

船 型 試 験 資 料

— 自 航 要 素 編 —

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Model Test data —Self-Propulsion Factor—

By

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1. は し が き

目白水槽において水槽試験を実施した模型船のうちから、昭和33年7月より昭和41年10月までの間に行った長さ100m以上の1軸船に対する模型船の抵抗試験結果をとりまとめ、抵抗編 No.1 および No.2¹⁾ に報告したが、今回はこれらの模型船の自航試験結果より解析した自航要素の結果を報告する。

2. 内 容

各模型船の要目を Table 1 より Table 35 に示し、スラスト減少係数 t 、スラスト・ベースによる伴流係数 W_T およびプロペラ効率比 η_R の形で、Fig. 1 より Fig. 35 に示されている。各要目表および図は C_B の大きさによって分けられており、模型船番号は抵抗編と同一で、それぞれの船種に対して番号をつけている。自航試験の際の摩擦修正のためには摩擦抵抗係数として Schoenherr の式を使用した。

各要目表および図中に示した模型船の記号は、B：ばら積運搬船、BO：ばら積鉱石運搬船、BT：ばら積油運搬船、C：貨物船、CE：セメント運搬船、CO：石炭運搬船、F：魚工船、L：木材運搬船、LPG：LPGタンカー、O：鉱石運搬船、OT：鉱石油運搬船、R：冷蔵運搬船、T：タンカー、W：重量運搬船であり、 A_B ：F.P.における横断面面積、 A_M ：中央横断面面積、 d_B ：満載喫水線より船首バルブの先端または船首バルブの最大幅までの距離、 l ：F.P.よりのバルブ突出量、 D_P ：模型プロペラの直径、 I ：満載喫水線よりプロペラ中心までの距離である。

また、船首形状ではB：バルブ型、Cシリンダー型、LR：大傾斜型、SR：小傾斜型、V：直立型、VB：直立バルブ型であり、船尾形状ではG：G型、H：膨出型、M：マリナー型であり、舵ではA：アクテブ舵、C：コントラ舵、H：ハンギング舵、R：反動舵、S：流線形舵である。

なお、 $F_n \nabla$ は排水量 ∇ で表現されたフルード数であるが、長さ L で表現した F_n との換算図を Fig. 36 に示した。

参 考 文 献

- 1) 横尾幸一、齋藤 勇：船型試験資料，抵抗編 No.1 (昭和40年5月)，抵抗編 No.2 (昭和43年6月)，船舶技術研究所報告別冊。

* 推進性能部 原稿受付：昭和49年2月7日

Table 1 $C_B=0.548 \sim 0.573$

M.S.No.	C-1	C-54	C-55	C-56	C-57	C-58	C-59
L (m)	6.00	6.00	6.00	6.00	5.50	5.00	6.00
C_B	0.548	0.562	0.564	0.565	0.567	0.569	0.573
l_{CB} (%)	+2.10	+1.81	+1.84	+1.45	+1.20	+1.35	-2.02
L/B	7.00	6.88	6.48	6.71	6.59	6.32	6.64
B/d	2.40	2.49	2.75	2.58	2.65	2.53	2.48
$\nabla/(0.1L)^3$	4.66	4.77	4.89	4.86	4.92	5.64	5.25
$S/\nabla^{2/3}$	6.57	6.56	6.45	6.48	6.44	6.36	6.37
A_B/A_M (%)		6.31		1.77	2.21	8.35	4.53
d_B/d (%)		79.1		75.0	78.0	82.6	72.6
l/L (%)		0		0.30	0.60	1.01	0.68
$D_P/0.01L$	4.27	3.85	3.94	4.00	4.07	3.84	3.85
I/D_P	0.86	0.97	0.84	0.90	0.84	1.07	1.04
Stem form	LR	VB	LR	B	B	B	B
Stern form	M	M	M	M	M	M	M
Rudder	H	H	H	H	H	H	H
Marks	———	———	———	———	———	-----	-----

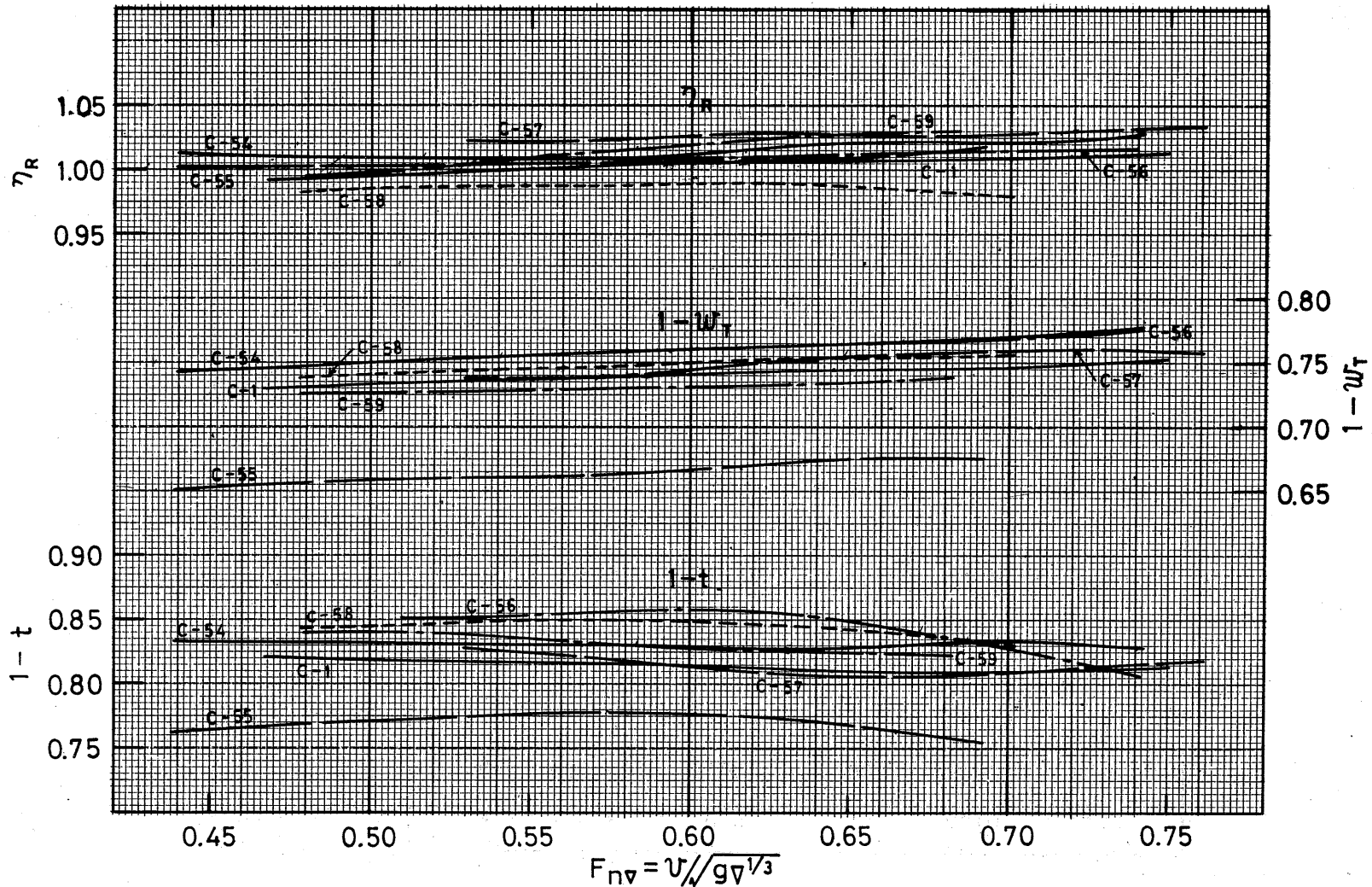


Fig.1 $C_B = 0.548 \sim 0.573$

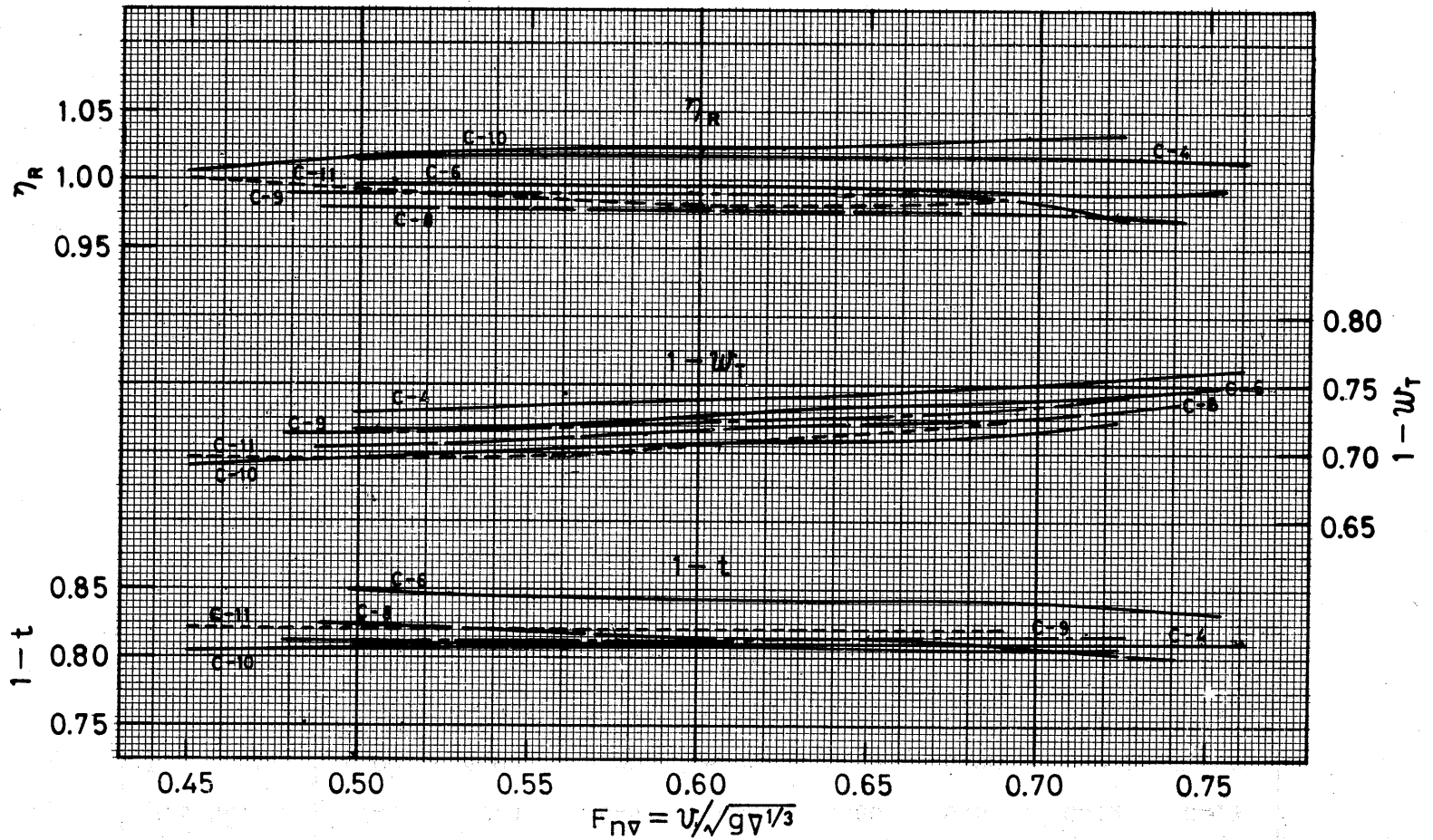


Fig.2 $C_B = 0.574$

(237)

Table 3 $C_B=0.575 \sim 0.585$

M.S.No.	C-2	C-3	C-5	C-7	C-60	C-61	C-12	C-13
L (m)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
C_B	0.575	0.575	0.575	0.575	0.575	0.578	0.585	0.585
l_{CB} (%)	+1.89	+1.90	+1.89	+1.89	-1.71	+1.80	+1.47	+1.59
L/B	8.00	8.00	8.00	7.00	6.64	6.63	7.20	7.20
B/d	2.70	2.40	2.10	2.40	2.31	2.33	2.36	2.36
$\nabla/(0.1L)^3$	3.33	3.74	4.28	4.89	5.65	5.66	4.79	4.79
$S/\nabla^{2/3}$	6.90	6.79	6.71	6.48	6.40	6.38	6.54	6.54
A_B/A_M (%)					11.58	4.92		
d_B/d (%)					84.5	68.1		
l/L (%)					0	0.28		
$D_P/0.01L$	3.20	3.73	4.27	4.27	3.85	3.85	4.17	4.17
I/D_P	0.89	0.86	0.86	0.86	1.10	1.03	0.91	0.91
Stem form	LR	LR	LR	LR	C	B	LR	LR
Stern form	M	M	M	M	G	G	M	M
Rudder	H	H	H	H	S	S	H	H
Marks	—	—	—	—	---	---	—	---

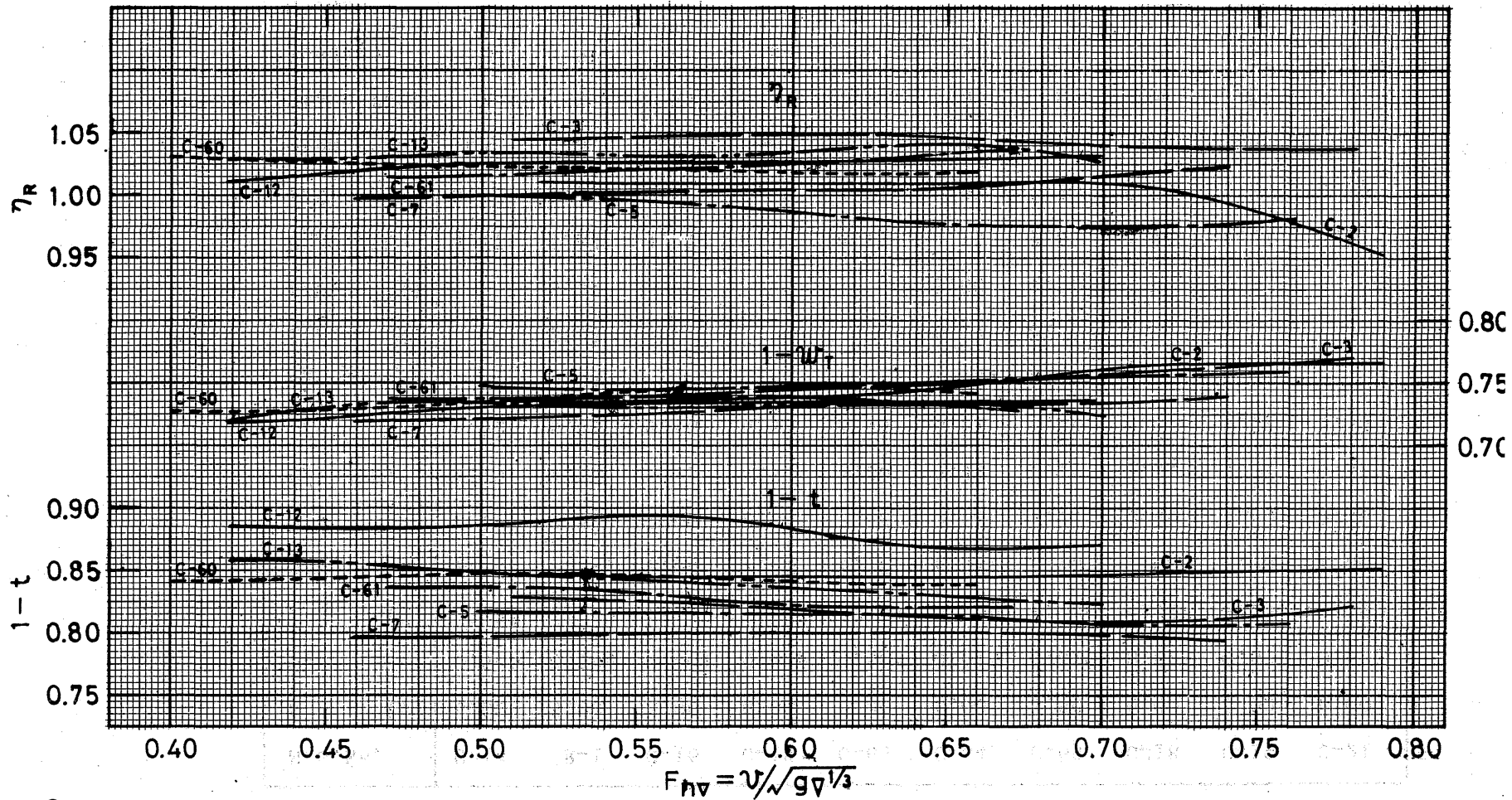


Fig.3 $C_b = 0.575 \sim 0.585$

(239)

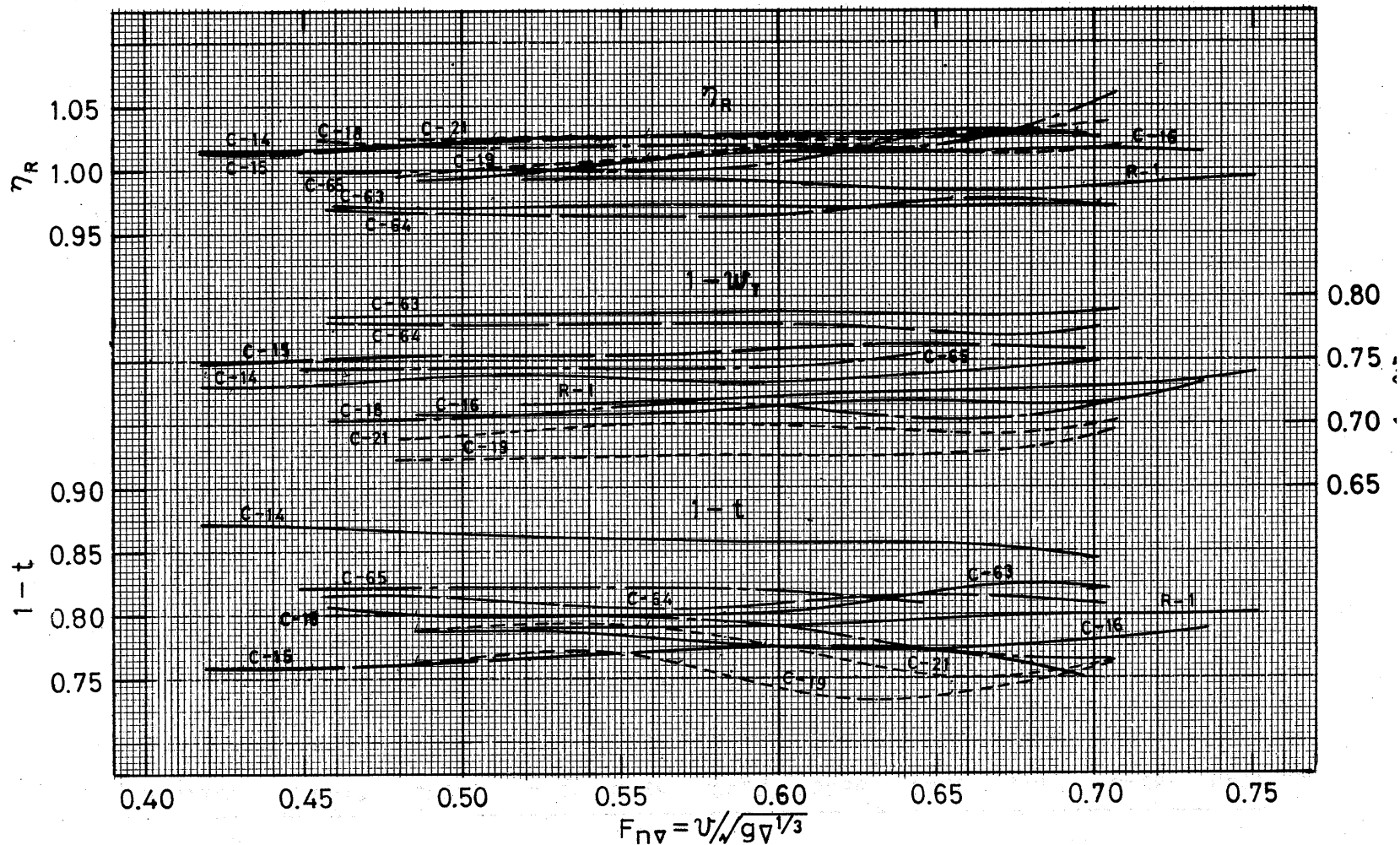


Fig.4 $C_B = 0.586 \sim 0.625$

Table 6 $C_B=0.661 \sim 0.679$

M.S.No.	C-30	C-29	C-31	C-34	C-32	C-33	C-36	C-35	L-1	C-68
L (m)	5.50	6.00	6.00	6.00	6.00	6.00	5.50	6.00	5.50	5.50
C_B	0.661	0.664	0.664	0.671	0.672	0.672	0.676	0.677	0.678	0.679
l_{CB} (%)	+0.56	+0.32	+0.88	+0.49	+0.90	+1.06	+0.53	+0.56	-0.91	+0.26
L/B	6.88	7.43	7.24	6.82	7.42	7.46	7.34	7.46	5.65	6.97
B/d	2.52	2.41	2.21	2.41	2.17	2.11	2.21	2.23	2.69	2.48
$\nabla/(0.1L)^3$	5.55	5.00	5.67	6.00	5.65	5.72	5.68	5.46	7.91	5.63
$S/\nabla^{2/3}$	6.23	6.38	6.34	6.24	6.42	6.29	6.36	6.43	6.08	6.32
A_B/A_M (%)										
d_B/d (%)										
l/L (%)										
$D_P/0.01L$	4.07	3.55	4.17	3.79	3.87	3.73	3.88	3.55	3.66	3.84
I/D_P	0.84	0.97	0.92	1.03	1.01	1.07	0.99	1.05	1.21	0.91
Stem form	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR
Stern form	G	G	G	G	G	G	G	G	G	G
Rudder	R	S	S	R	S	R	S	R	S	S
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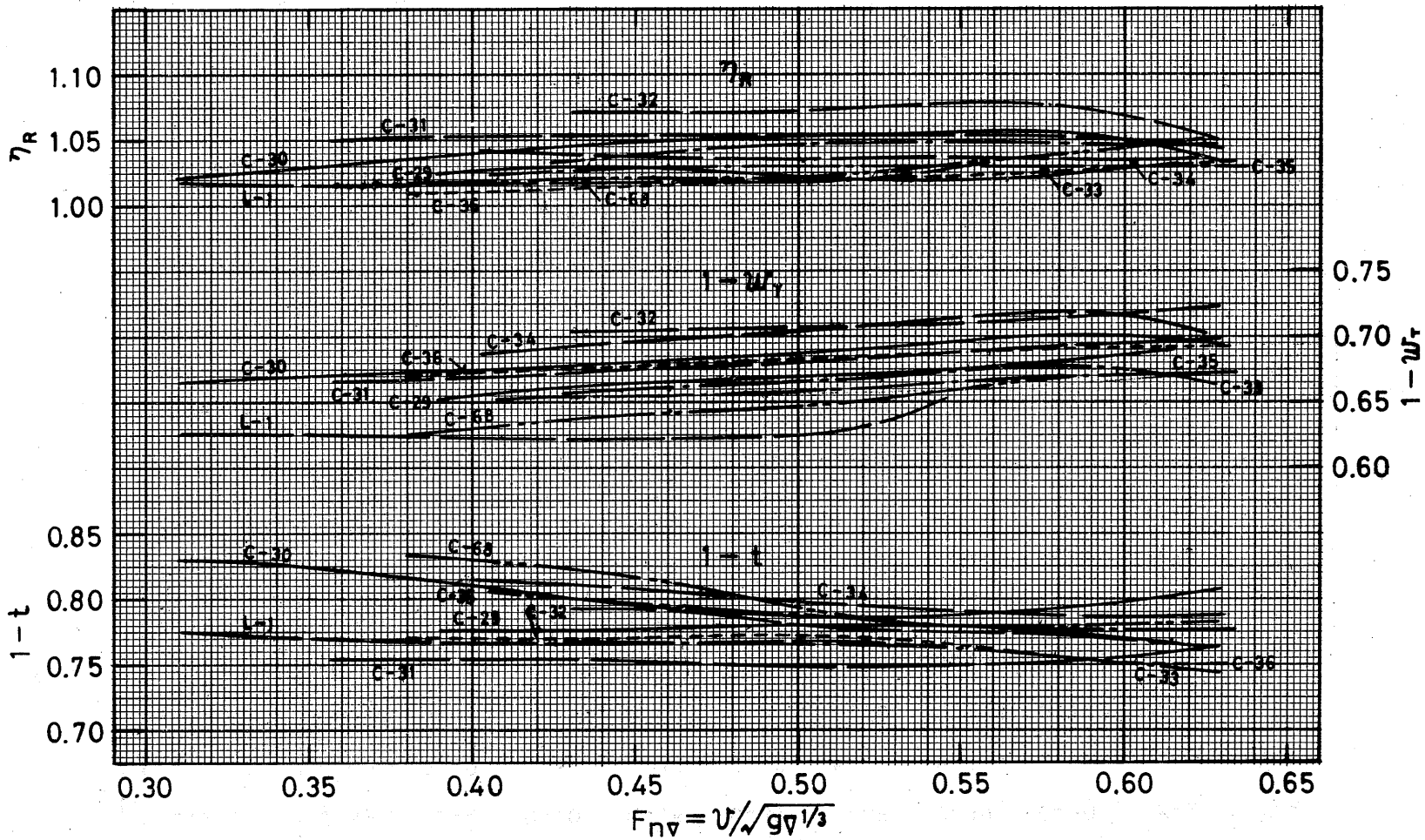


Fig.6 $C_B = 0.661 \sim 0.679$

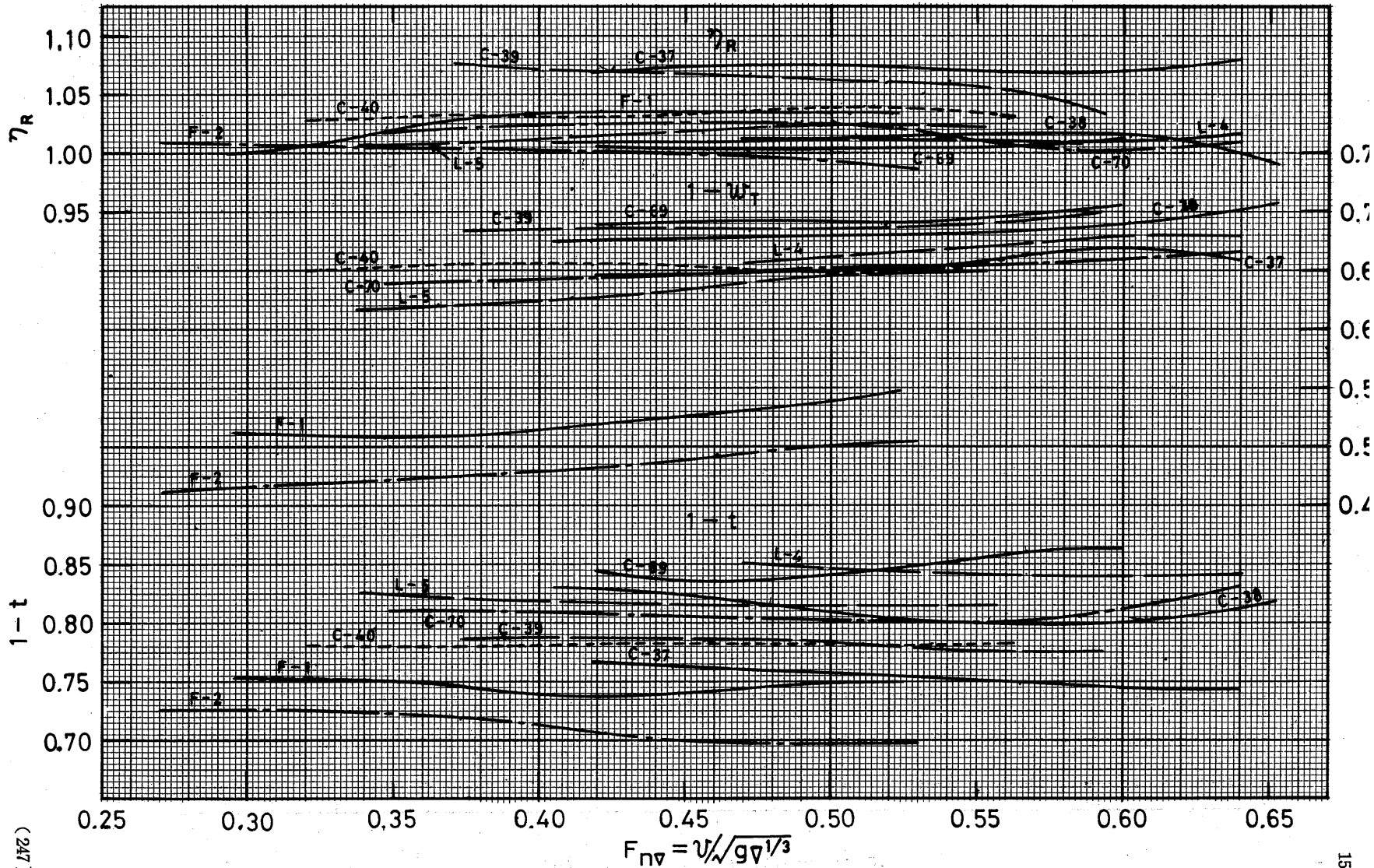


Fig.7 $C_B = 0.688 \sim 0.729$

(247)

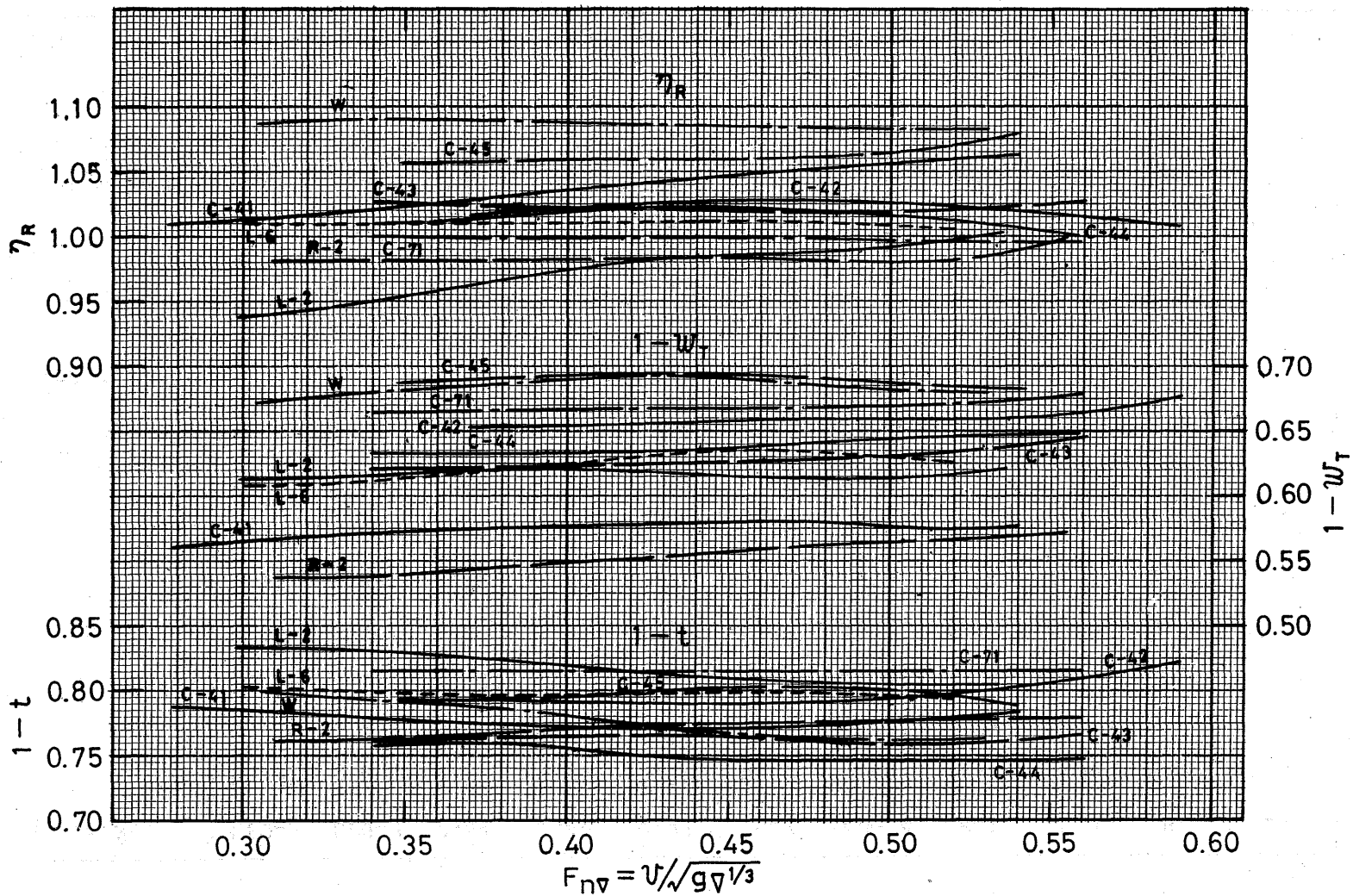


Fig.8 $C_B = 0.730 \sim 0.739$

Table 9 $C_B=0.740 \sim 0.755$

M.S.No.	LPG-2	LPG-3	T-64	C-46	C-47	L-7	LPG-4	CE-1	L-3	B-7	C-48
L (m)	6.00	6.30	6.00	6.00	5.50	6.70	6.20	5.50	6.00	5.60	6.00
C_B	0.740	0.742	0.742	0.743	0.747	0.750	0.751	0.752	0.753	0.755	0.755
l_{CB} (%)	-1.66	-1.83	-1.37	-1.16	-0.69	-1.70	-1.44	-0.97	-1.41	-0.99	-1.33
L/B	6.33	6.47	6.80	6.80	7.19	6.94	6.00	6.73	6.39	6.57	7.15
B/d	2.91	2.83	2.52	2.30	2.20	2.48	2.98	2.74	2.63	2.85	2.20
$\nabla/(0.1L)^3$	6.36	6.26	6.37	6.98	6.55	6.29	7.00	6.07	7.02	6.13	6.72
$S/\nabla^{2/3}$	6.19	6.23	6.15	6.07	6.13	6.19	6.15	6.25	6.04	6.19	6.13
A_B/A_M (%)							5.45				
d_B/d (%)							69.1				
l/L (%)							1.20				
$D_P/0.01L$	3.11	3.25	3.27	3.36	3.64	3.02	3.06	3.05	3.06	3.58	3.52
I/D_P	1.11	1.05	1.13	1.22	1.13	1.31	1.18	1.09	1.32	0.84	1.18
Stem form	LR	LR	LR	LR	LR	LR	B	LR	LR	LR	LR
Stern form	G	G	G	G	G	G	G	G	G	G	G
Rudder	R	R	S	S	S	R	S	S	S	S	S
Marks	_____	_____	_____	_____	_____	_____	_____	-----	-----	-----	-----

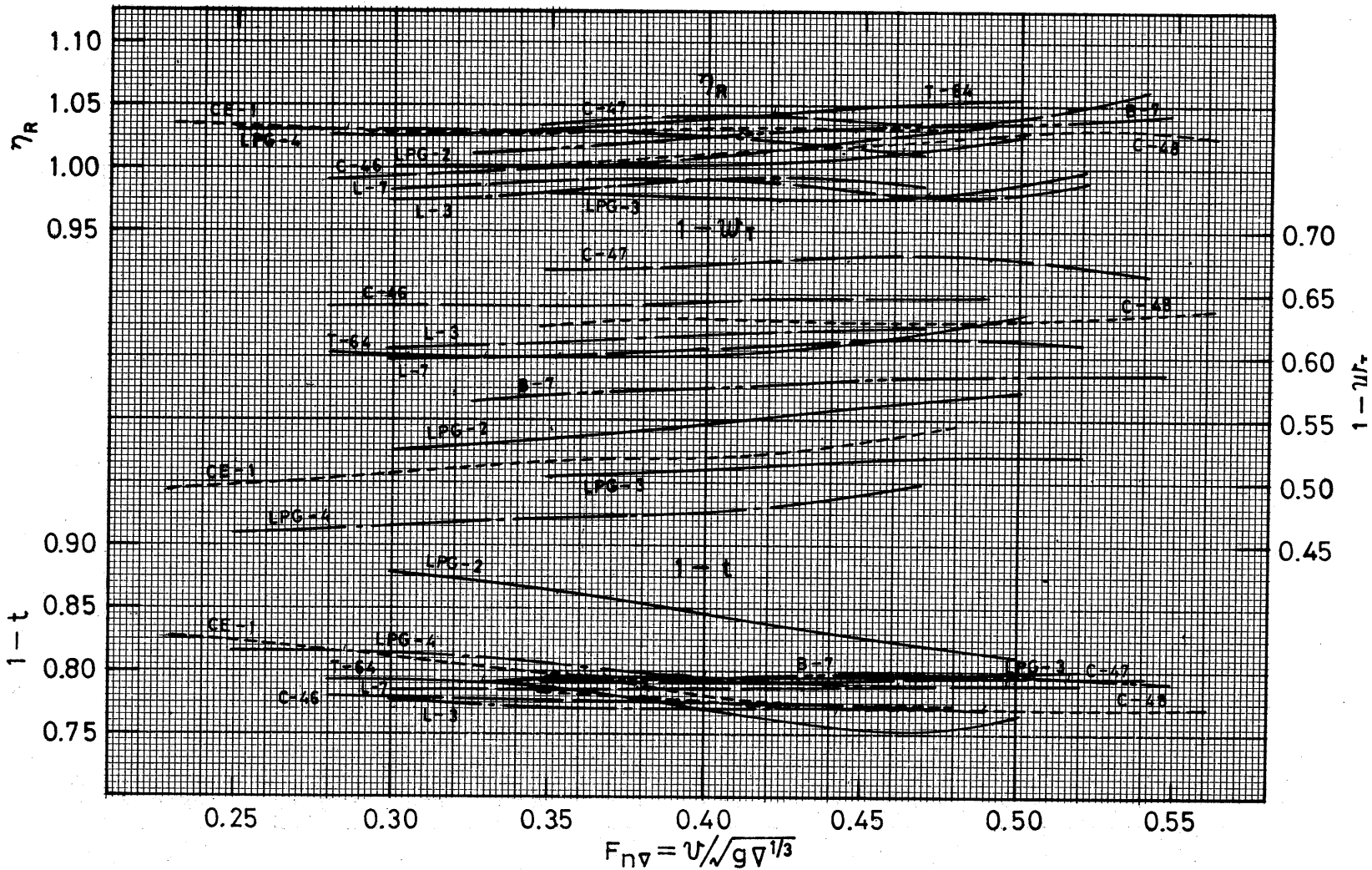


Fig.9 $C_B = 0.740 \sim 0.755$

Table 10 $C_B=0.756 \sim 0.768$

M.S.No.	LPG-1	B-8	C-49	B-9	L-8	CE-2	B-10	T-2	C-72	T-1
L (m)	6.00	5.80	6.00	6.00	5.60	6.00	6.00	6.00	5.60	6.80
C_B	0.756	0.757	0.763	0.764	0.764	0.766	0.767	0.767	0.767	0.768
l_{CB} (%)	-1.60	-1.34	-1.13	-1.40	-1.47	-1.59	-1.62	-1.57	-1.84	-2.21
L/B	6.99	6.45	7.29	7.30	6.12	7.07	7.30	7.13	6.94	6.96
B/d	2.69	2.46	2.49	2.41	2.54	2.46	2.41	2.46	2.30	2.71
$\nabla/(0.1L)^3$	5.72	7.40	5.78	5.95	8.05	6.23	5.97	6.15	6.92	5.86
$S/\nabla^{2/3}$	6.27	6.08	6.28	6.31	5.94	6.18	6.32	6.23	6.11	6.35
A_B/A_M (%)				3.18			12.20			4.46
d_B/d (%)							74.8			85.3
l/L (%)				0			1.60			0
$D_P/0.01L$	3.41	3.46	3.54	3.22	3.57	3.52	3.22	3.54	3.58	2.94
I/D_P	0.94	1.12	0.97	1.11	1.17	1.02	1.11	0.99	1.13	1.18
Stem form	LR	LR	LR	C	LR	LR	B	LR	LR	VB
Stern form	G	G	G	G	G	G	G	G	G	G
Rudder	R	S	R	R	S	R	R	R	S	S
Marks	_____	_____	_____	_____	_____	_____	_____	_____	_____	_____

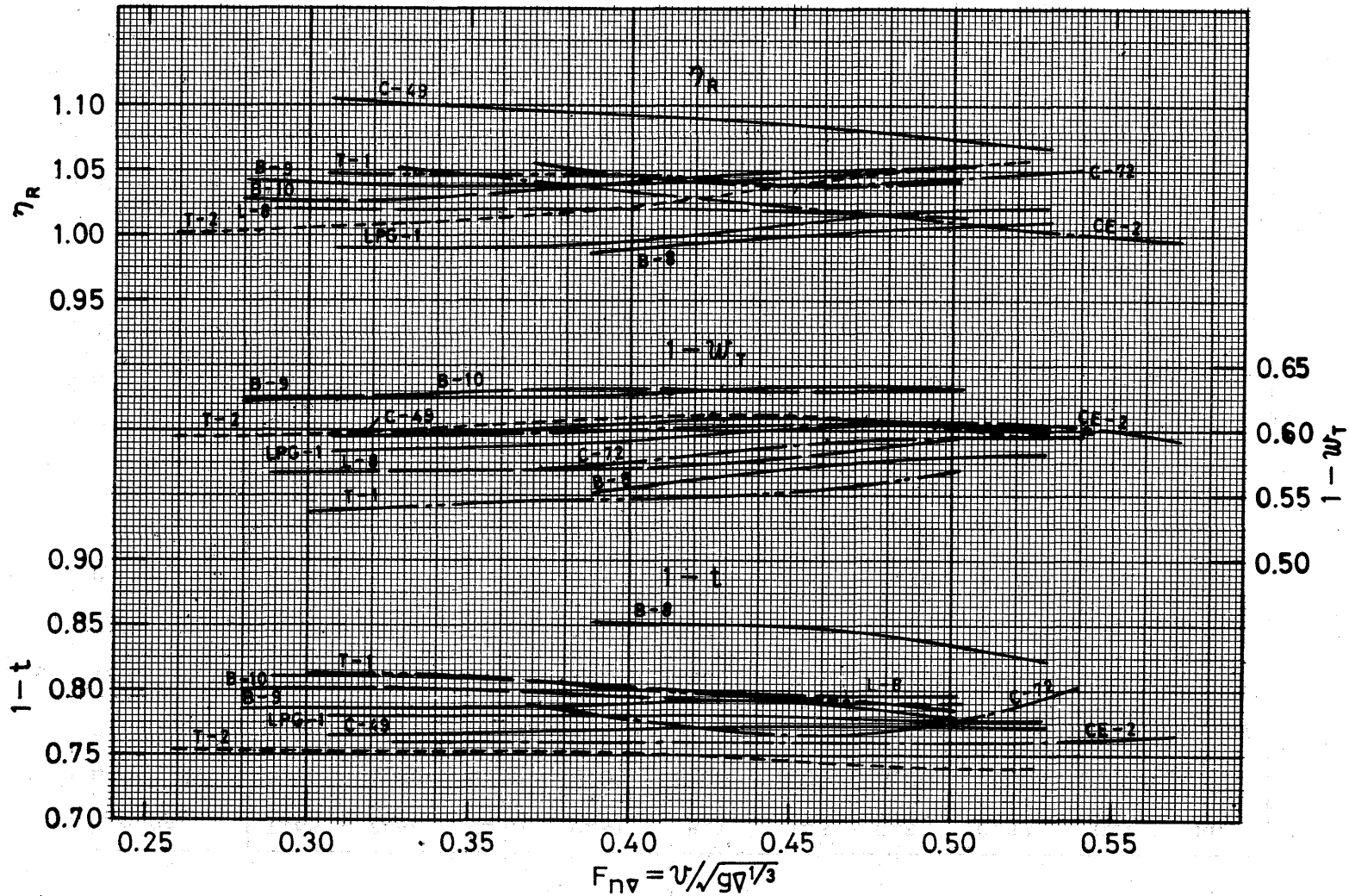


Fig.10 $C_B = 0.756 \sim 0.768$

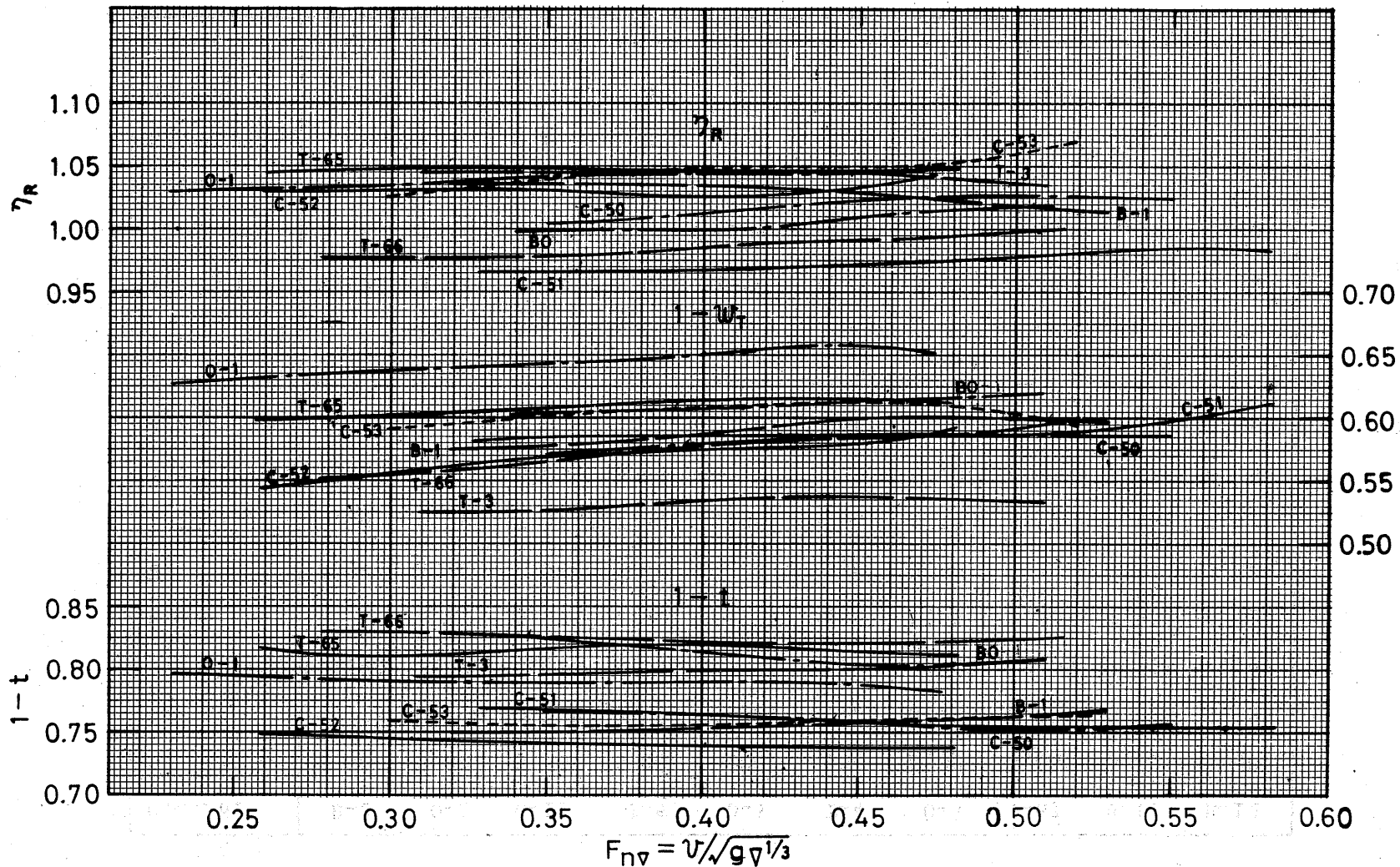


Fig.11 $C_B = 0.772 \sim 0.777$

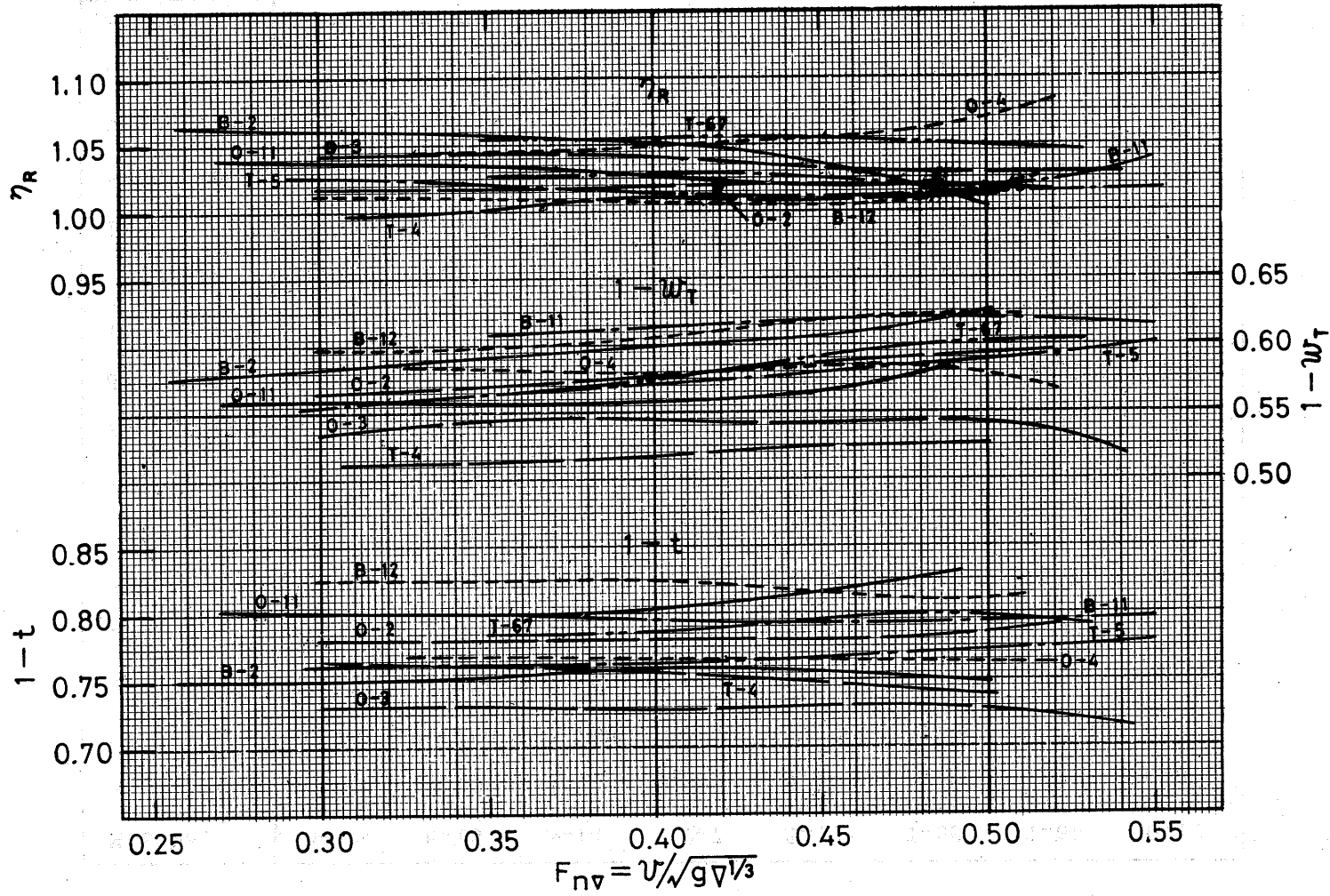


Fig.12 $C_B = 0.778 \sim 0.785$

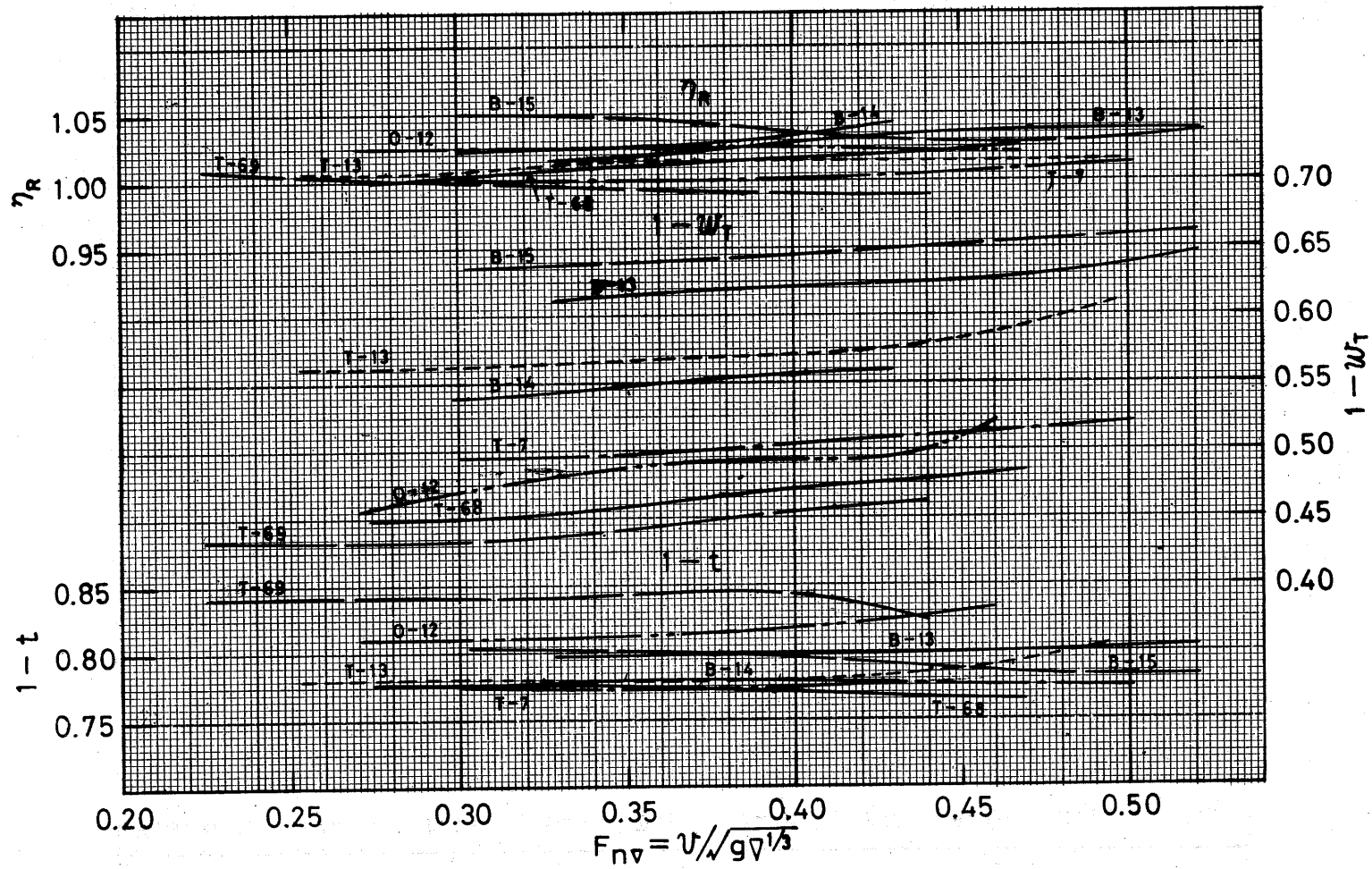


Fig.13 $C_B = 0.787 \sim 0.791$

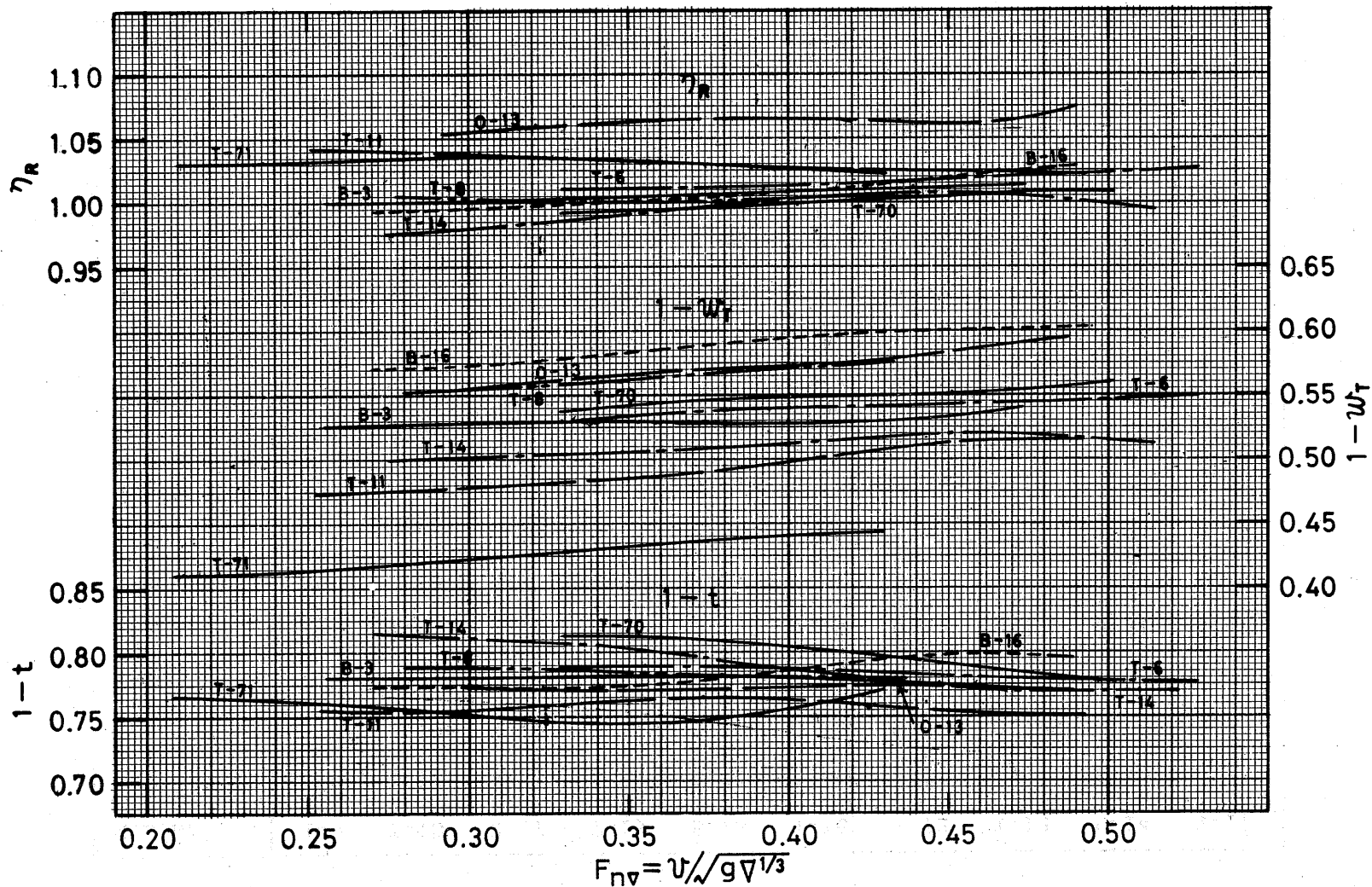


Fig.14 $C_B = 0.792 \sim 0.796$

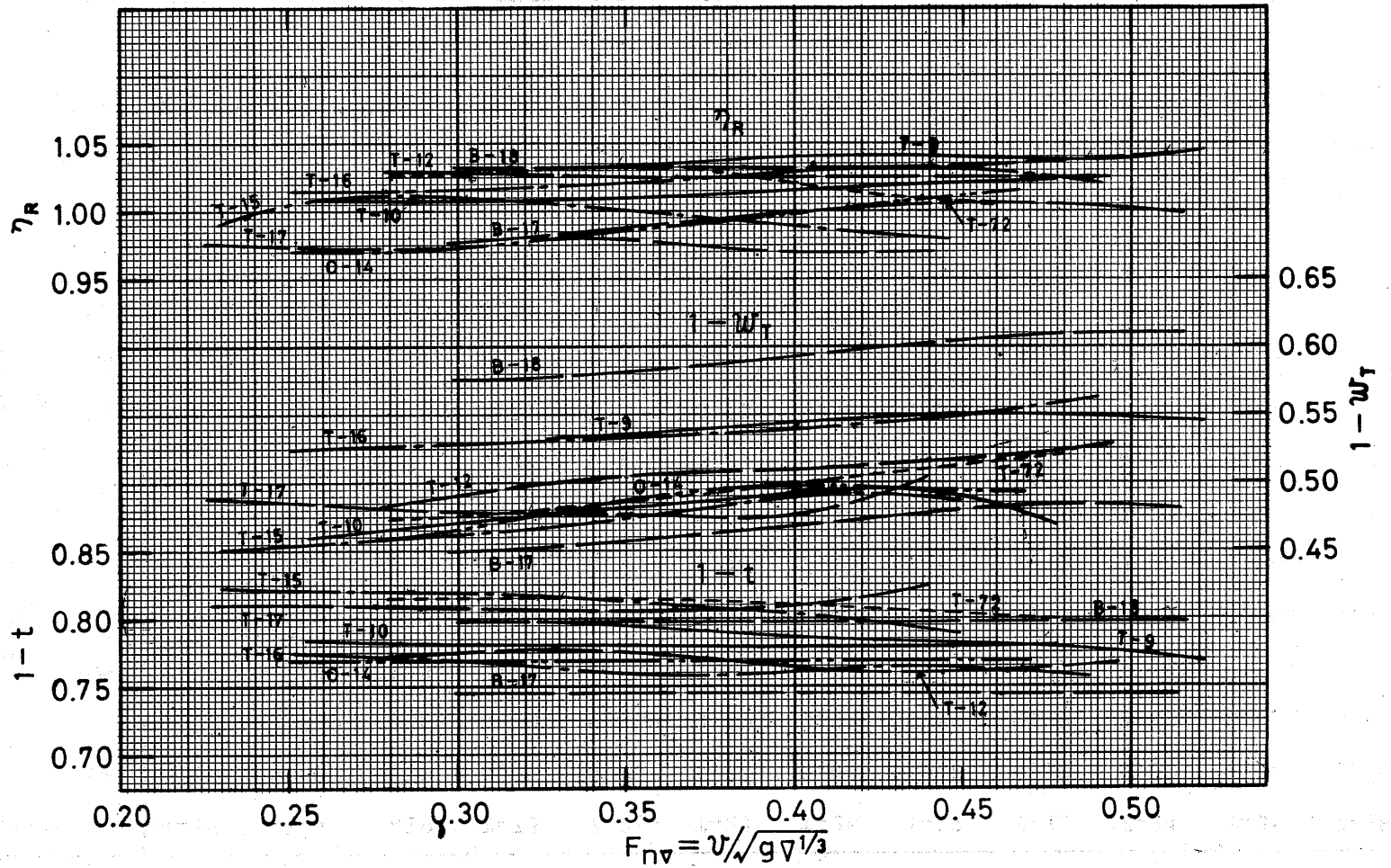


Fig.15 $C_B = 0.798$ & 0.799

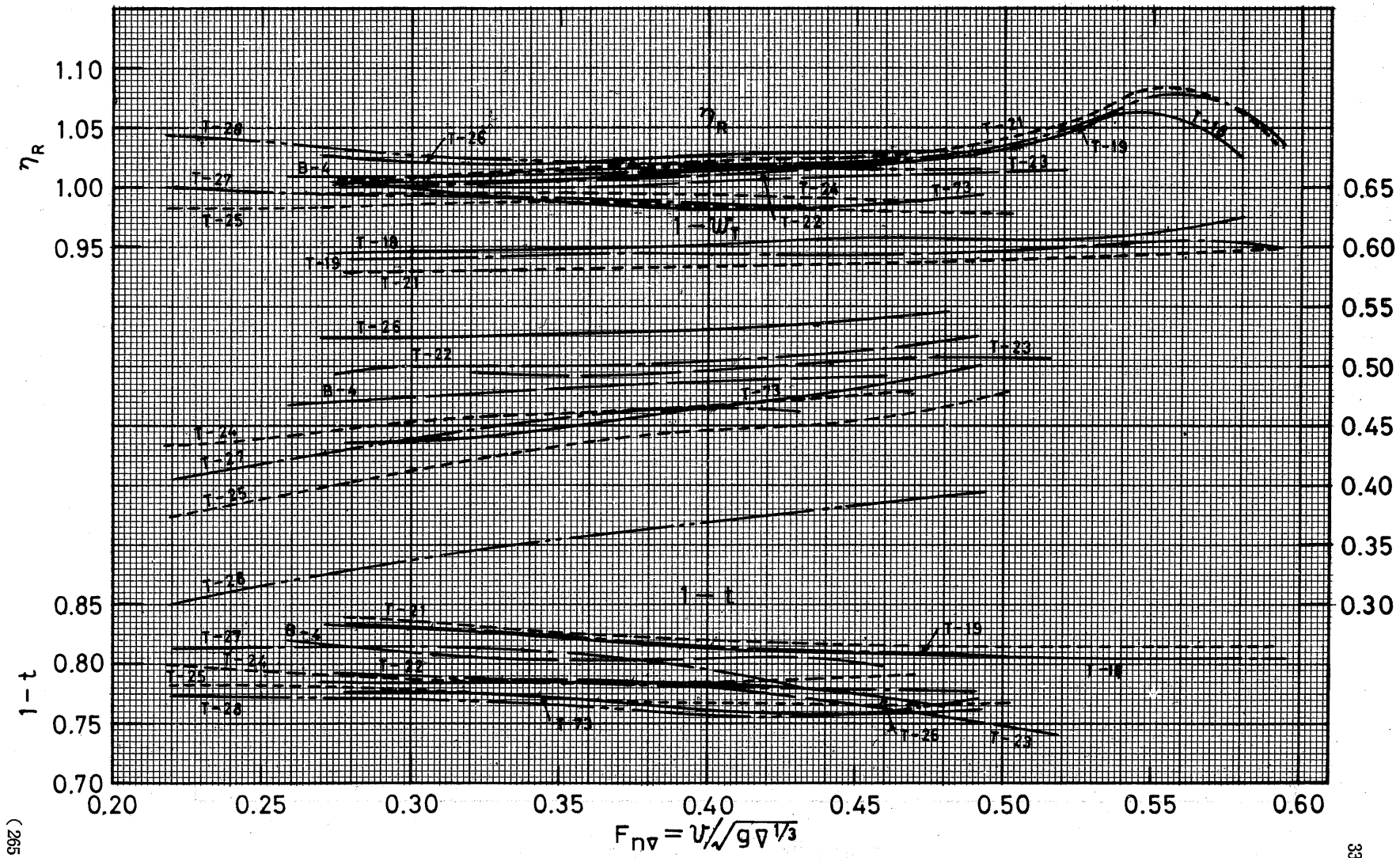


Fig.16 $C_B = 0.800$ & 0.801

(265)

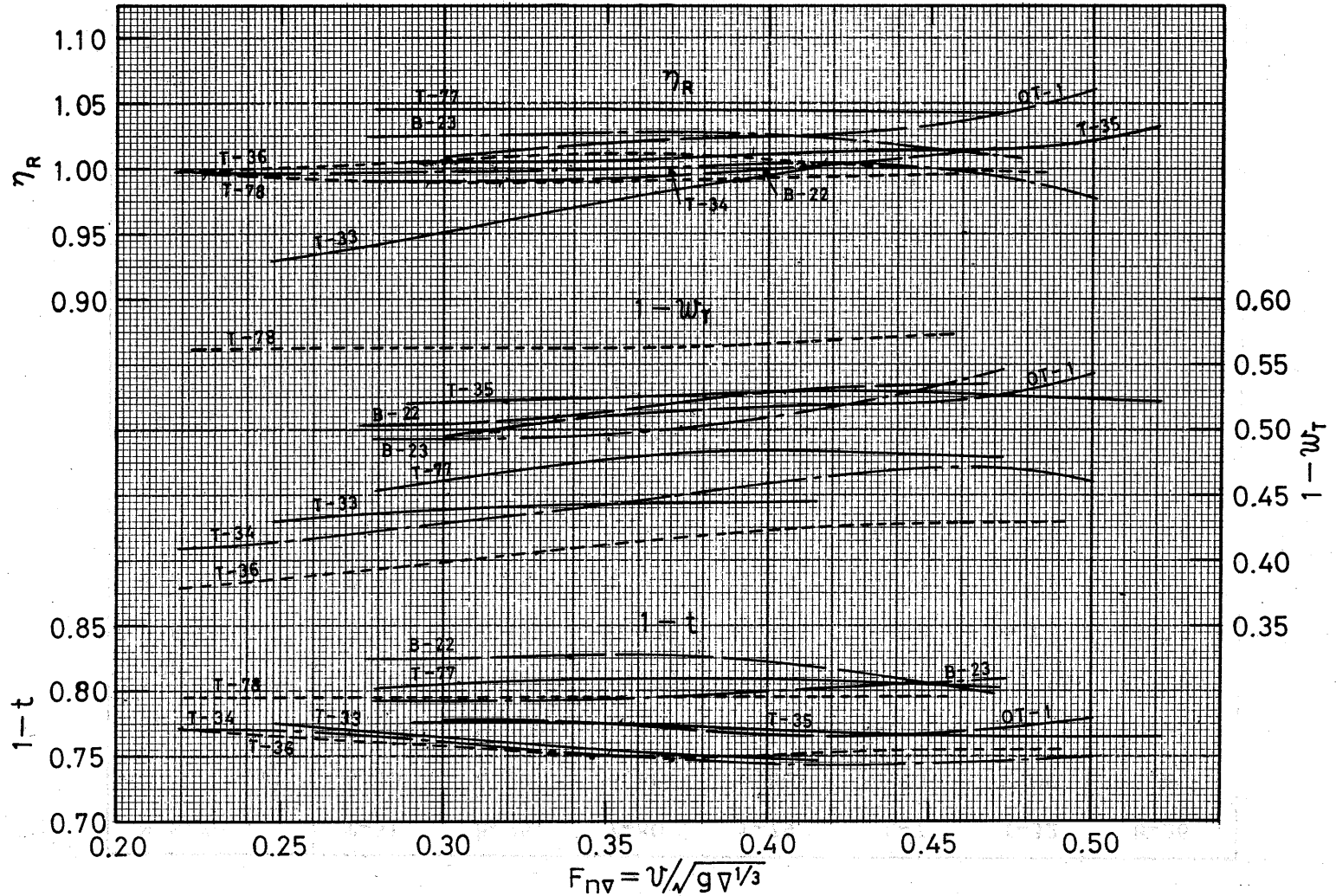


Fig.18 $C_B = 0.803$ & 0.804

Table 19 $C_B=0.805$

M.S.No.	T-31	B-25	T-80	T-79	O-7	T-32	B-26
L (m)	6.50	6.20	6.80	6.80	6.50	7.00	5.60
C_B	0.805	0.805	0.805	0.805	0.805	0.805	0.805
l_{CB} (%)	-1.60	-1.97	-1.95	-2.31	-2.10	-1.98	-1.60
L/B	6.87	7.14	6.47	6.43	6.72	6.65	7.19
B/d	2.66	2.44	2.94	2.95	2.64	2.68	2.12
$\nabla/(0.1L)^3$	6.40	6.47	6.53	6.60	6.68	6.81	7.34
$S/\nabla^{2/3}$	6.24	6.27	6.31	6.34	6.22	6.19	6.09
A_B/A_M (%)	5.30	2.99	4.15	10.29	5.70	4.19	8.30
d_B/d (%)	77.1		79.3	75.6	82.9	78.7	
l/L (%)	0	0	0	1.70	0	0	0
$D_P/0.01L$	3.15	3.24	2.87	2.68	3.00	2.72	3.38
I/ D_P	1.12	1.15	1.17	1.27	1.27	1.34	1.30
Stem form	VB	C	VB	B	VB	VB	C
Stern form	G	G	G	G	G	G	G
Rudder	S	S	R	R	C	R	S
Marks	—	—	—	—	—	—	—

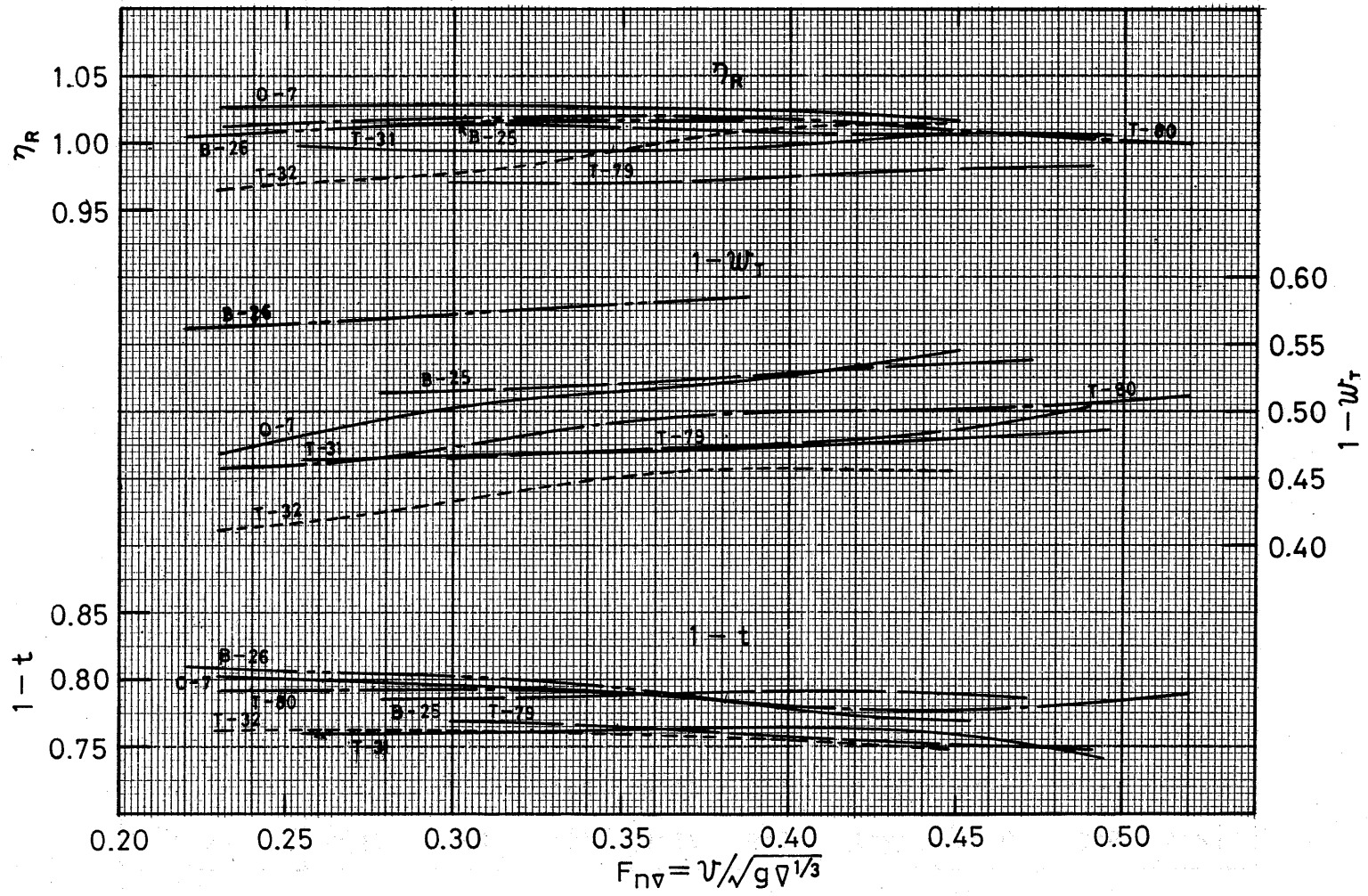


Fig.19 $C_B=0.805$

Table 20

 $C_B=0.806$ & 0.807

M.S.No.	B-30	T-82	B-31	B-27	B-28	T-81	T-30	O-6	T-83
L (m)	6.20	6.30	5.90	6.00	6.50	6.50	6.80	6.50	5.50
C_B	0.806	0.806	0.806	0.806	0.806	0.806	0.807	0.807	0.807
l_{CB} (%)	-1.84	-2.14	-2.20	-2.00	-2.90	-2.20	-2.07	-1.00	-2.27
L/B	7.11	6.34	6.59	6.72	6.13	6.18	6.91	6.90	6.54
B/d	2.43	2.93	2.67	2.51	2.97	2.71	2.79	2.67	2.75
$\nabla/(0.1L)^3$	6.59	6.85	6.93	7.11	7.24	7.77	6.06	6.36	6.87
$S/\nabla^{2/3}$	6.23	6.27	6.29	6.15	6.19	6.15	6.35	6.33	6.20
A_B/A_M (%)		4.22	12.17	8.44	7.20	10.13		5.08	6.19
d_B/d (%)		62.8	66.6		67.1	69.9		76.1	71.7
l/L (%)		0.68	1.50	0	1.63	1.70		0	0.82
$D_P/0.01L$	3.30	3.10	3.09	3.34	2.91	2.69	2.80	3.15	3.72
I/D_P	1.12	1.09	1.20	1.15	1.23	1.51	1.16	1.16	0.83
Stem form	V	B	B	C	B	B	LR	VB	B
Stern form	G	G	G	G	G	G	G	G	G
Rudder	S	R	R	R	S	R	S	S	S
Marks	_____	_____	-----	-----	-----	-----	-----	-----	-----

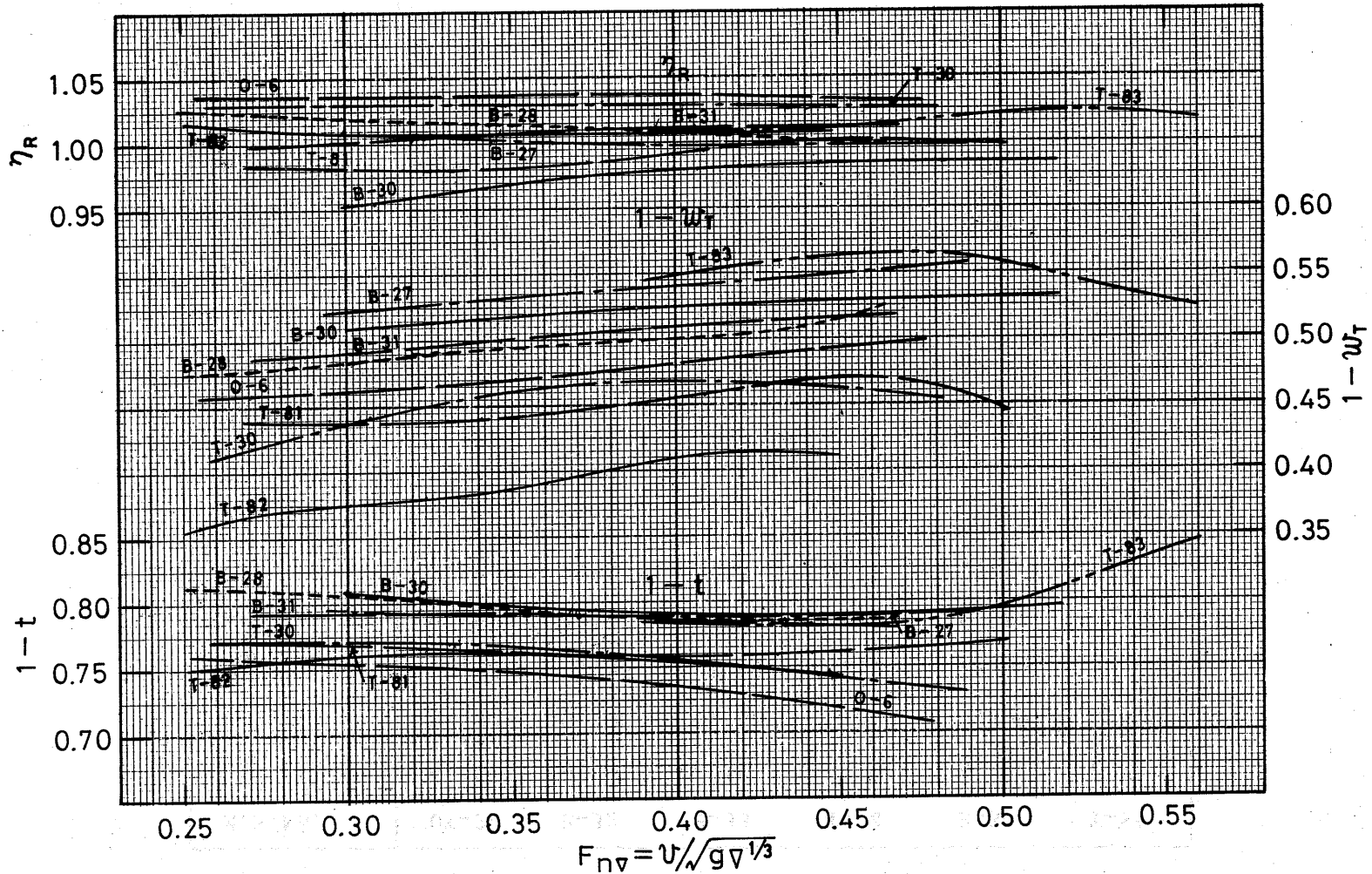


Fig.20 $C_B = 0.806$ & 0.807

Table 21 $C_B=0.808$ & 0.809

M.S.No.	OT-2	B-32	B-33	T-84	B-34	T-85
L (m)	6.50	6.50	6.50	6.50	6.50	6.80
C_B	0.808	0.808	0.808	0.809	0.809	0.809
l_{CB} (%)	-1.80	-2.68	-1.97	-2.00	-2.06	-2.42
L/B	6.98	7.14	6.85	7.21	6.85	6.36
B/d	2.69	2.53	2.72	2.46	2.72	2.76
$\nabla/(0.1L)^3$	6.17	6.26	6.34	6.32	6.35	7.26
$S/\nabla^{2/3}$	6.30	6.20	6.29	6.23	6.30	6.20
A_B/A_M (%)		6.70	7.03		7.27	9.26
d_B/d (%)		81.7	74.0		73.1	69.8
l/L (%)		1.02	0.97		1.44	1.49
$D_P/0.01L$	3.15	3.09	2.87	2.93	2.87	2.74
I/D_P	1.04	1.11	1.23	1.35	1.23	1.42
Stem form	LR	B	B	LR	B	B
Stern form	G	G	M	M	M	M
Rudder	S	R	H	H	H	H
Marks	—	—	—	—	—	—

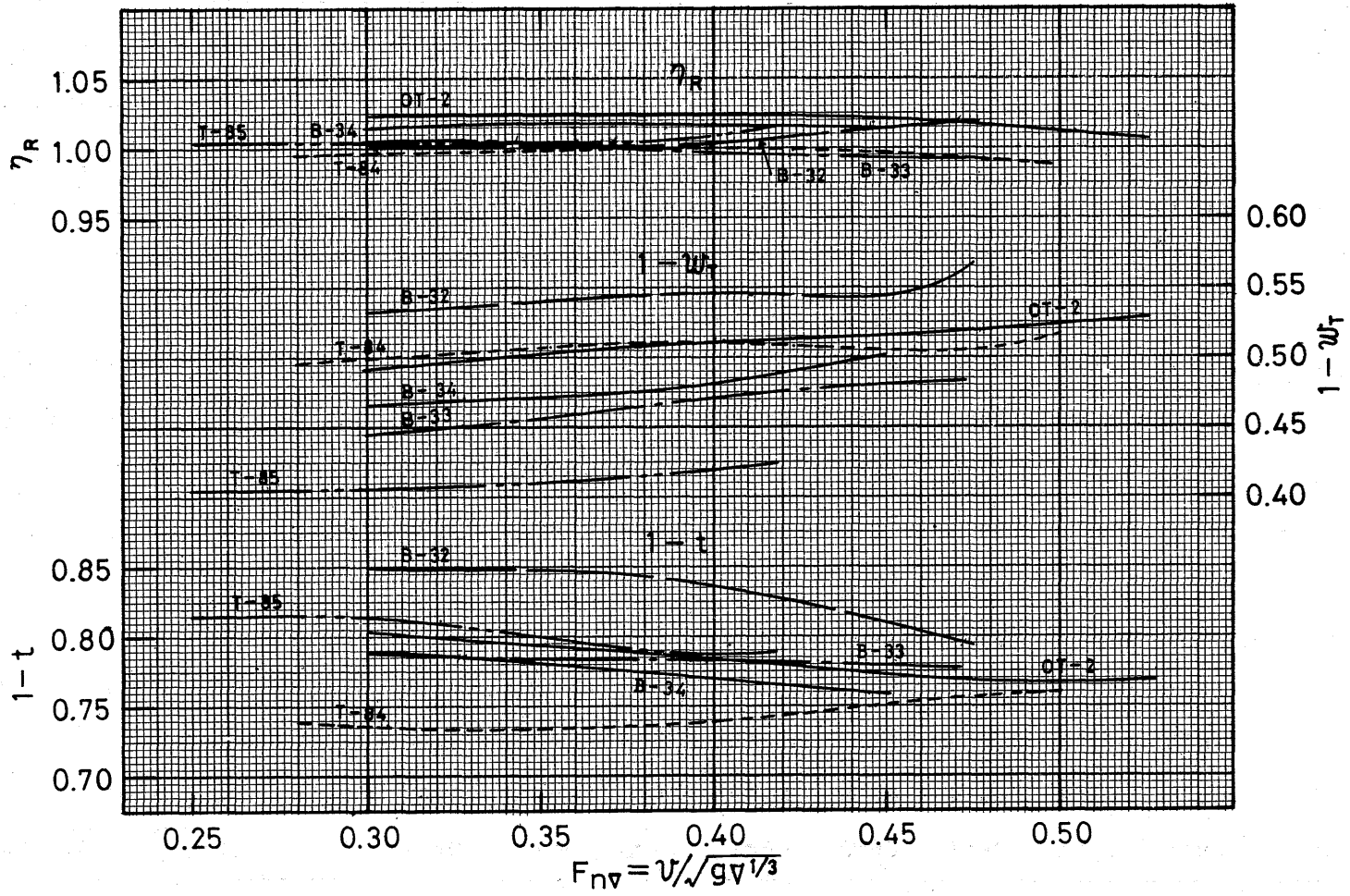


Fig.21 $C_B = 0.808$ & 0.809

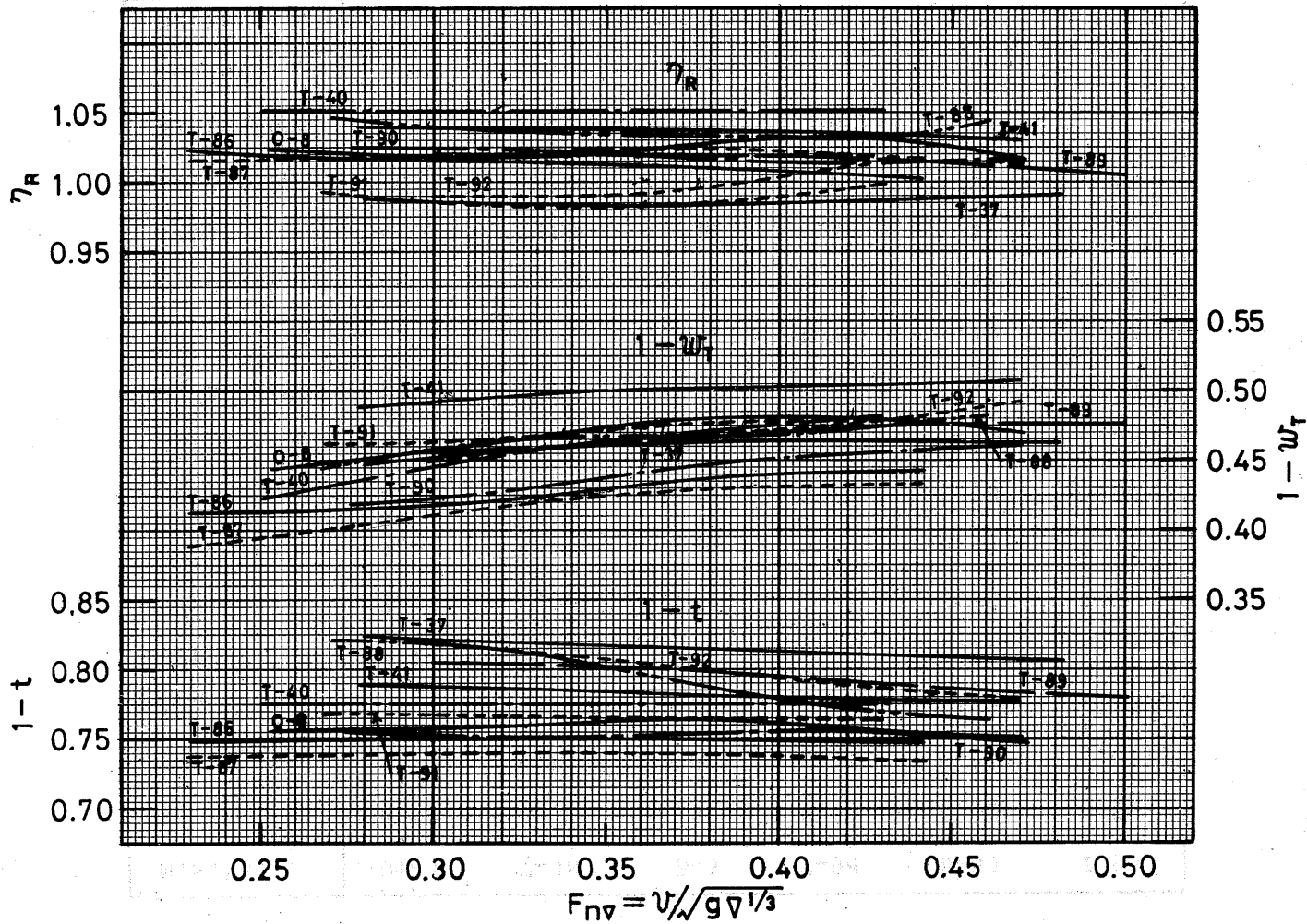


Fig.22 $C_B = 0.810$

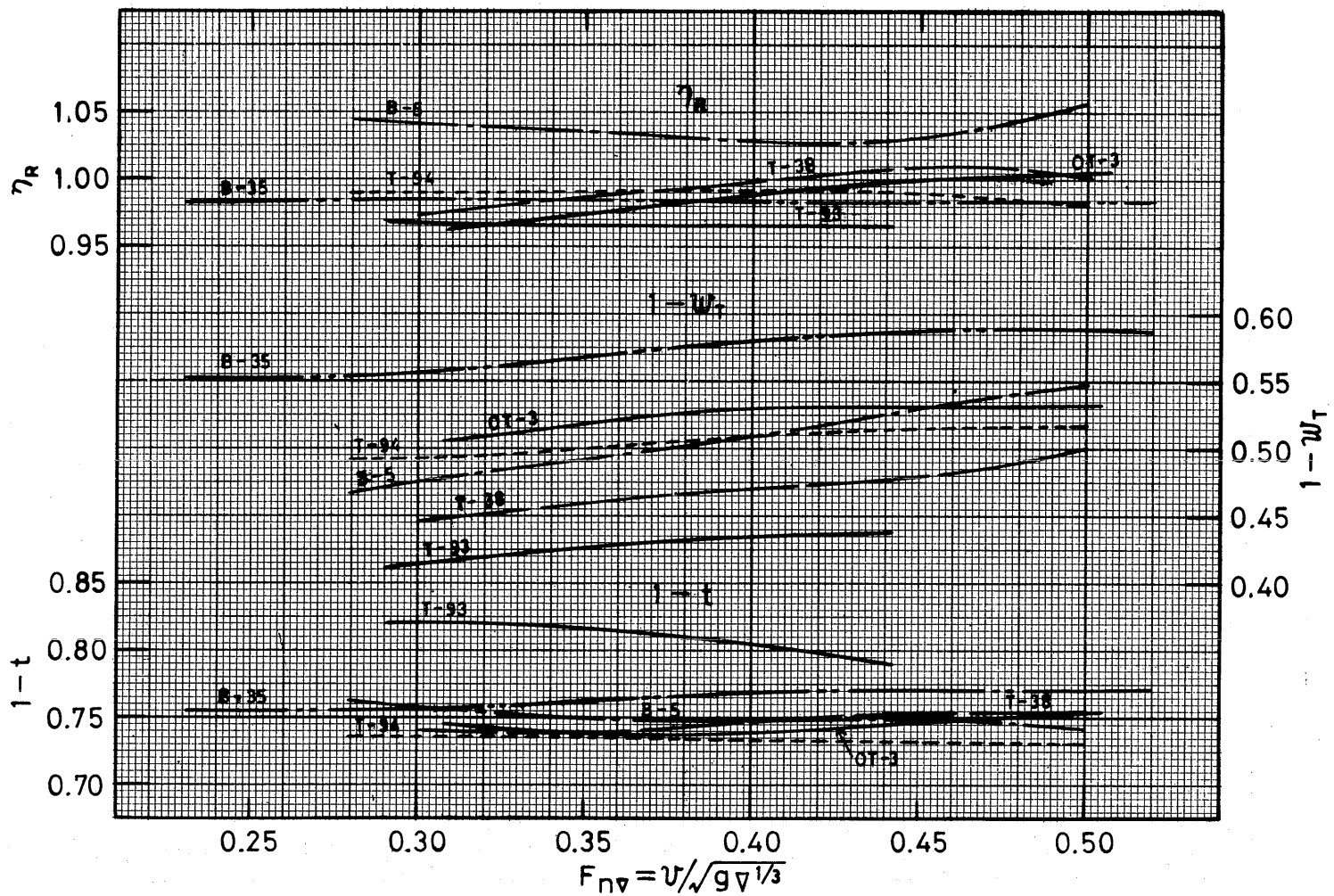


Fig.23 $C_B=0.811$

Table 24 $C_B=0.812$ & 0.813

M.S.No.	C0-1	T-39	T-96	0-9	0T-4	T-95	T-97
L (m)	6.50	6.50	6.50	6.50	6.50	6.20	6.70
C_B	0.812	0.812	0.812	0.812	0.812	0.812	0.813
l_{CB} (%)	-2.09	-1.68	-2.43	-1.62	-1.72	-2.85	-2.02
L/B	7.06	6.76	6.57	6.79	6.54	6.04	6.51
B/d	2.71	2.79	2.79	2.61	2.79	2.97	2.54
$\nabla/(0.1L)^3$	6.02	6.38	6.75	6.76	6.80	7.48	7.56
$S/\nabla^{2/3}$	6.33	6.32	6.31	6.18	6.25	6.20	6.15
A_B/A_M (%)	6.09		10.29	4.84	4.71	9.45	6.17
d_B/d (%)	77.2		69.6			67.9	79.2
l/L (%)	0		1.50	0	0	1.60	0.66
$D_p/0.01L$	3.15	2.80	3.08	3.00	2.93	2.94	2.69
I/D_p	1.07	1.24	1.11	1.25	1.25	1.22	1.54
Stem form	VB	LR	B	C	C	B	B
Stern form	G	G	G	G	G	G	G
Rudder	S	S	R	R	R	S	S
Marks	—	—	—	---	—	---	---

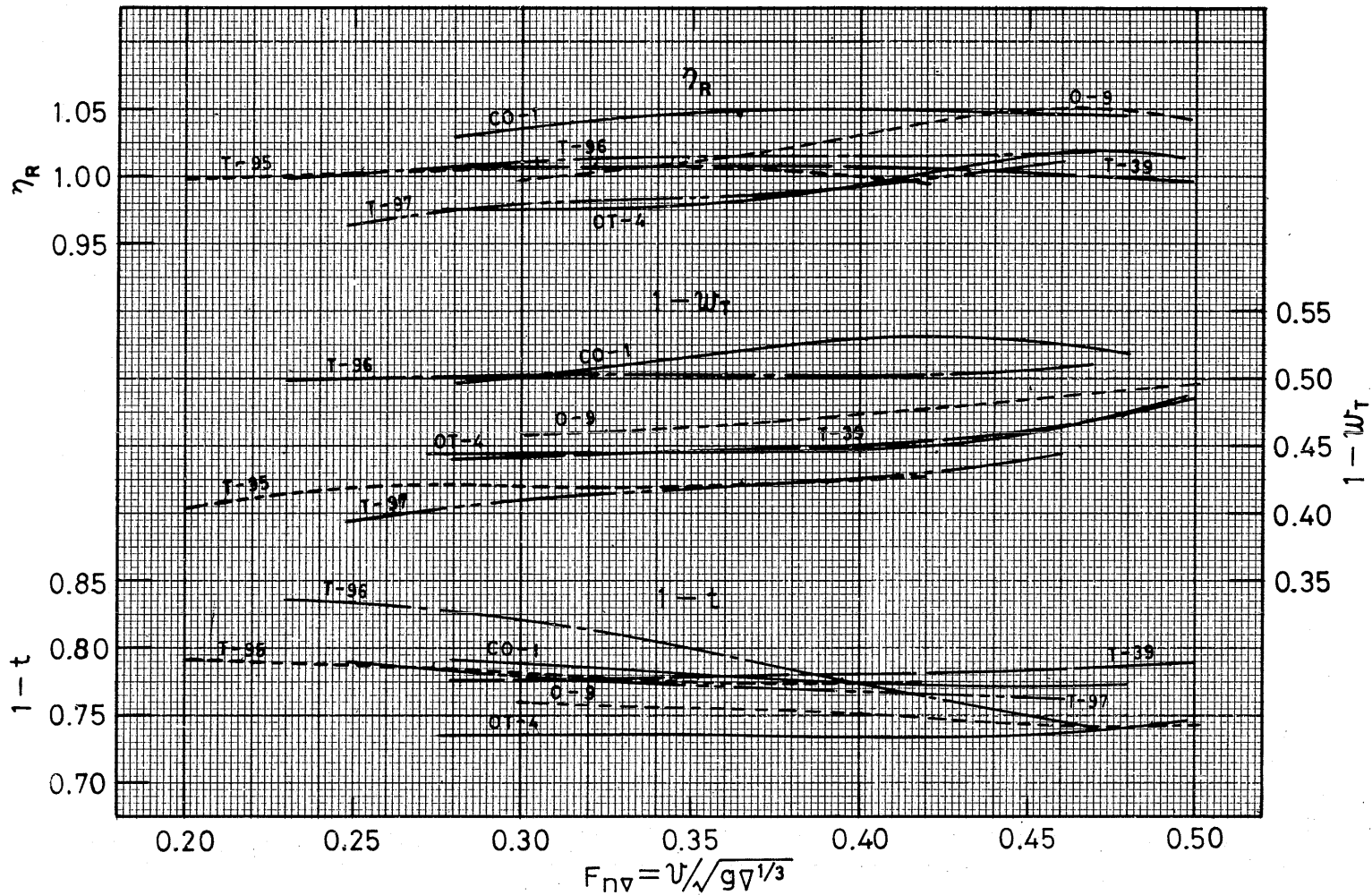


Fig:24 $C_B = 0.812$ & 0.813

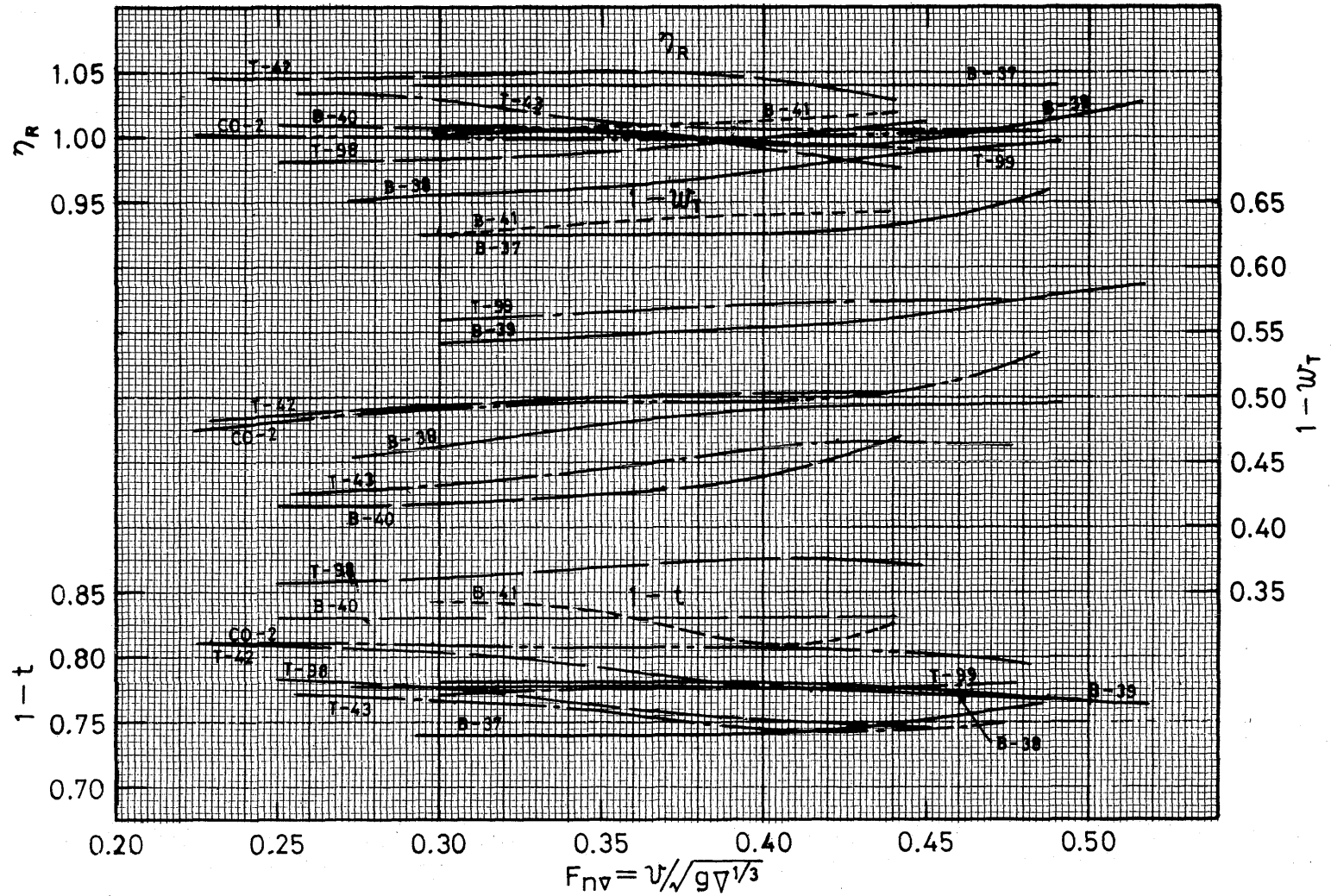


Fig. 25 $C_B = 0.814$ & 0.815

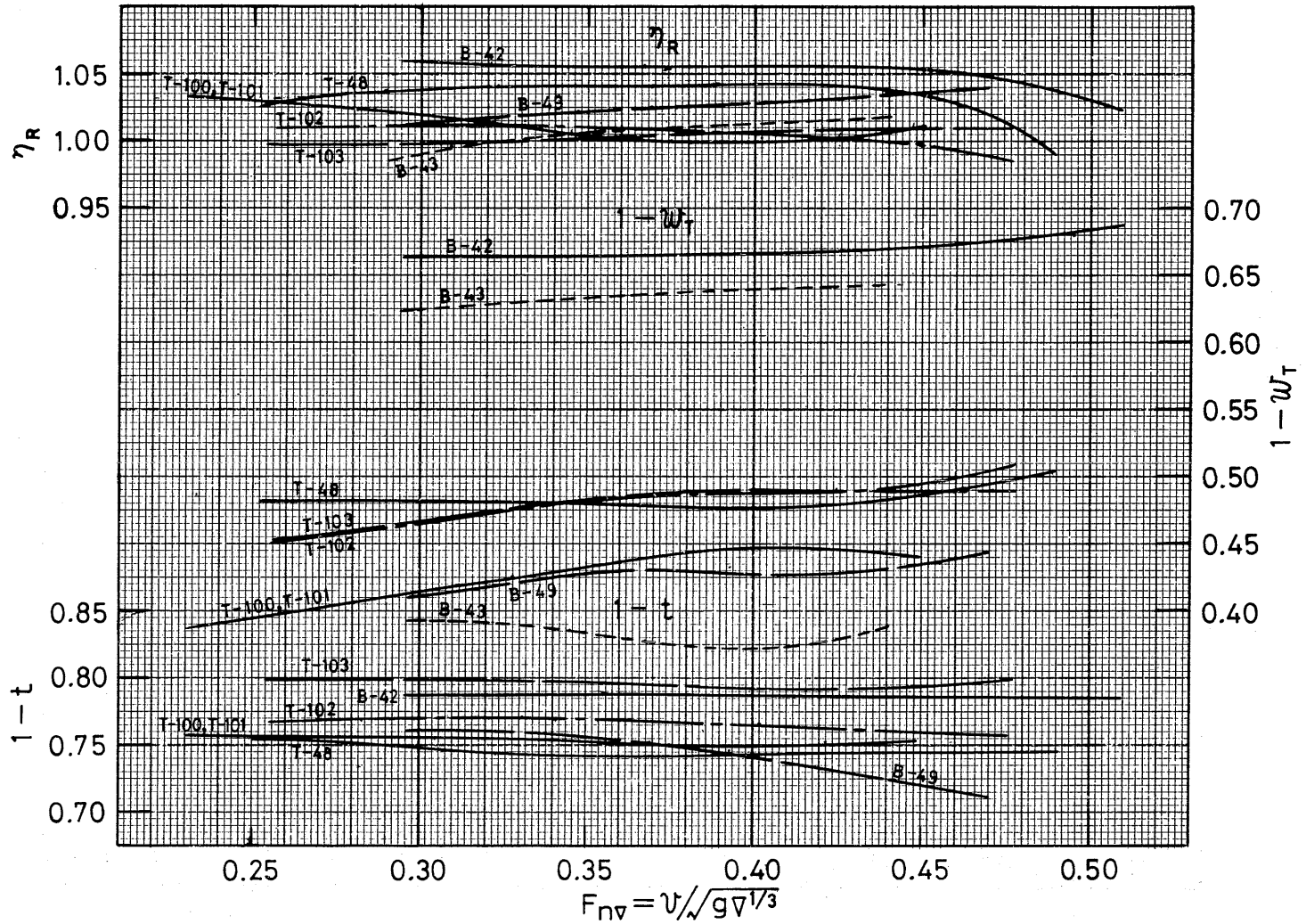


Fig.26 $C_B = 0.816$ & 0.817

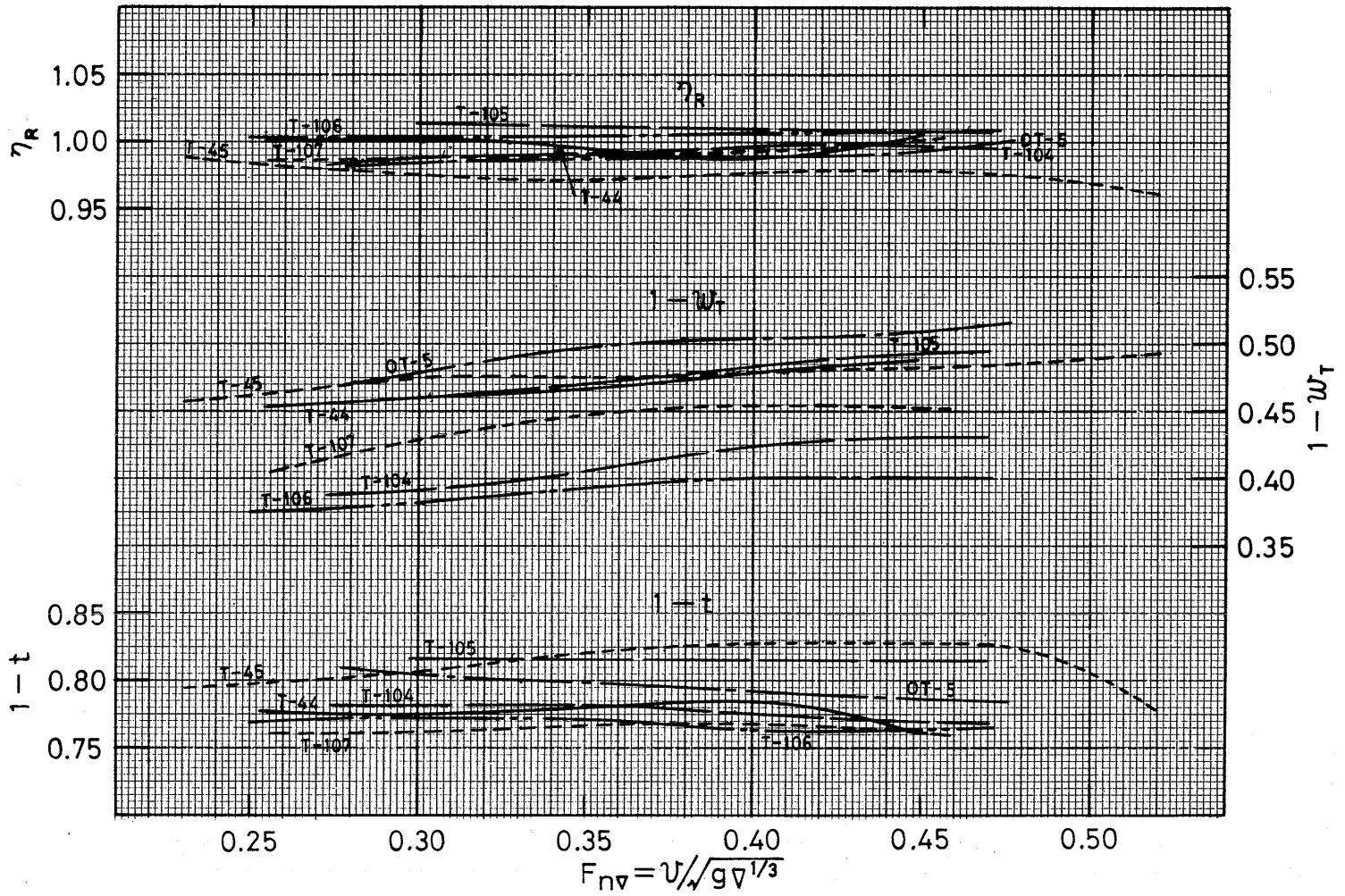


Fig.27 $C_B = 0.818$ & 0.819

Table 28 $C_B=0.820$

M.S.No.	B-46	T-108	T-46	B-44	T-52	B-45
L (m)	7.00	6.80	6.50	6.80	6.50	5.80
C_B	0.820	0.820	0.820	0.820	0.820	0.820
l_{CB} (%)	-1.58	-3.08	-1.76	-2.48	-1.99	-2.66
L/B	7.57	6.65	6.41	6.59	6.17	6.22
B/d	2.79	3.00	2.96	2.79	2.60	2.53
$\nabla/(0.1L)^3$	5.14	6.17	6.74	6.76	8.28	8.38
$S/\nabla^{2/3}$	6.67	6.40	6.21	6.24	6.05	6.04
A_B/A_M (%)	7.68	10.91	4.80	10.81	4.20	12.34
d_B/d (%)	73.9	75.2	68.3	82.5	76.0	73.6
l/L (%)	1.65	1.33	0	2.04	0	0.95
$D_P/0.01L$	2.50	2.57	2.80	2.87	2.80	3.46
I/D_P	1.21	1.30	1.20	1.15	1.59	1.19
Stem form	B	B	SR	B	SR	B
Stern form	G	M	G	M	G	G
Rudder	S	H	R	H	S	S
Marks	———	———	———	———	-----	-----

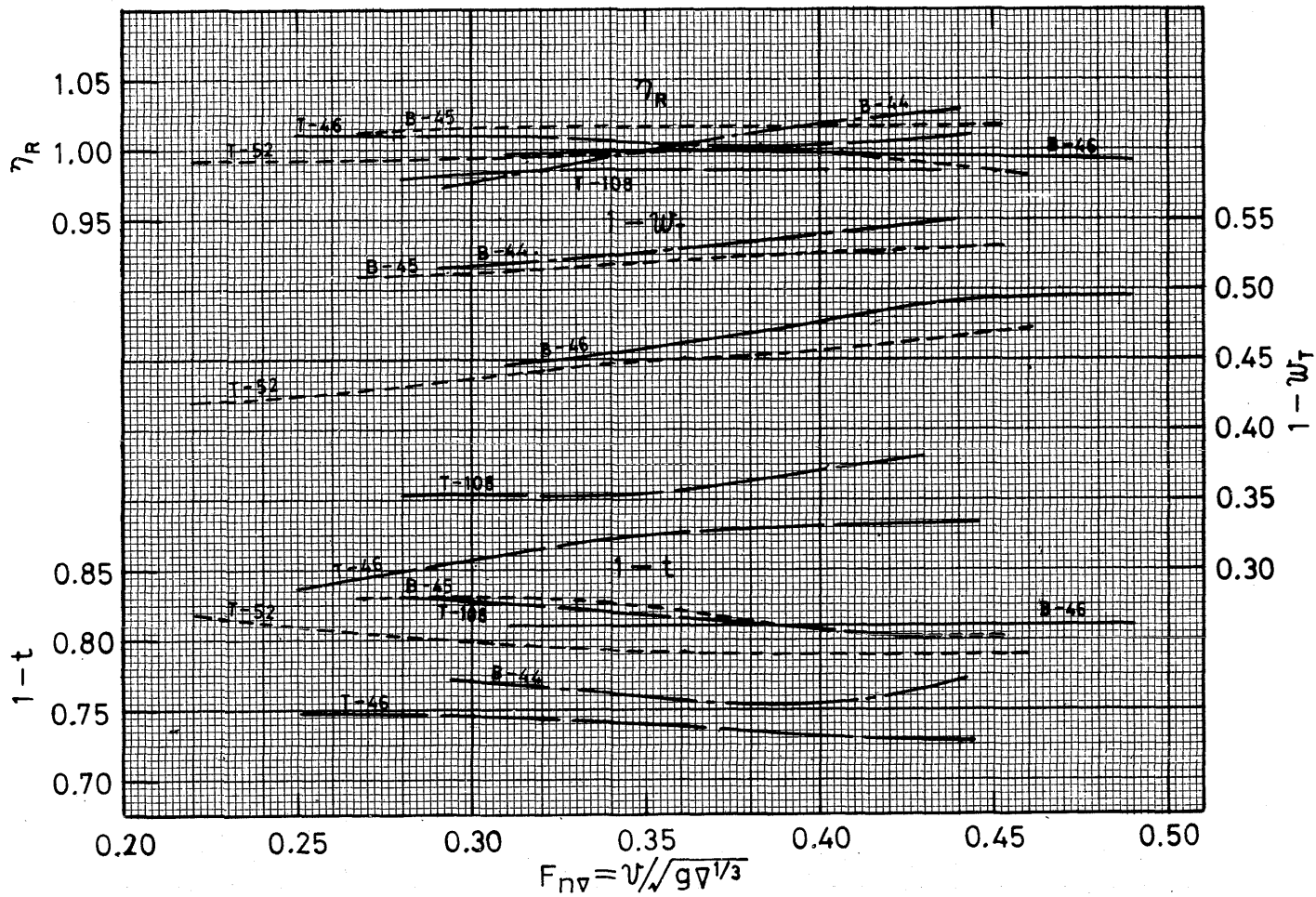


Fig.28 $C_B = 0.820$

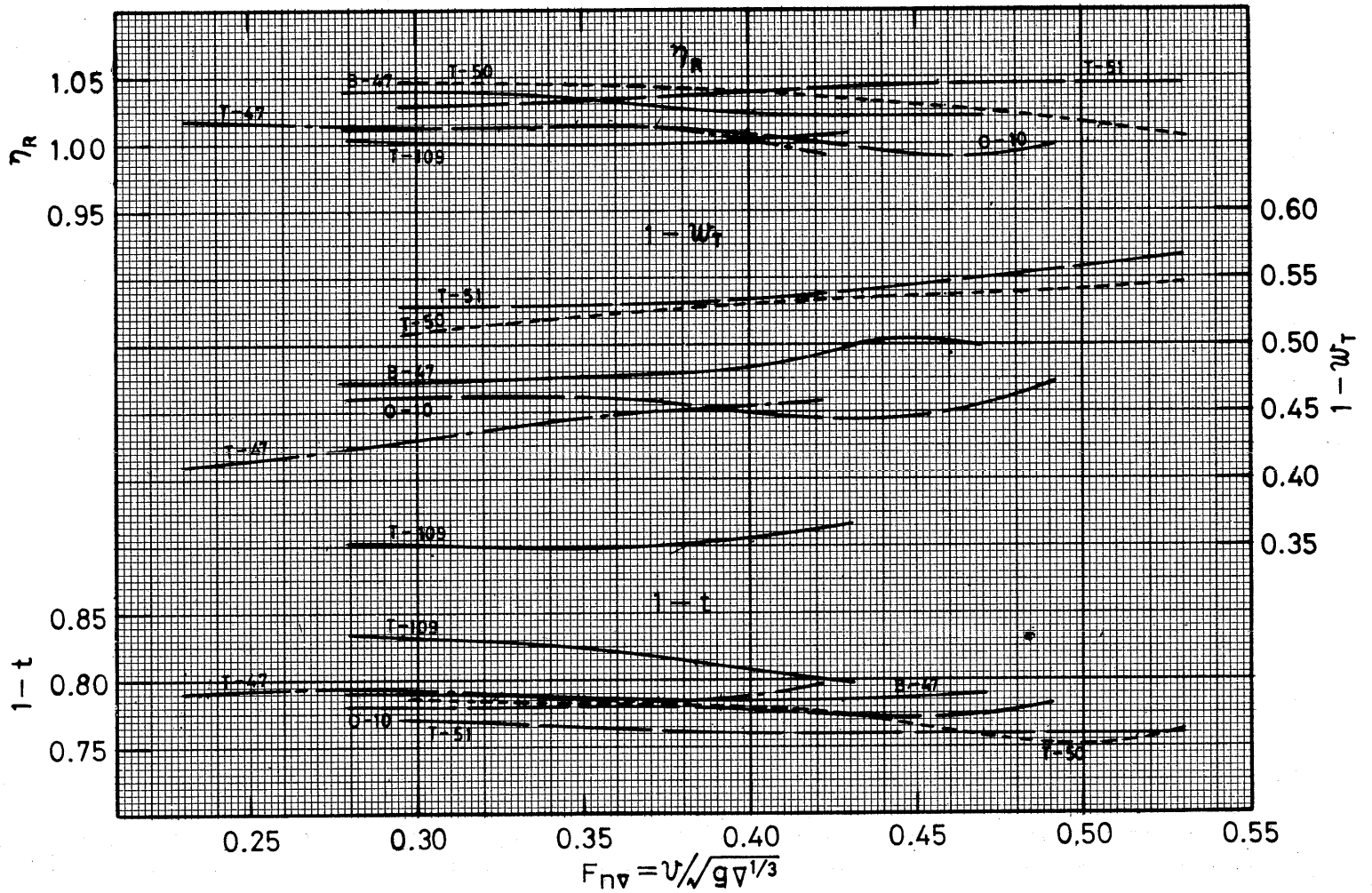


Fig.29 $C_B = 0.821$

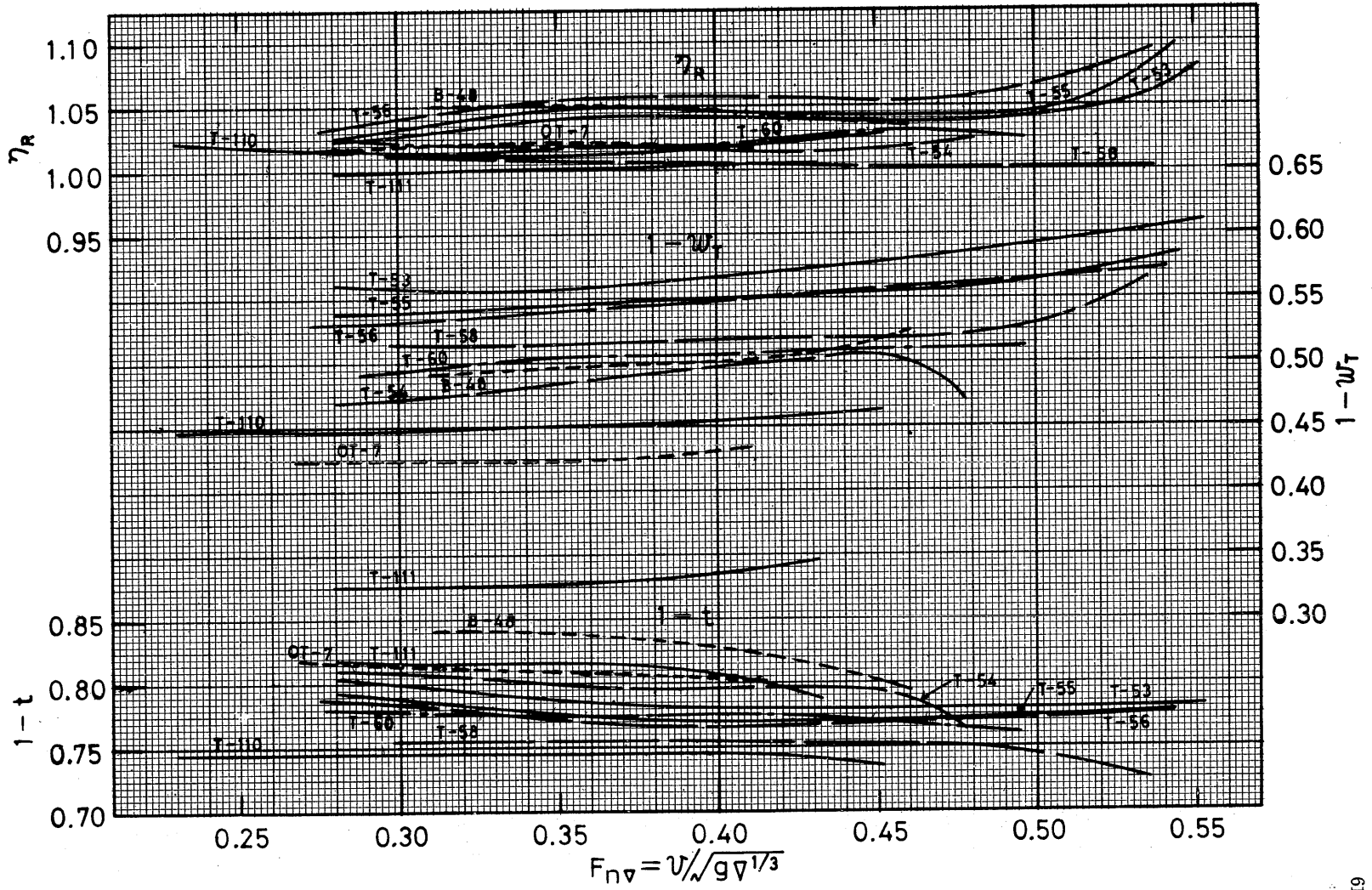


Fig.30 $C_B = 0.822$

Table 31 $C_B=0.823$ & 0.824

M.S.No.	B-49	O-15	T-114	T-113	T-57	T-112	T-115	O-16	B-50
L (m)	6.50	6.50	6.50	6.50	6.00	6.50	6.50	6.50	6.50
C_B	0.823	0.823	0.823	0.823	0.823	0.823	0.824	0.824	0.824
l_{CB} (%)	-2.00	-2.08	-3.05	-2.25	-1.53	-2.20	-1.54	-2.40	-2.53
L/B	6.82	6.66	6.70	6.53	6.50	6.62	6.89	6.71	6.71
B/d	2.76	2.83	2.79	2.87	2.76	2.53	2.55	2.69	2.69
$\nabla/(0.1L)^3$	6.42	6.57	6.58	6.73	7.06	7.40	6.79	6.82	6.82
$S/\nabla^{2/3}$	6.26	6.34	6.27	6.30	6.17	6.14	6.19	6.23	6.23
A_B/A_M (%)	11.34	7.04	11.17	9.24		9.92		6.62	8.99
d_B/d (%)	82.4	75.4	73.9	69.0				74.5	74.5
l/L (%)	0	0.71	0.94	1.75		0		0.82	1.51
$D_P/0.01L$	2.77	2.80	3.00	3.00	3.52	3.00	3.00	2.77	2.77
I/D_P	1.26	1.21	1.16	1.10	0.98	1.36	1.28	1.30	1.30
Stem form	C	B	B	B	LR	C	V	B	B
Stern form	G	G	G	G	G	G	M	G	G
Rudder	S	S	R	S	R	S	H	S	S
Marks	_____	_____	_____	_____	_____	_____	_____	_____	_____

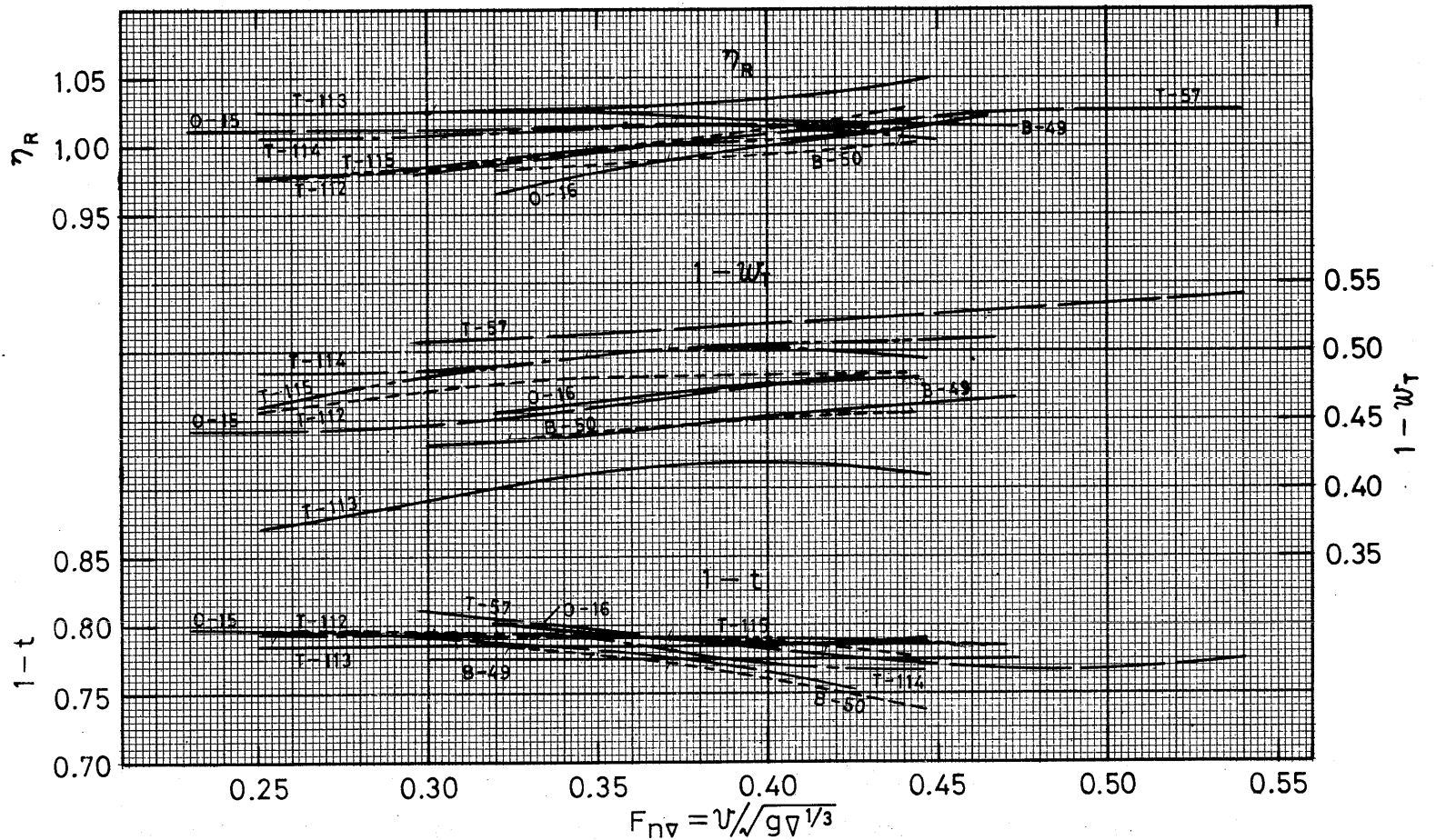


Fig.31 $C_B=0.823$ & 0.824

Table 32 $C_B=0.825$

M.S.No.	B-51	0-17	0T-6	T-120	T-118	T-119	T-116	T-117	T-59
L (m)	6.70	6.80	6.70	7.00	7.00	6.50	7.00	7.00	6.50
C_B	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825	0.825
l_{CB} (%)	-1.87	-2.40	-1.48	-3.07	-3.10	-3.38	-2.94	-2.94	-1.98
L/B	7.54	7.12	7.06	6.66	6.66	6.48	6.48	6.48	6.22
B/d	2.79	2.76	2.68	2.92	2.92	3.01	2.88	2.88	3.03
$\nabla/(0.1L)^3$	5.21	5.89	6.32	6.39	6.38	6.53	6.81	6.82	7.06
$S/\nabla^{2/3}$	6.56	6.46	6.22	6.38	6.39	6.31	6.25	6.26	6.21
A_B/A_M (%)	9.84	10.21		7.87	7.86	11.76	5.32	8.89	4.33
d_B/d (%)	78.3	72.3		75.9	75.9	73.8	82.2	70.4	75.2
l/L (%)	1.44	0.74		1.73	1.73	0.88	1.32	1.50	0
$D_P/0.01L$	2.69	2.68	2.99	2.43	2.43	2.77	2.46	2.46	2.97
I/D_P	1.11	1.15	1.09	1.40	1.40	1.16	1.50	1.50	1.15
Stem form	B	B	LR	B	B	B	B	B	SR
Stern form	G	G	G	G	M	G	G	G	G
Rudder	S	R	R	S	H	R	S	S	R
Marks	—	---	—	---	—	---	---	---	---

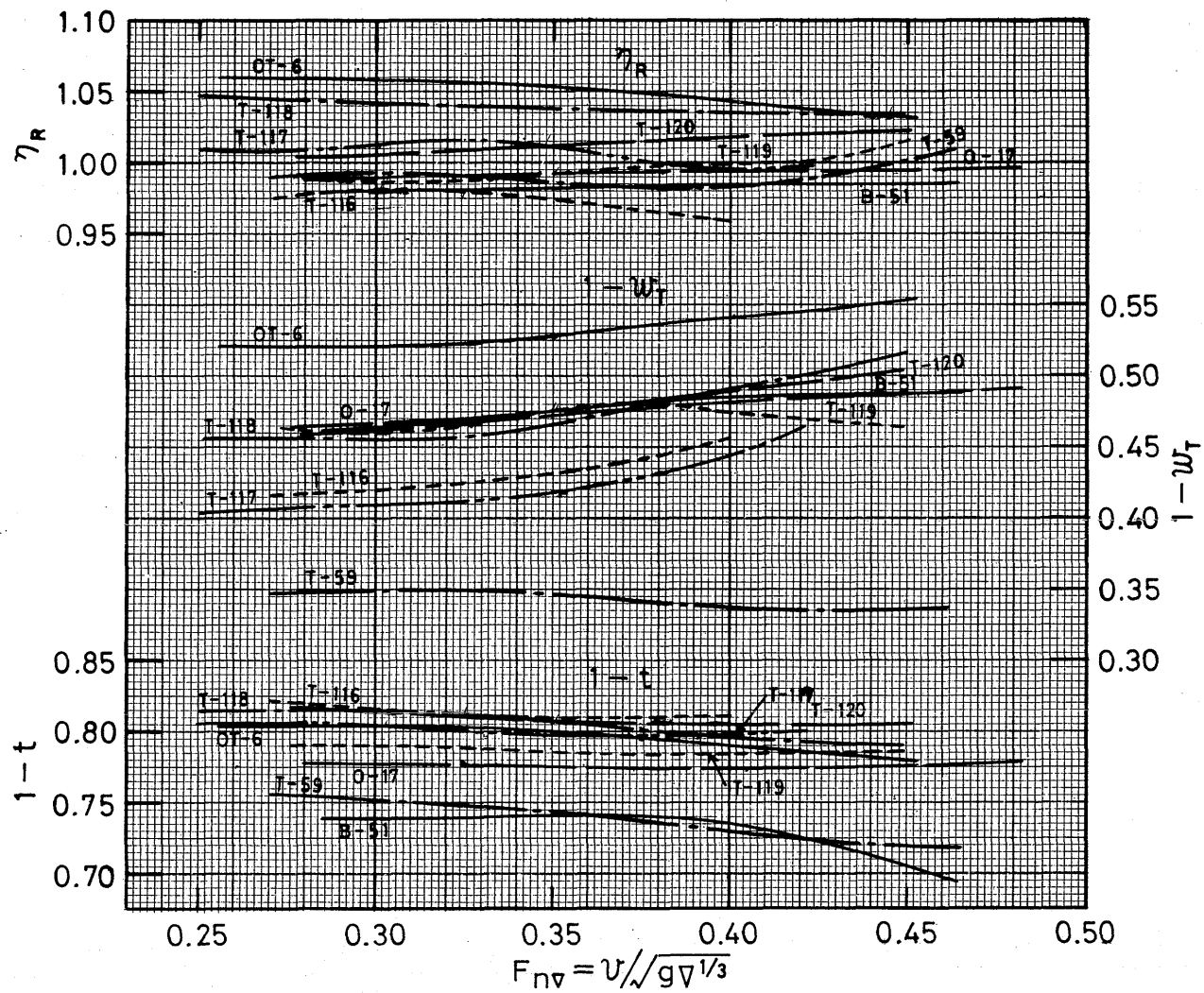


Fig.32 $C_B = 0.825$

Table 33 $C_B=0.826 \sim 0.829$

M.S.No.	B-52	OT-8	OT-9	T-121	T-122	T-123	B-53	T-124	B-54
L (m)	6.70	6.50	6.50	6.00	6.00	6.70	6.70	7.00	6.70
C_B	0.826	0.826	0.826	0.826	0.826	0.826	0.827	0.828	0.829
l_{CB} (%)	-1.92	-1.90	-1.90	-3.12	-3.07	-2.61	-1.98	-2.50	-1.78
L/B	7.54	7.41	7.41	6.24	6.24	6.26	7.54	7.48	7.54
B/d	2.79	2.61	2.61	2.98	2.98	2.54	2.79	2.43	2.62
$\nabla/(0.1L)^3$	5.21	5.77	5.77	7.12	7.13	8.31	5.22	6.10	5.58
$S/\nabla^{2/3}$	6.56	6.39	6.39	6.22	6.22	6.06	6.57	6.33	6.49
A_B/A_M (%)	11.85	8.97	8.97	9.83	9.83	12.27	7.77	1.00	11.36
d_B/d (%)	78.3	83.4	83.4	77.0	77.0	69.9	78.3		79.6
l/L (%)	1.70	0	0	0.78	0.78	2.00	1.05	0	1.70
$D_P/0.01L$	2.69	2.77	2.77	2.87	2.87	2.61	2.69	2.53	2.69
I/ D_P	1.11	1.25	1.20	1.24	1.24	1.75	1.11	1.65	1.22
Stem form	B	C	C	B	B	B	B	C	B
Stern form	G	G	G	G	G	M	G	M	G
Rudder	S	R	R	S	S	H	S	H	S
Marks	_____	_____	_____	_____	_____	-----	-----	-----	-----

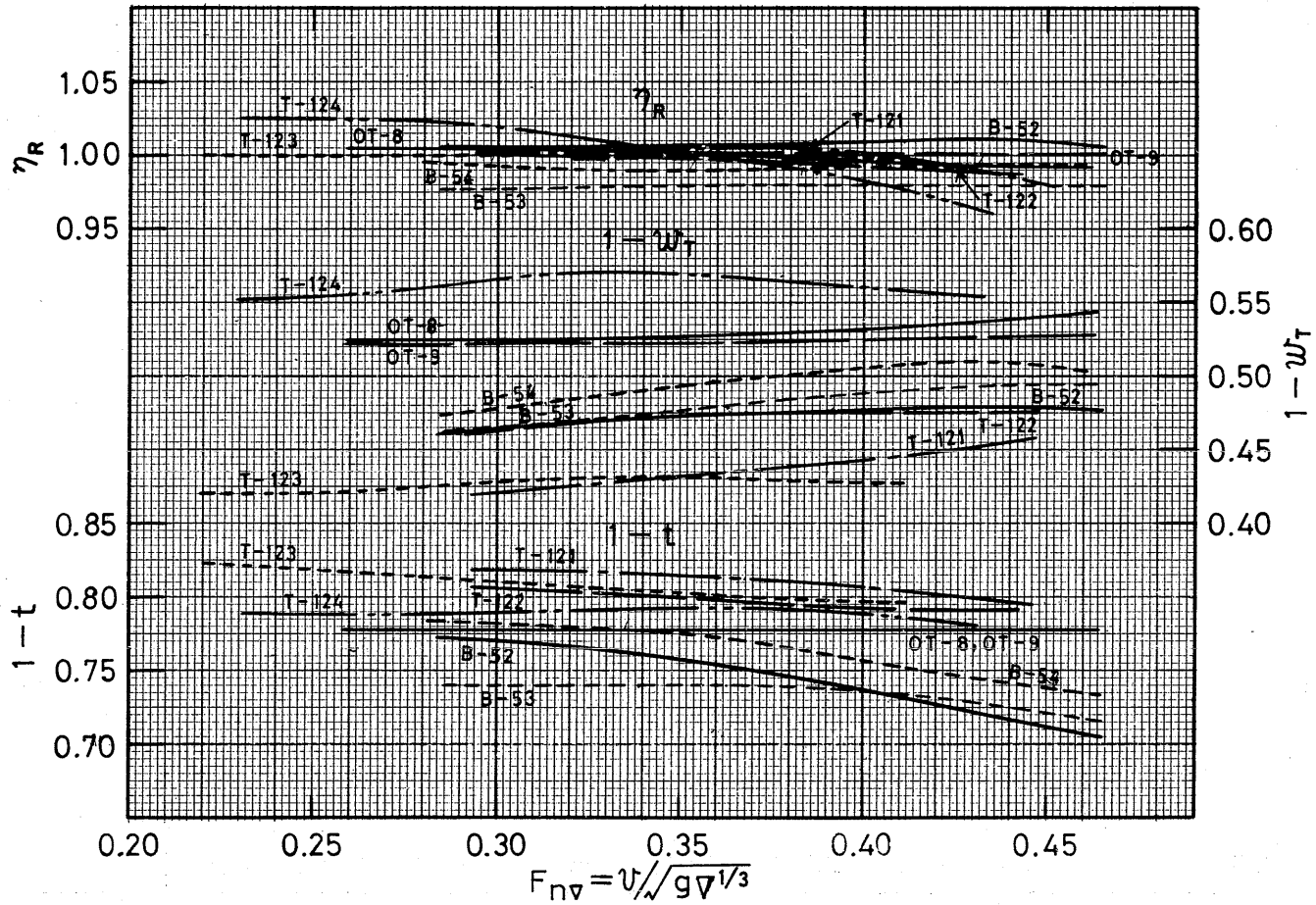


Fig.33 $C_B = 0.826 \sim 0.829$

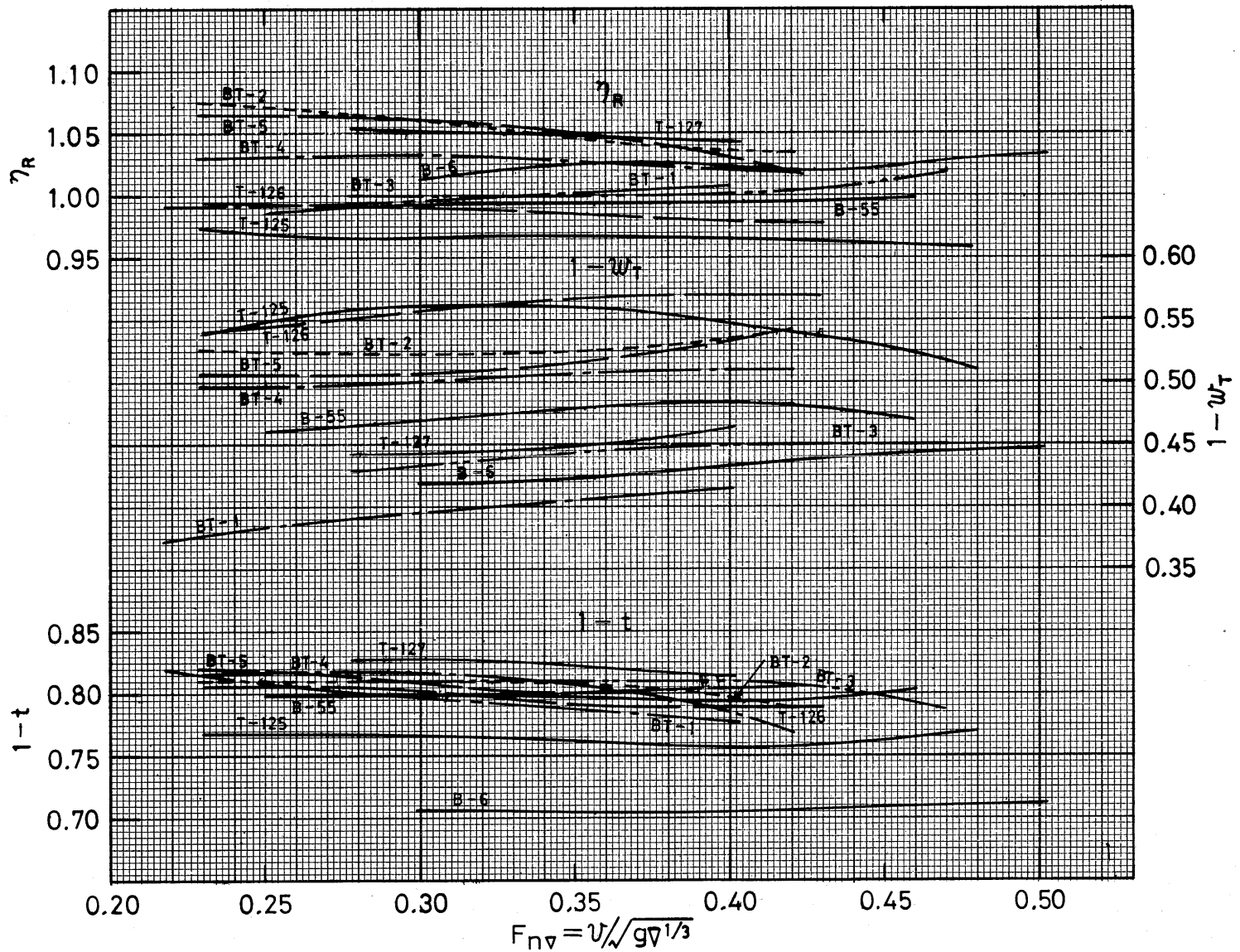


Fig.34 $C_B = 0.830 \sim 0.835$

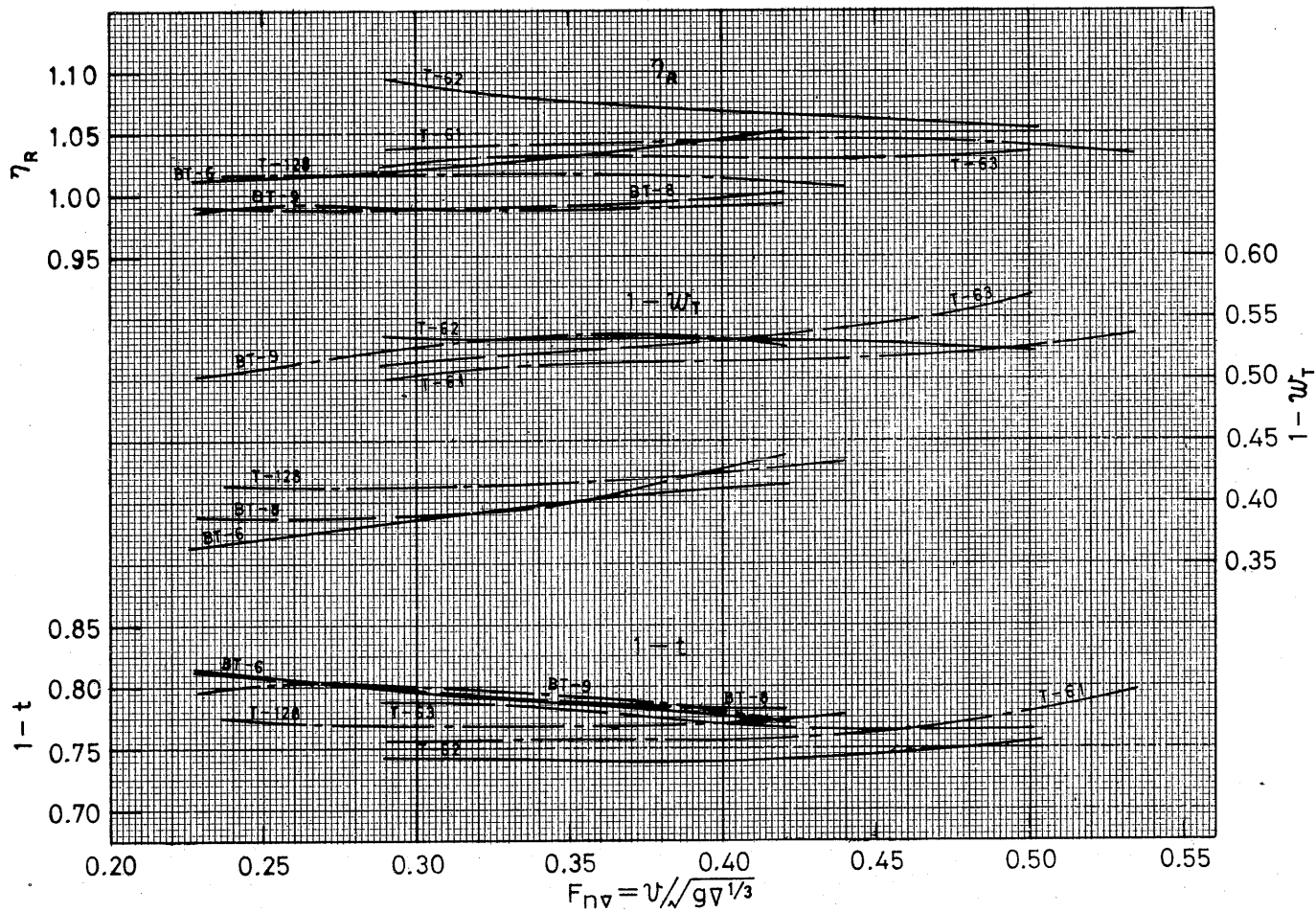


Fig.35 $C_B = 0.836 \sim 0.841$

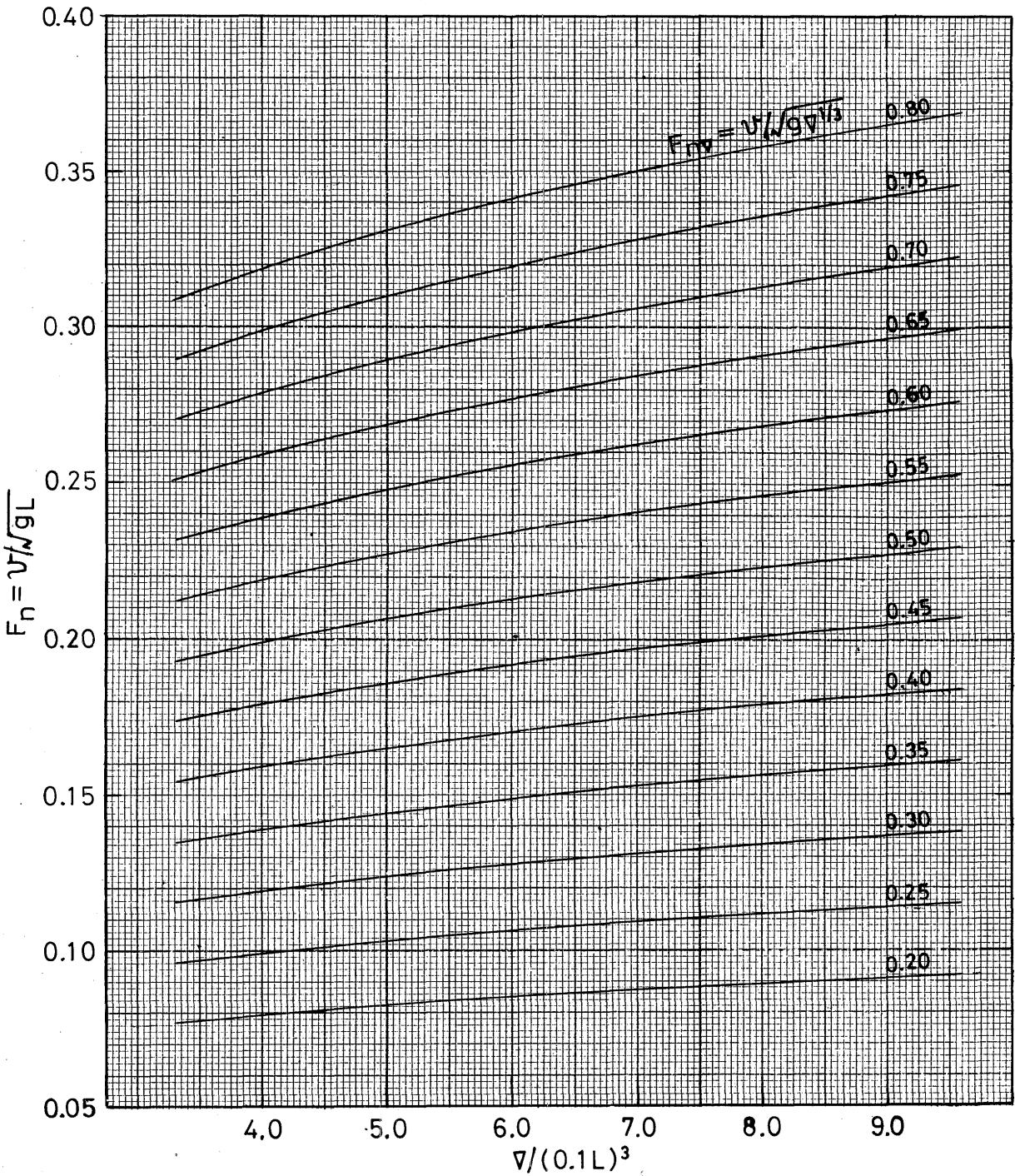


Fig. 36 $F_{nv} \sim F_n$