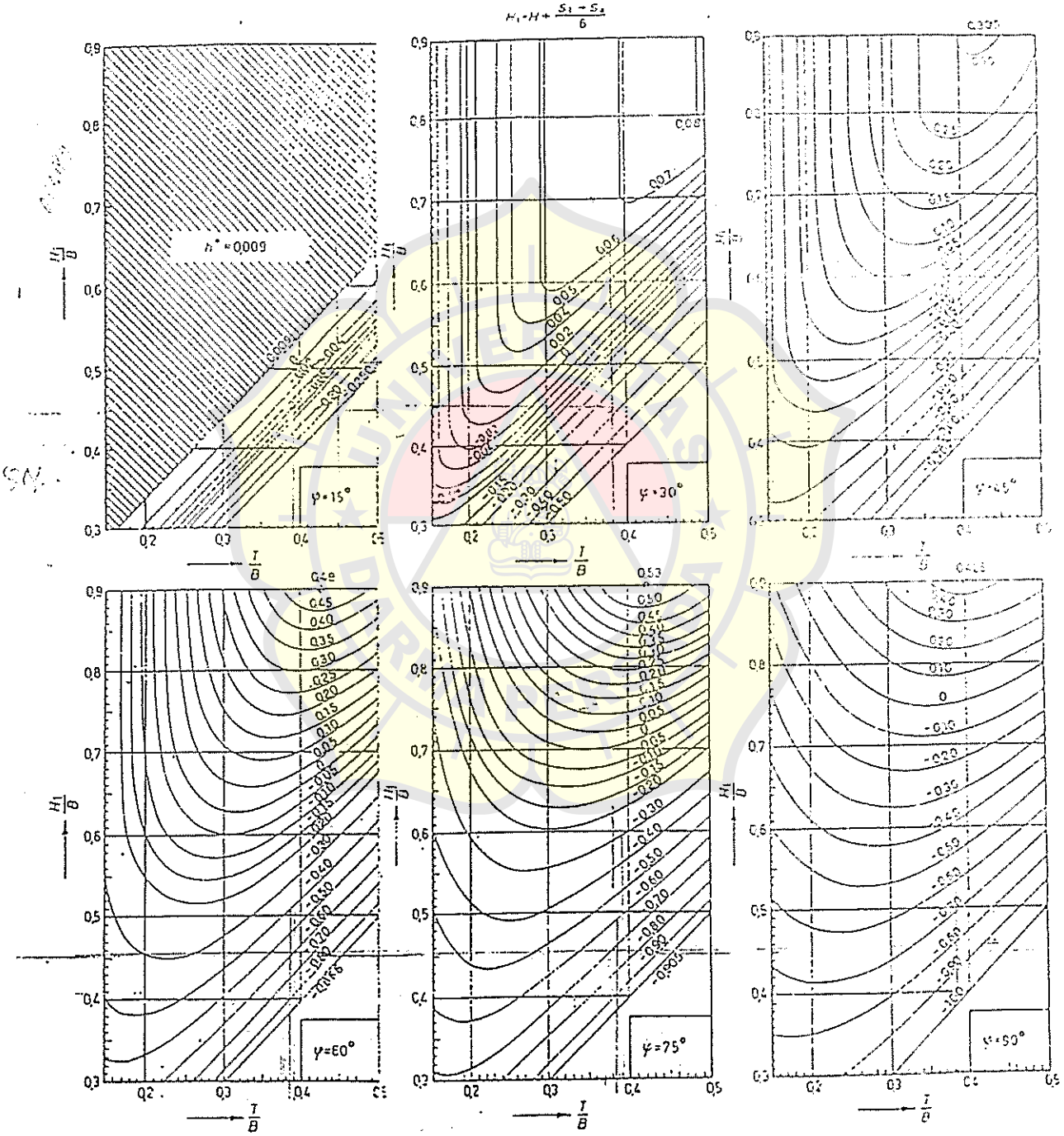
Lampiran 4. Grafik Dr. Yamagata Untuk $\dfrac{(\Delta C_R')_{B/T}}{(B/T)-0{,}1350}$



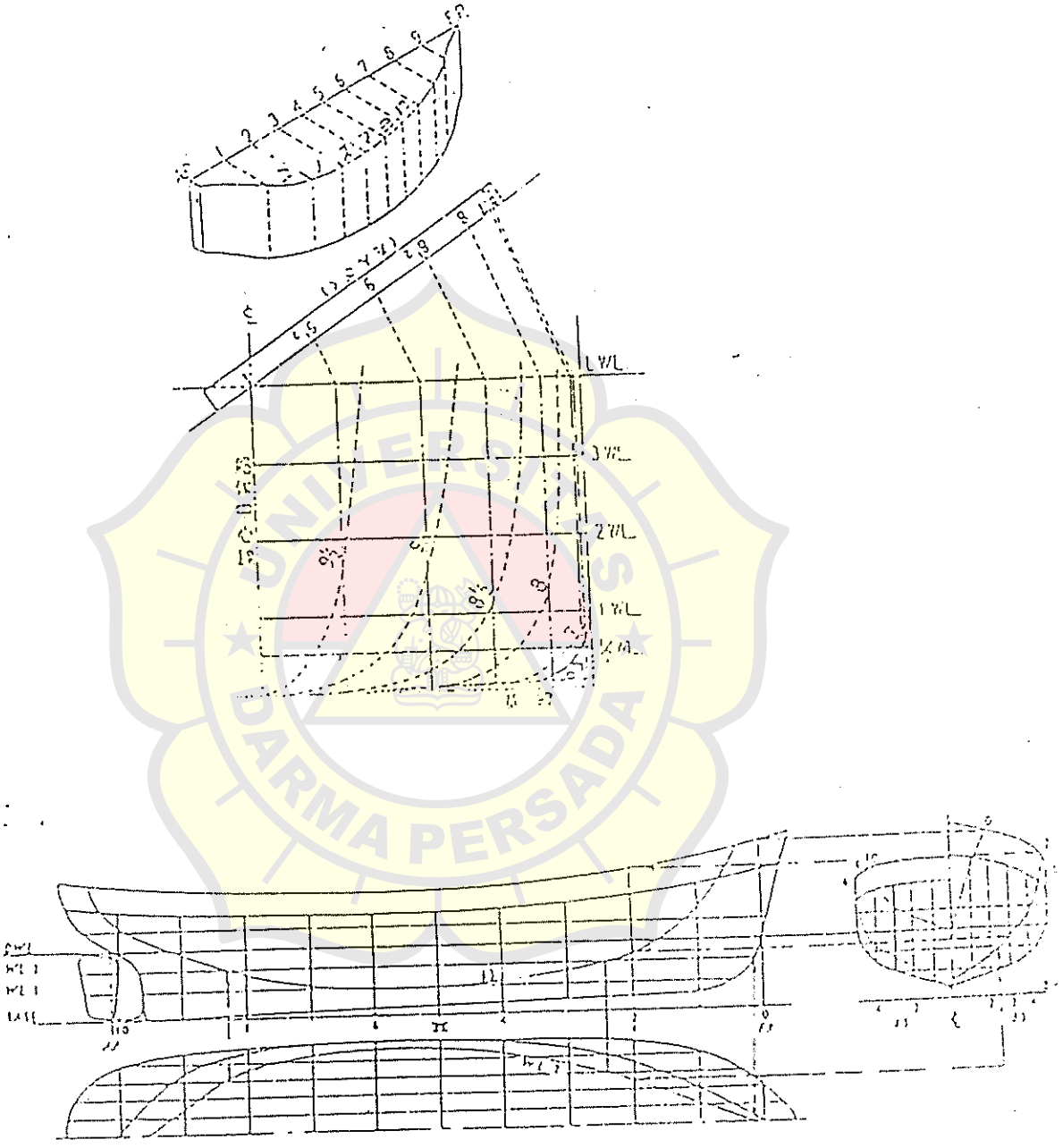
フルード数 $V/\sqrt{Lg}$

図 49 B/d が標準値と異なる場合の修正（曲線の使い方）

Lampiran 5. Grafik Untuk Menentukan h*, Cara Prohaska



Lampiran 6. Cara pembuatan Body Plan



Lampiran 6. Grafik Untuk Menentukan C_R' Cara Sv. Aa. Harvald Dan Guldhammer

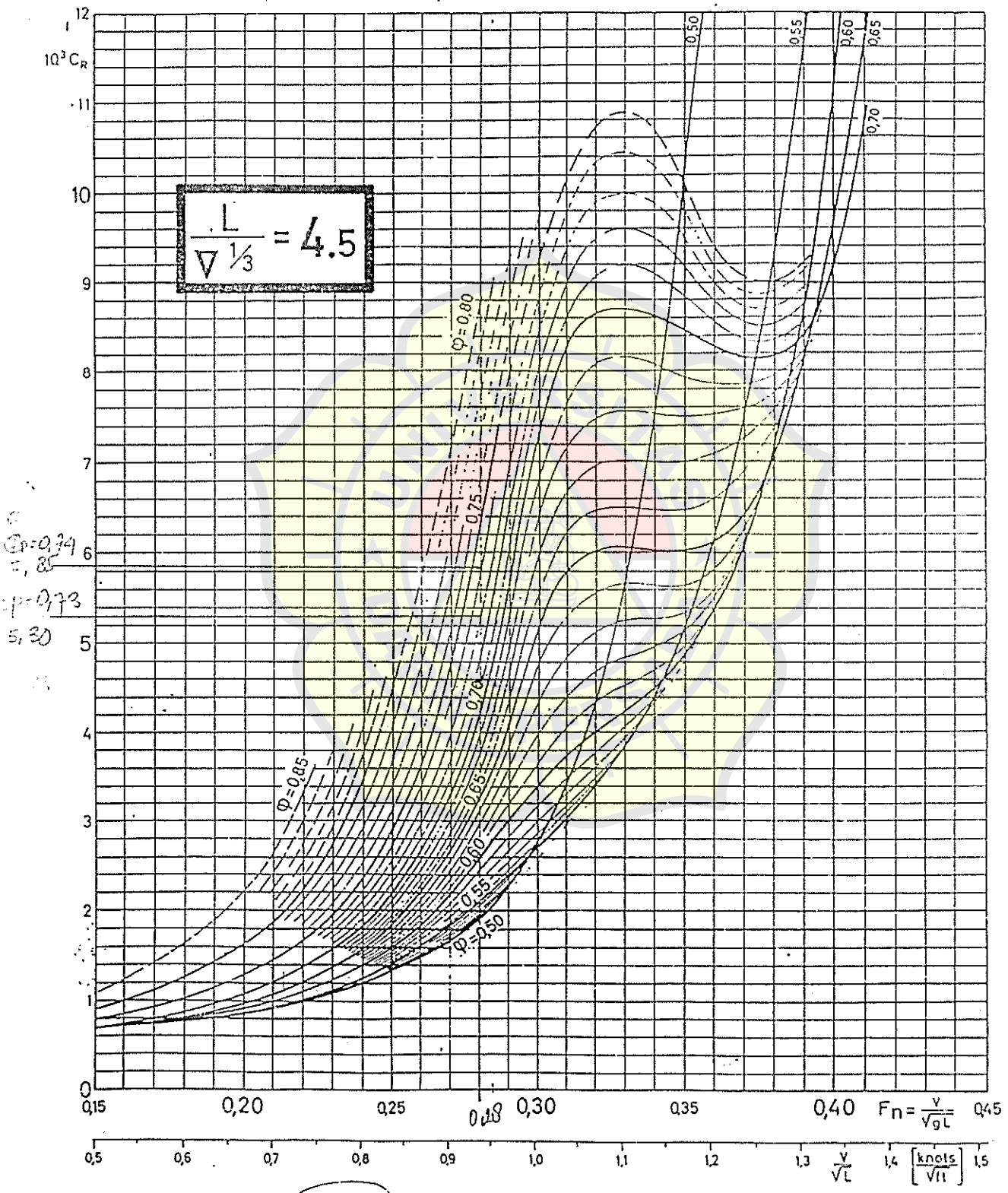


Figure 5.5.6. Residuary resistance coefficient versus speed–length ratio for different values of longitudinal prismatic coefficient. $L/\nabla^{1/3} = 4.5$

Lampiran 7. . Grafik Untuk Menentukan C_R' Cara Sv. Aa. Harvald Dan Guldhammer.

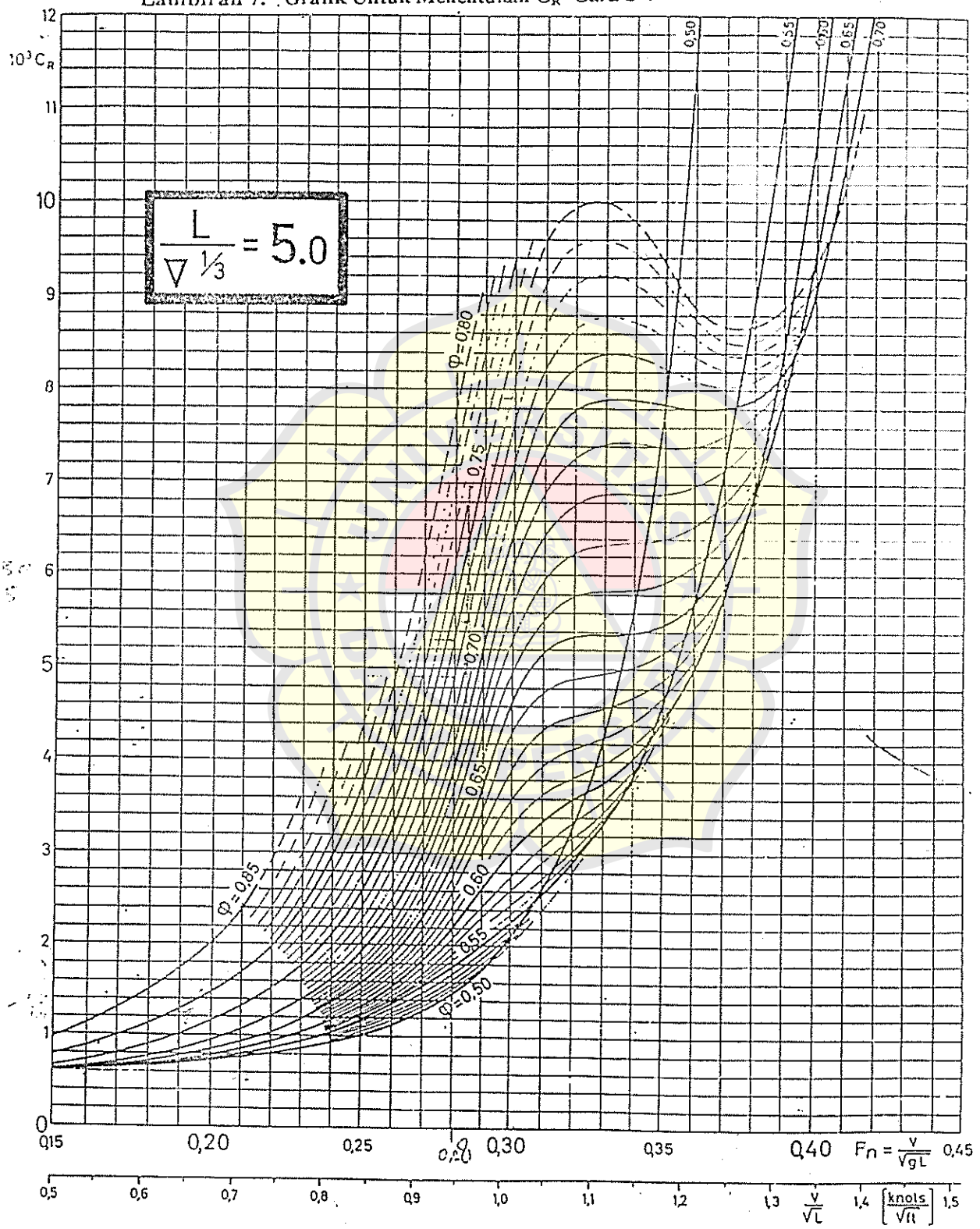
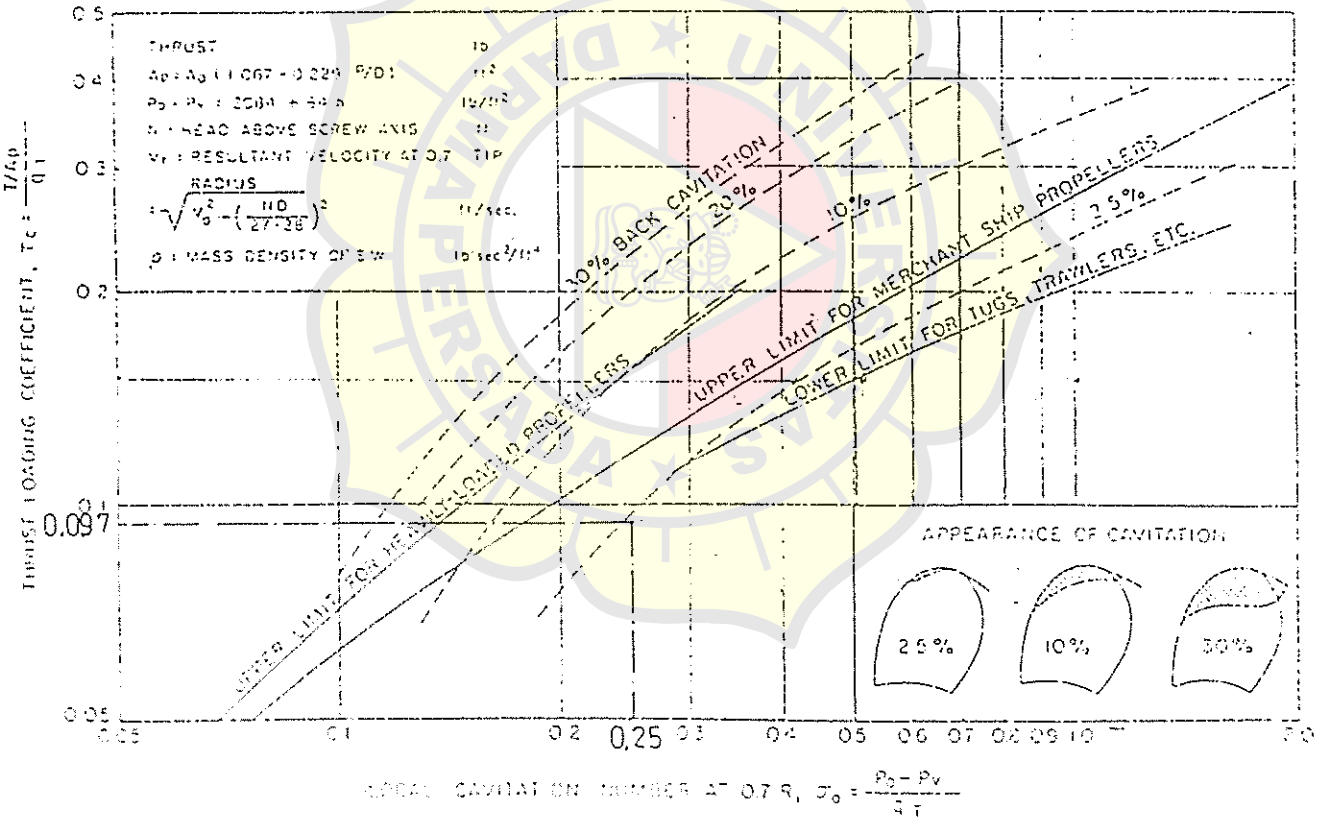


Figure 5.5.7. Residuary resistance coefficient versus speed–length ratio for different values of longitudinal prismatic coefficient. $L/\nabla^{1/3} = 5.0$.



Burrill's cavitation diagram

Lampiran 8. Grafik Untuk Menentukan $LCB_{Standard}$ Cara Sv. Aa. Harvald & Guldhammer

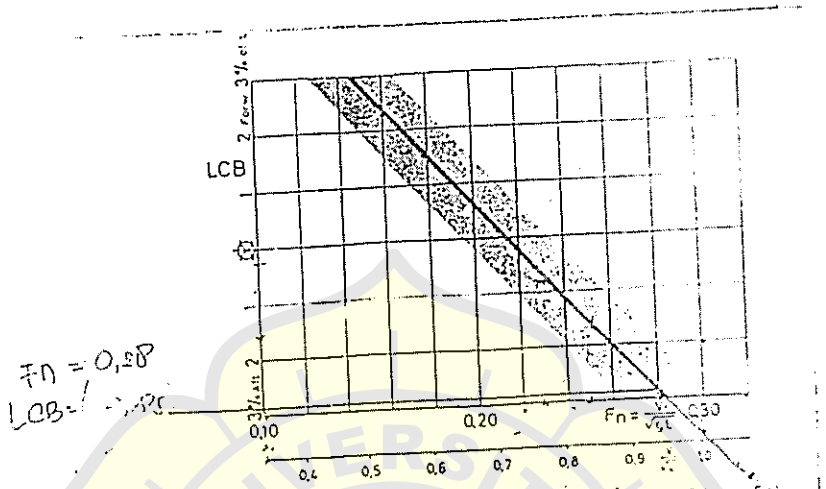


Figure 5.5.15. Standard LCB. The longitudinal position of the center of buoyancy that is considered the best possible.

Lampiran 9. Grafik Untuk Menentukan $LCB_{Koreksi}$ Cara Sv. Aa. Harvald & Guldhammer

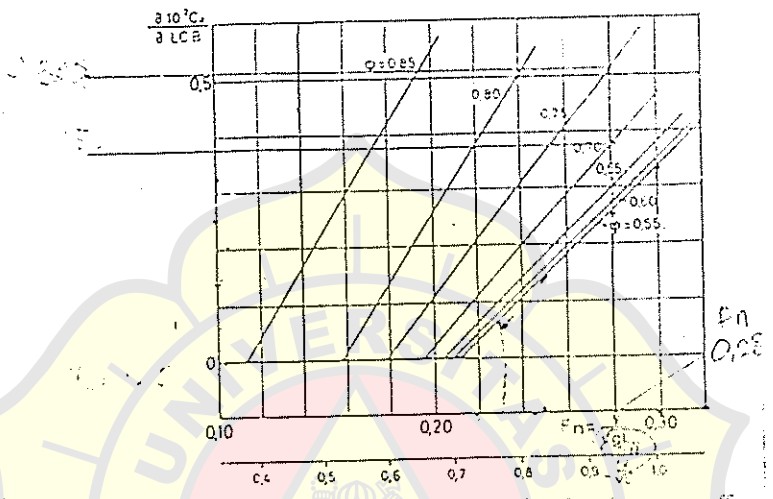


Figure 5.5.16. The correction of the residual resistance coefficient for LCB 1% forward of standard. The correction is thus $(\partial 10^3 C_R/\partial LCB)|\Delta LCB|$, where ΔLCB is the longitudinal distance between actual and standard LCB in percent of L. There is no correction for LCB aft of standard. The correction is always positive.

Lampiran 10. Grafik Untuk Menentukan C_F' Cara Sv. Aa. Harvald Dan Guldhammer

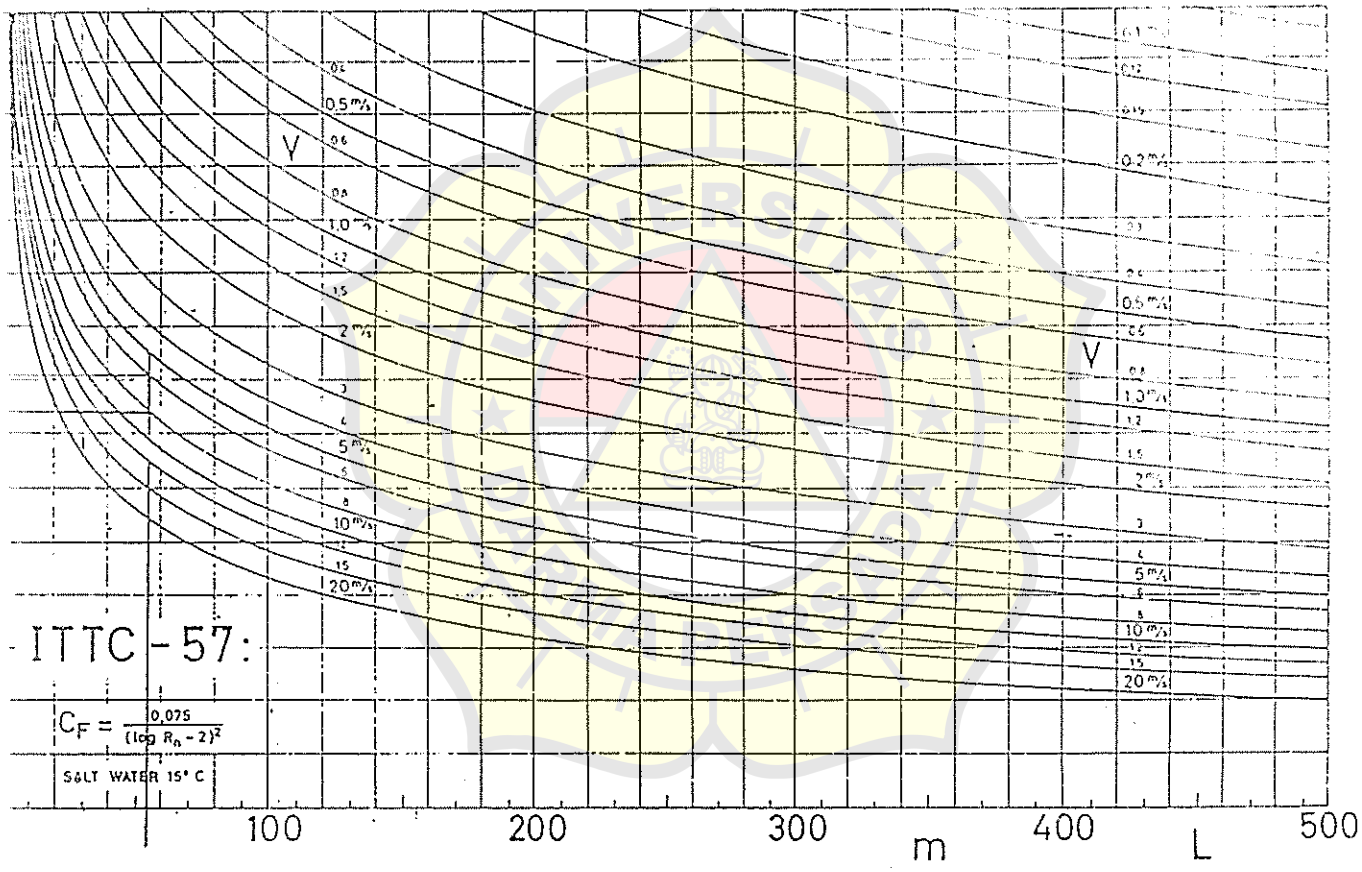


Figure 5.5.14. The frictional resistance coefficient C_F (according to ITTC 1957) as a function of ship length L and speed V.

Lampiran 14. Grafik Untuk Menentukan Kavitasi Cara Burril

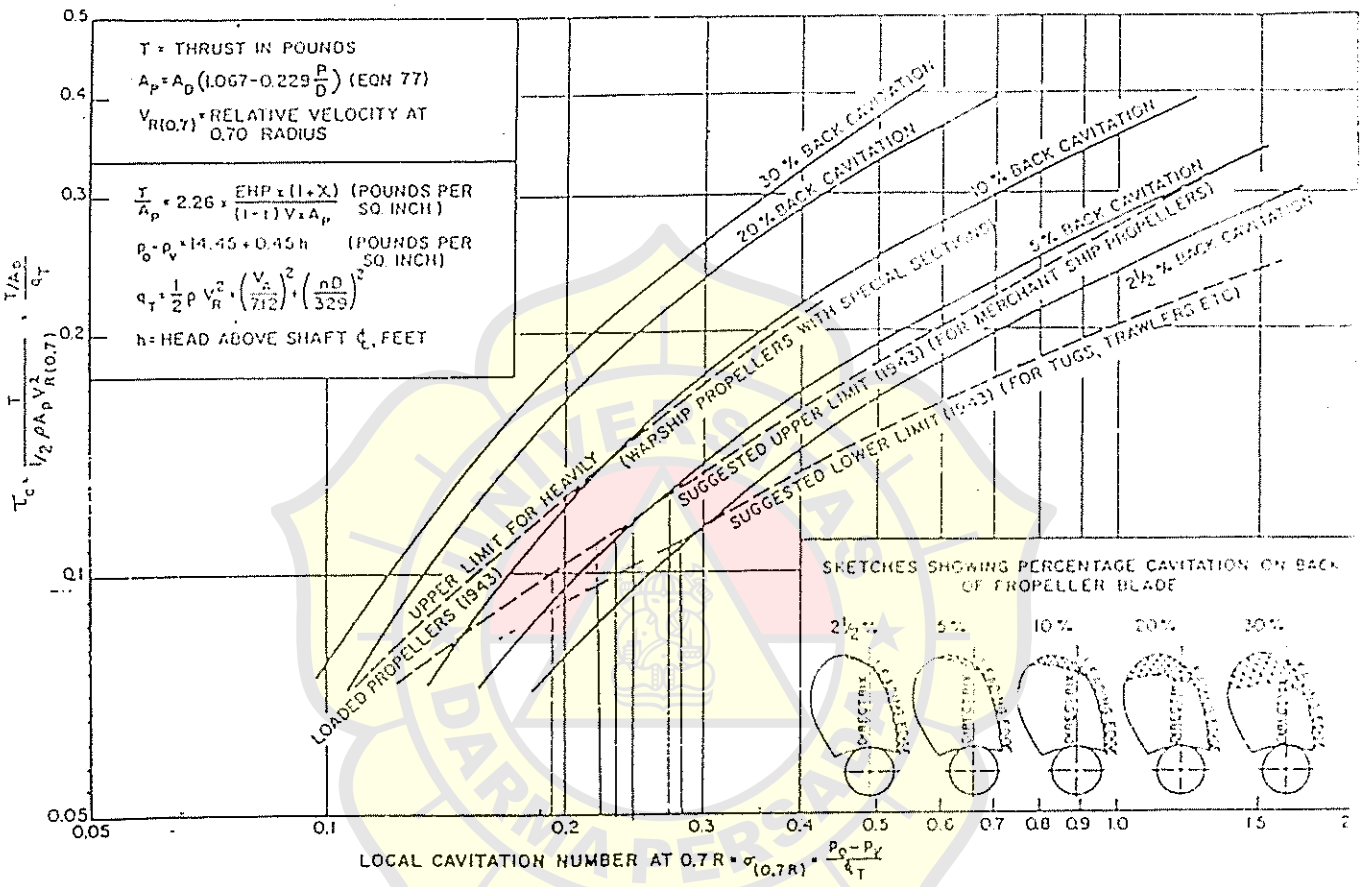
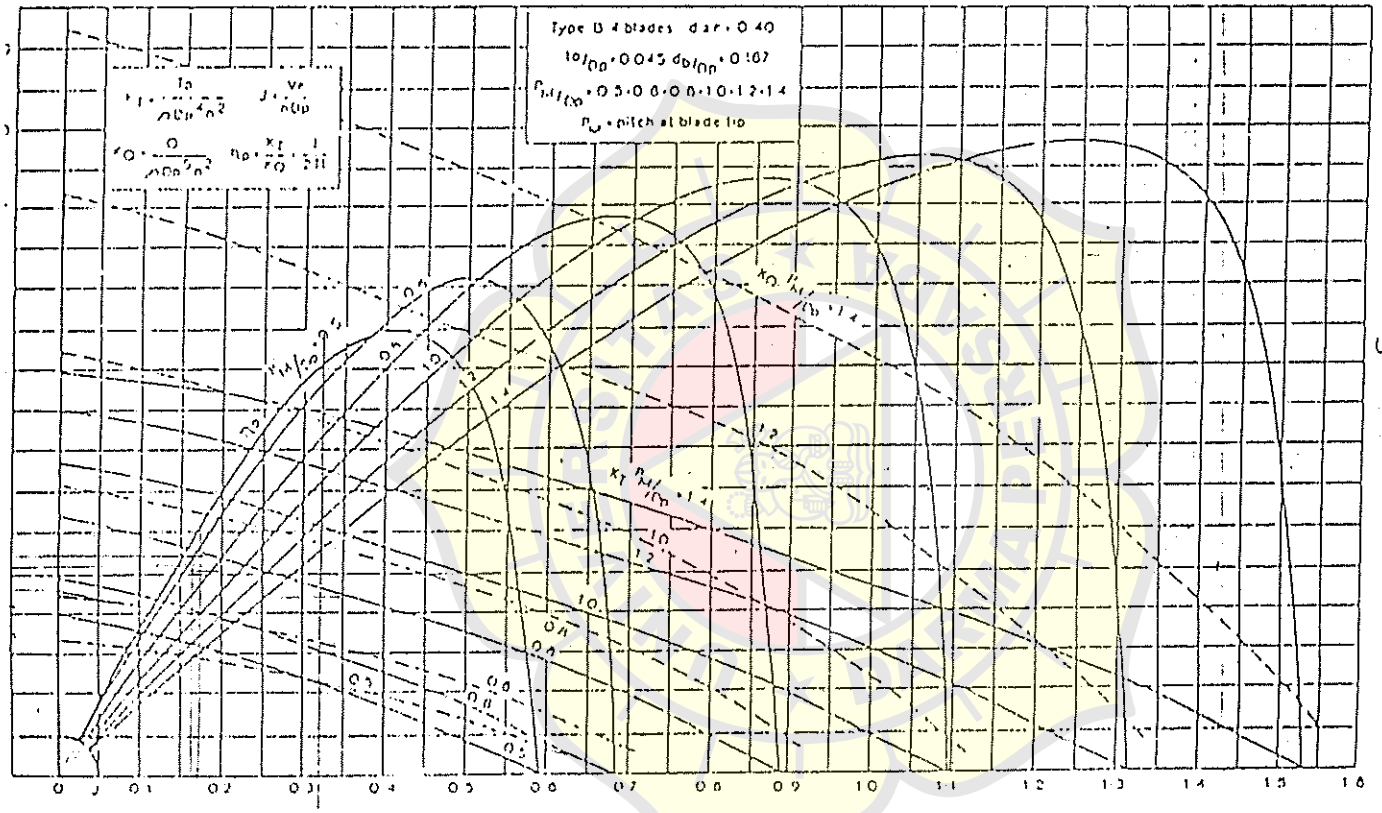


Fig. 110 Simple cavitation diagram



ure 37 K_T-K_Q-η_0 Chart for Type B propeller d a r 0·40

Lampiran 15. Diagram K_Q, K_T, J Untuk B4-55

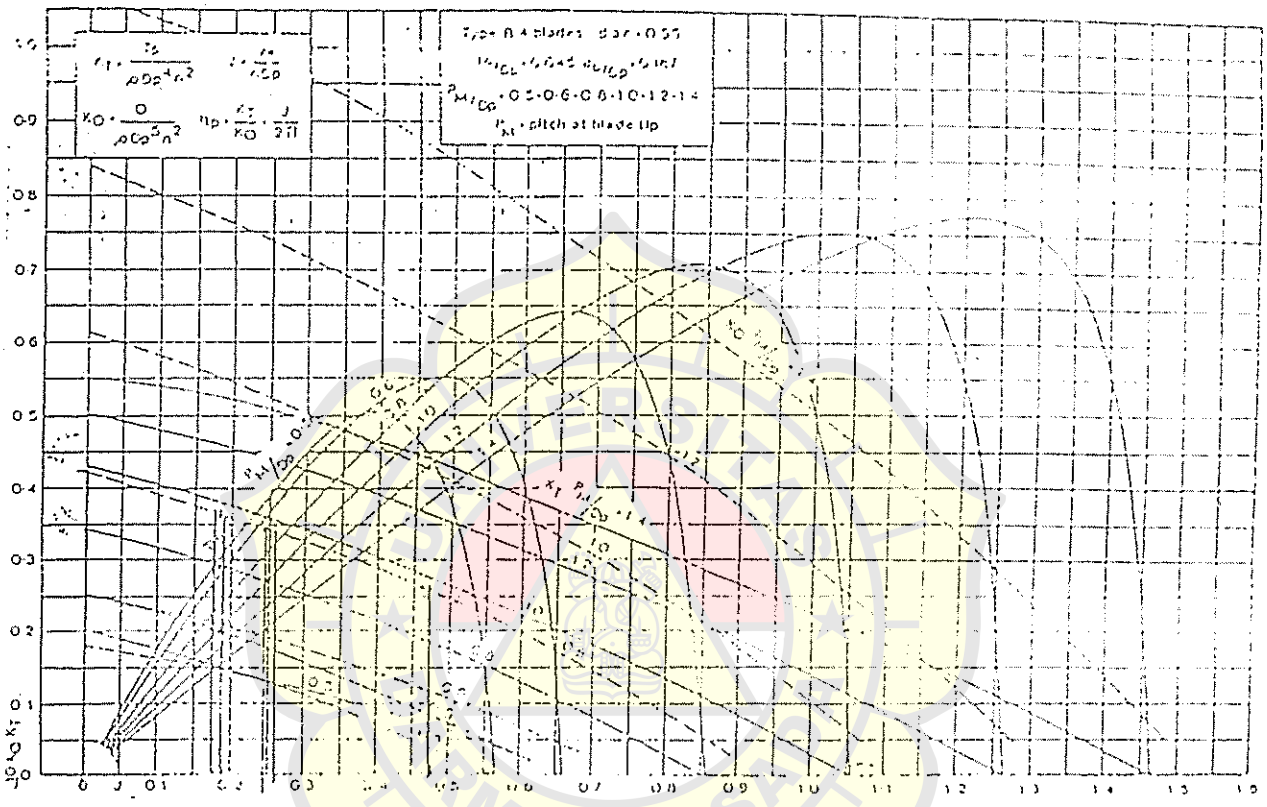
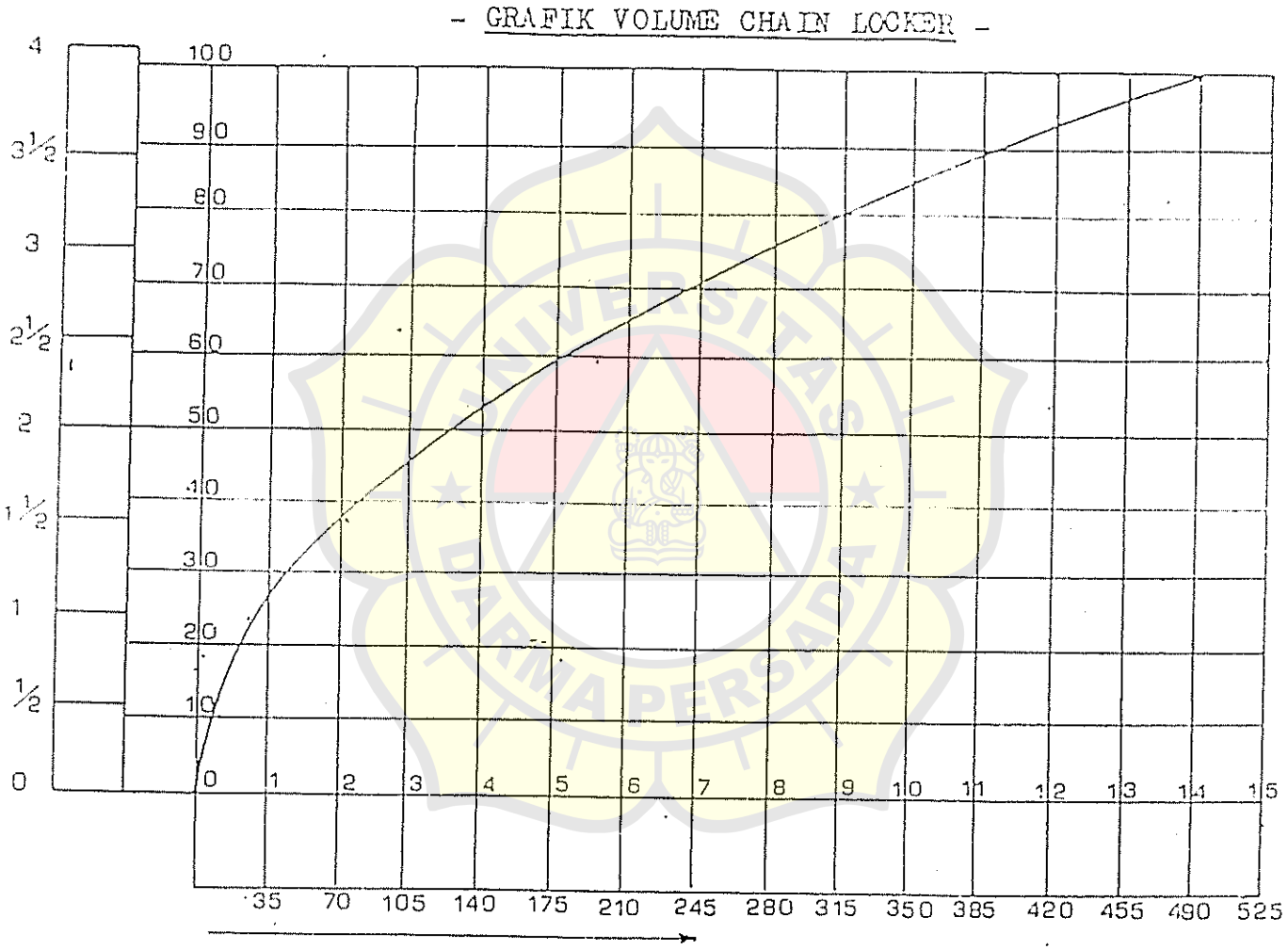


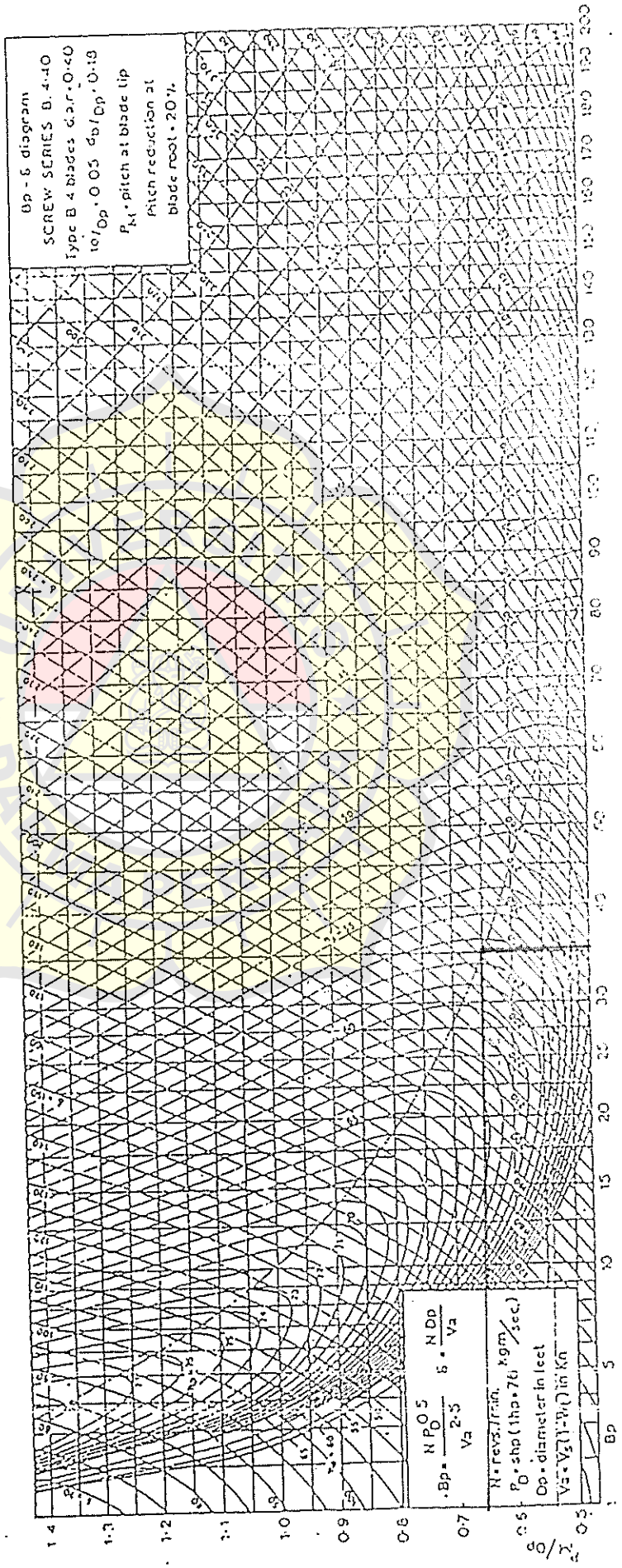
Figure 38 K_T–K_Q–η_p Chart for Type B propeller d a r 0·55

Lampiran 16. Grafik Untuk Menentukan Volume Chain Locker

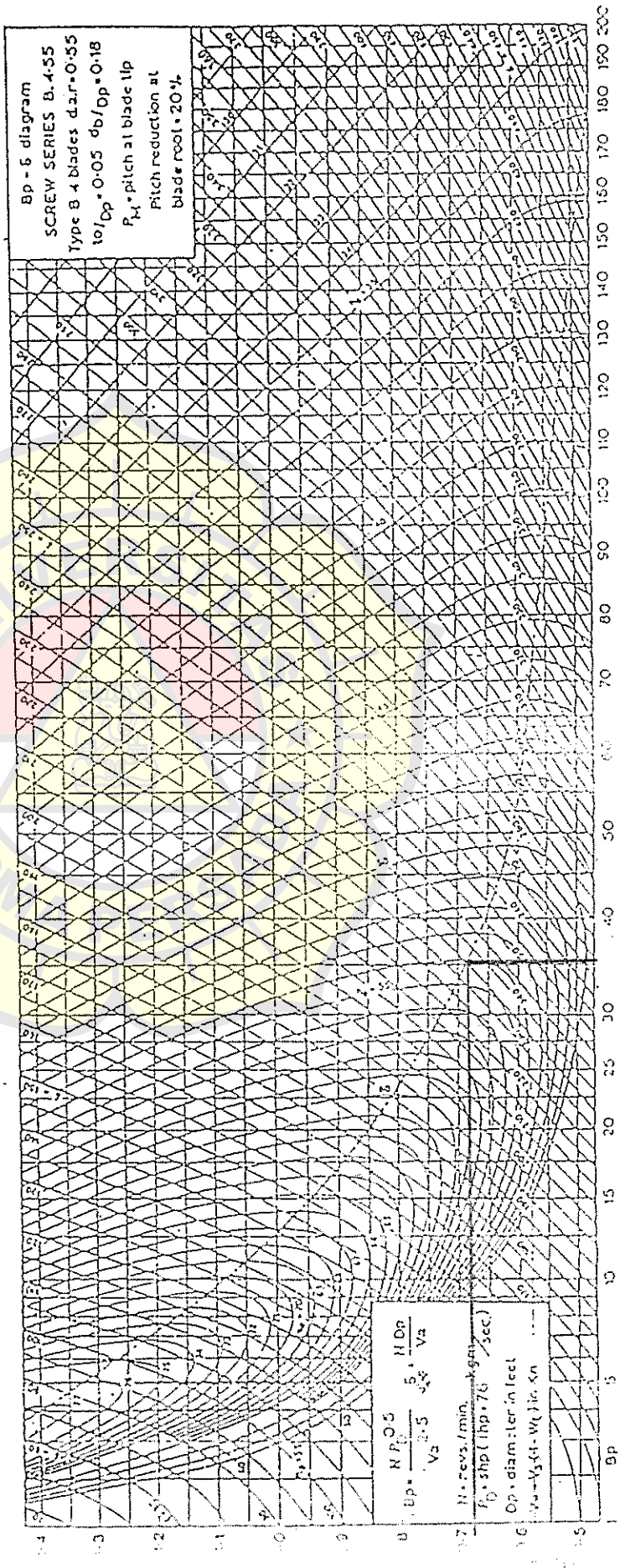


Volume Chain locker untuk setiap 100 fathoms panjang rantai.

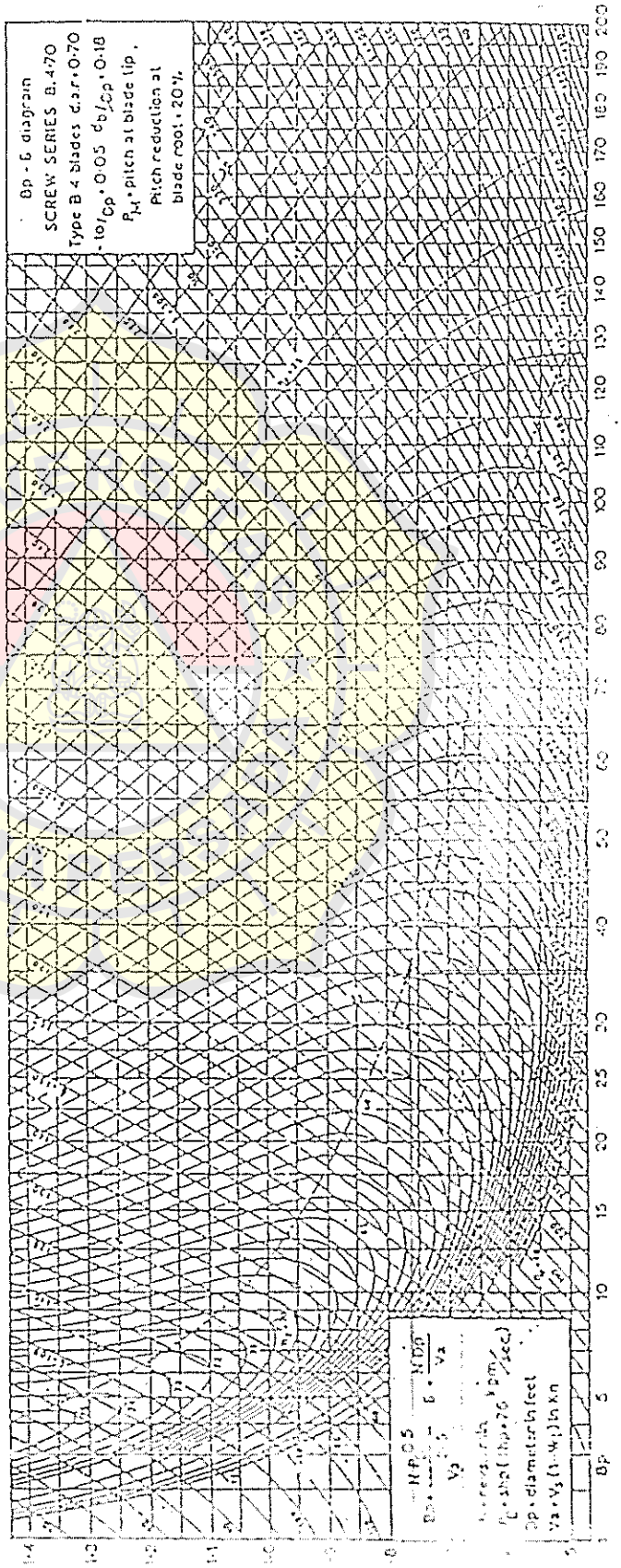
Lampiran 16. Diagram Bp – δ – Series B4-40

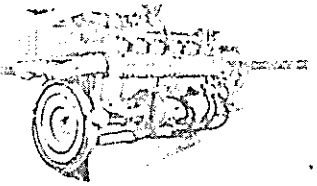


Lampiran 17. Diagram Bp – δ – Series B4-55



Lampiran 18. Diagram Bp – δ – Series B4-70





Wärtsilä UD 25

The Wärtsilä UD 25 is a highly versatile engine ideal for multitasking and heavy duty service. The engine is also used for cargo vessels and propulsion of workboats.

The relatively low speed 1200/1500 rpm version reduces sound insulation costs and the cylinder unit design allows easy onboard maintenance. The engine runs on fuels according to ISO 8217 class F-DMS/DMB.

MAIN DATA

Cylinder bore	150 mm
Piston stroke	180 mm
Speed	1200–1650 rpm
Swept volume	3.2 l/cyl
Mean effective pressure	6.5-19.5 bar
Piston speed	7.2–9.9 m/s
FUEL SPECIFICATION:	
Marine diesel oil	
ISO 8217, class F-DMB	

Output, Propeller Propulsion Engines

Output (MA1)	1500 rpm		1650 rpm	
Engine type	kW	BHP	kW	BHP
6L UD 25 M3D	294	400	–	–
6L UD 25 M4D	313	425	331	450
6L UD 25 M5D	338	460	368	500
12V UD 25 M3D	588	800	–	–
12V UD 25 M4D	626	850	662	900
12V UD 25 M5D	677	920	736	1000

MA1: Continuous heavy duty

Auxiliary on board genset

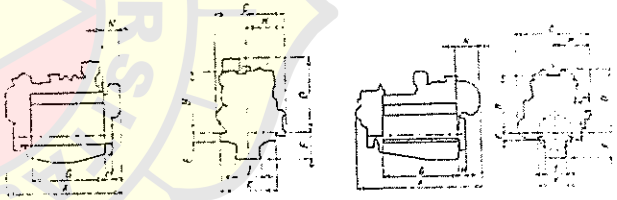
Engine type	Engine speed (rpm)	Continuous duty Auxiliary on board genset: Engine output (kW) MC10N (1)	BMEP (bar)	Alternator output (kVA) (2)
6L UD 25 S4	1200	258	13.5	303
	1500	322	13.5	378
6L UD 25 S5	1200	330	17.3	388
	1500	412	17.3	484
12V UD 25 S4	1200	516	13.5	606
	1500	644	13.5	757
12V UD 25 S5	1200	660	17.3	776
	1500	824	17.3	968

(1): MC10N: continuous net brake power, without time limitation, exceedable by 10% for load impact.
(2): with power factor 0.8 and alternator efficiency 0.94 %.

Harbour Genset / Emergency Genset

Engine type	Engine speed (rpm)	Continuous duty harbour genset: Engine output (kW) MC10N (1)	BMEP (bar)	Alt. output (kVA) (2)	Restricted duty emergency genset: Engine output (kW) M10N (3)	BMEP (bar)	Alt. output (kVA) (4)
6L UD 25 S4	1200	258	13.5	293	284	14.9	322
	1500	322	13.5	365	355	14.9	403
6L UD 25 S5	1200	330	17.3	372	362	19	409
	1500	412	17.3	461	453	19	508
12V UD 25 S4	1200	516	13.5	582	568	14.9	643
	1500	644	13.5	731	710	14.9	808
12V UD 25 S5	1200	660	17.3	746	724	19	821
	1500	824	17.3	933	906	19	1029

(1): MC10N: continuous net brake power, without time limitation, exceedable by 10% for load impact.
(2): with power factor 0.8, alternator efficiency 0.94 % and electrically driven fan deduction.
(3): M10N: net brake power, limited to 500 hours of operation per year, exceedable by 10 % for load impact.
(4): with power factor 0.8, alternator efficiency 0.94 % and electrically driven fan deduction.



Principal Engine Dimensions (mm) and Weights (kg)

Engine type	A	B	C	D	E	F
6L UD 25	2070	1111	1260	1360	160	485
12V UD 25	2711	1270	1624	1410	160	560

Engine type	G	H	I	K	M	N	Weight
6L UD 25	1301	134	466	1000	695	295	2.85
12V UD 25	1625	174	456	780	794	520	4.9