APPENDIX D

MODEL TEST CURVES FOR D_{TH}= 12 INCHES AND H = 1 FOOT AND CRITICAL RUNNER SIGMAS

SECTION	DESCRIPTION	PAGE
1	FRANCIS TURBINES	D-1
2	FRANCIS PUMP-TURBINES	D-13
3	PROPELLER TURBINES	D-19
4	CRITICAL RUNNER SIGMAS	D-27

SECTION I

FRANCIS TURBINE MODEL TEST CURVES FOR D_{TH}= 12 INCHES AND H = 1 FOOT

FIGURE	DESCRIPTION	PAGE
F1	N_S = 27.2	D-3
F2	N_S = 34.3	D-4
F3	N_S = 37.2	D-5
F4	N_S = 44.7	D-6
F5	N_S = 50.6	D-7
F6	N_S = 63.1	D-8
F7	N_S = 65.0	D-9
F8	N_S = 80.0	D-10
F9	PERFORMANCE HILL DATA, BEST PHI CONDITIONS	D-11

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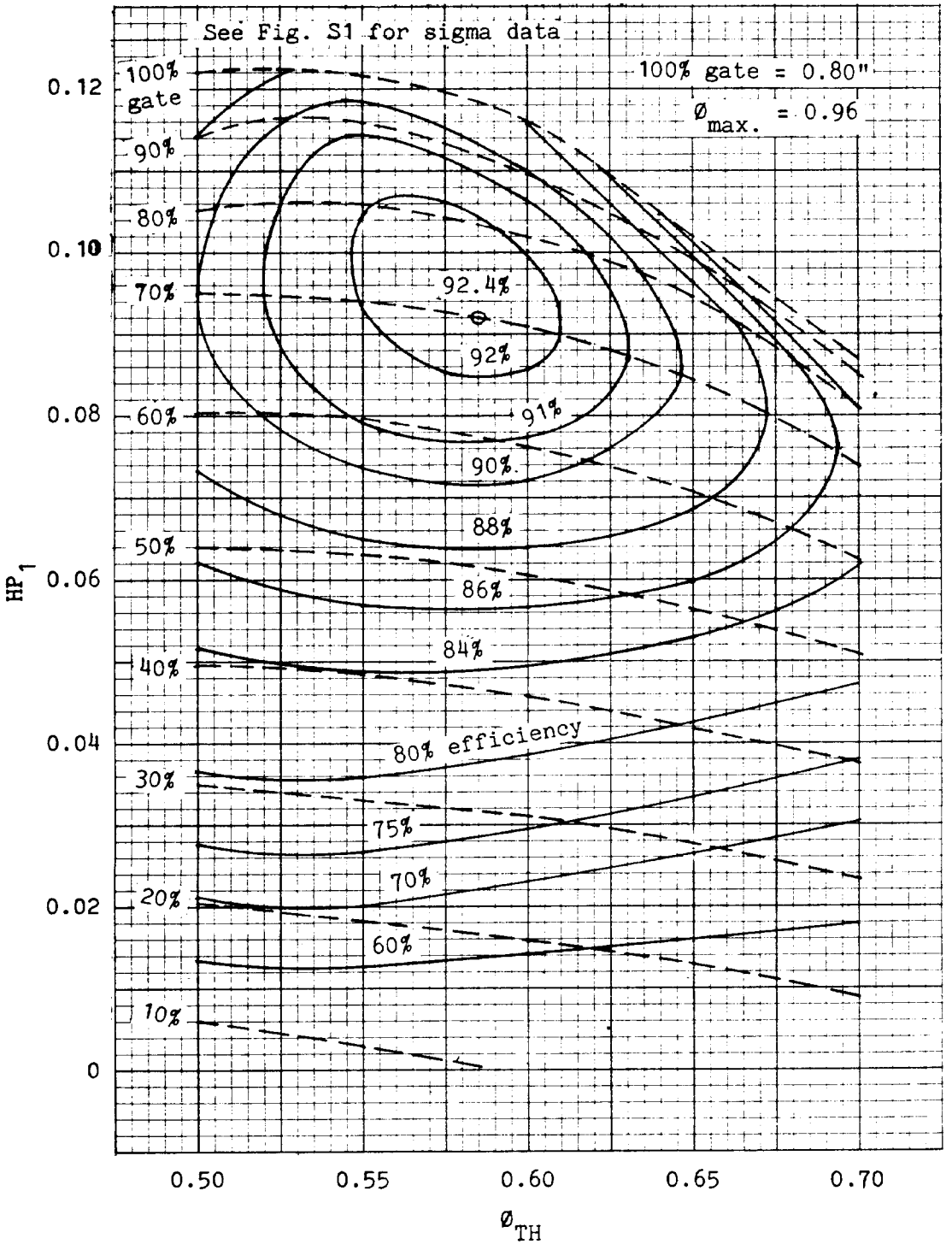

Figure F1. MODEL TEST DATA - FRANCIS TURBINE

D_{TH} = 12" ONE FOOT HEAD N_s = 27.2

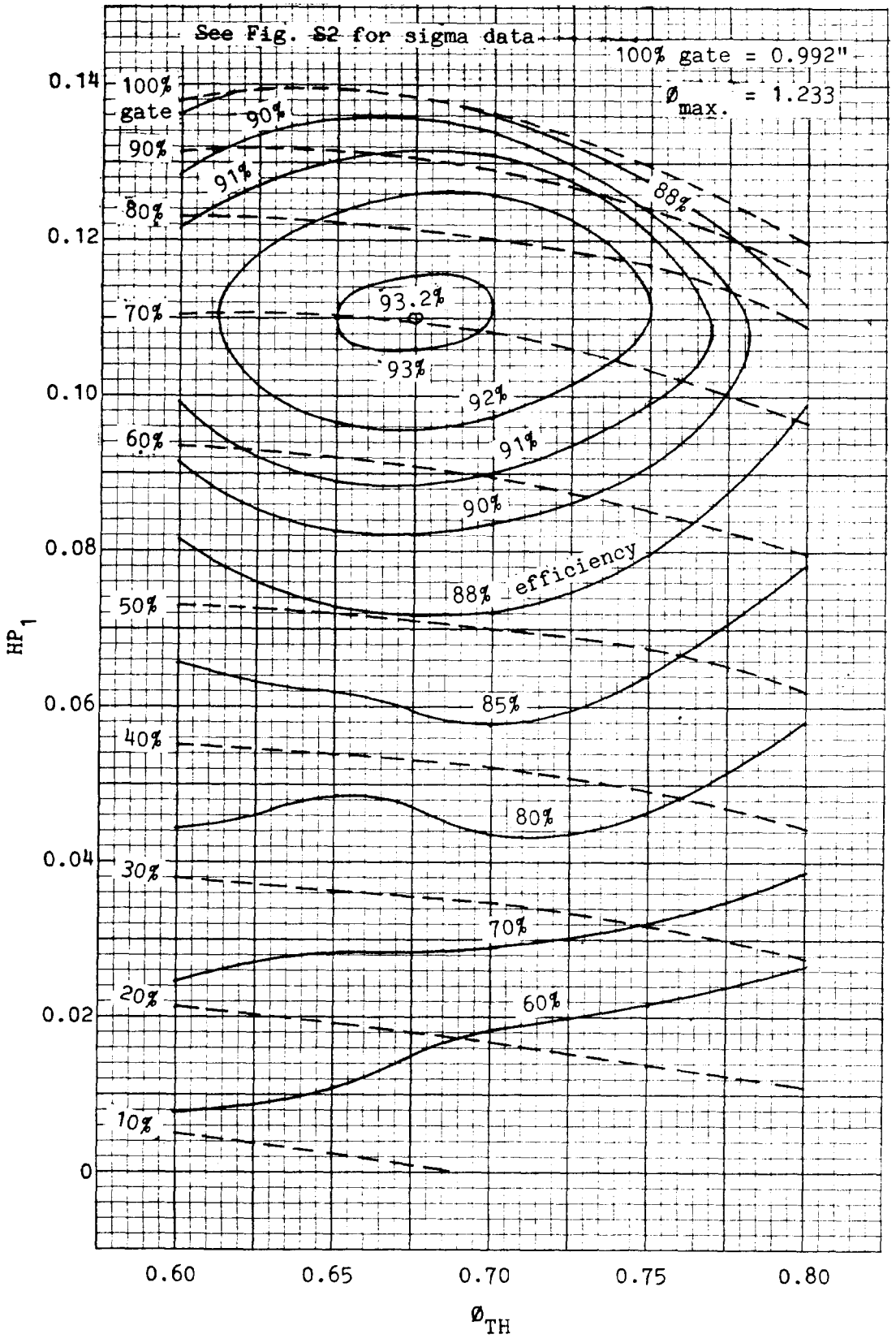

Figure F2. MODEL TEST DATA - FRANCIS TURBINE

D_{TH} = 12" ONE FOOT HEAD N_S = 34.3

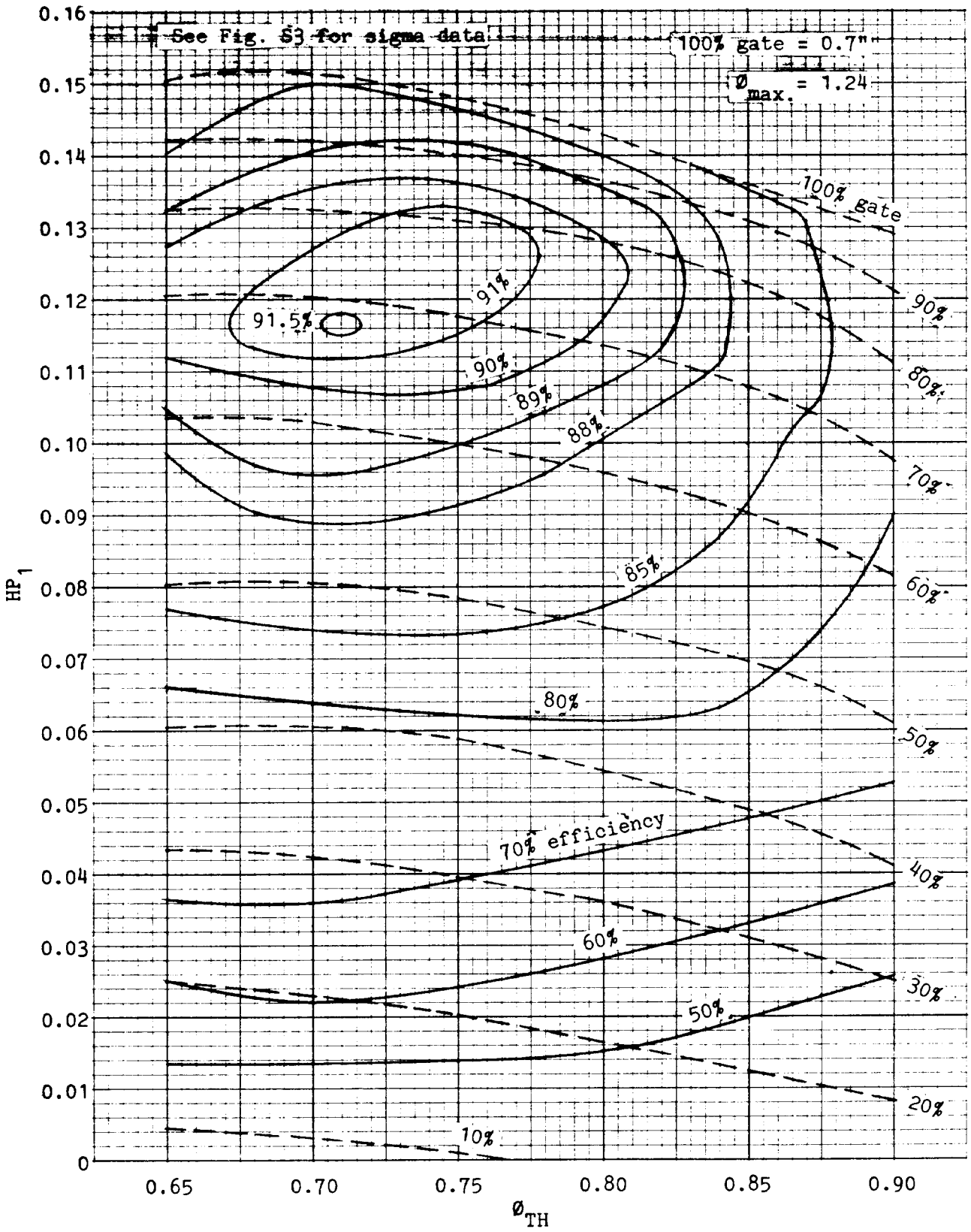

Figure F3. MODEL TEST DATA - FRANCIS TURBINE

D_{TH} = 12" ONE FOOT HEAD N_s = 37.2

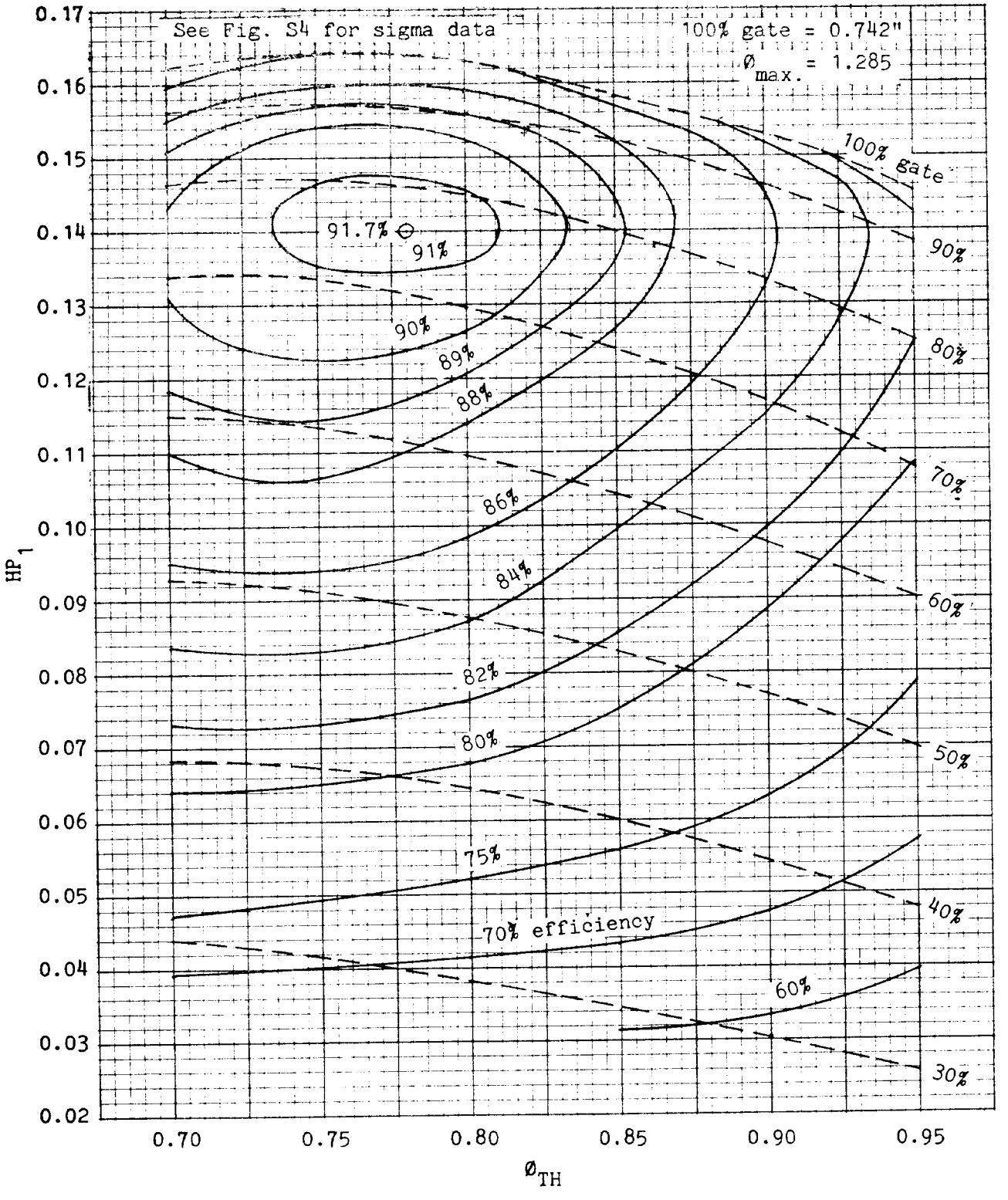

Figure F4. MODEL TEST DATA - FRANCIS TURBINE

D_{TH} = 12" ONE FOOT HEAD N_S = 44.7

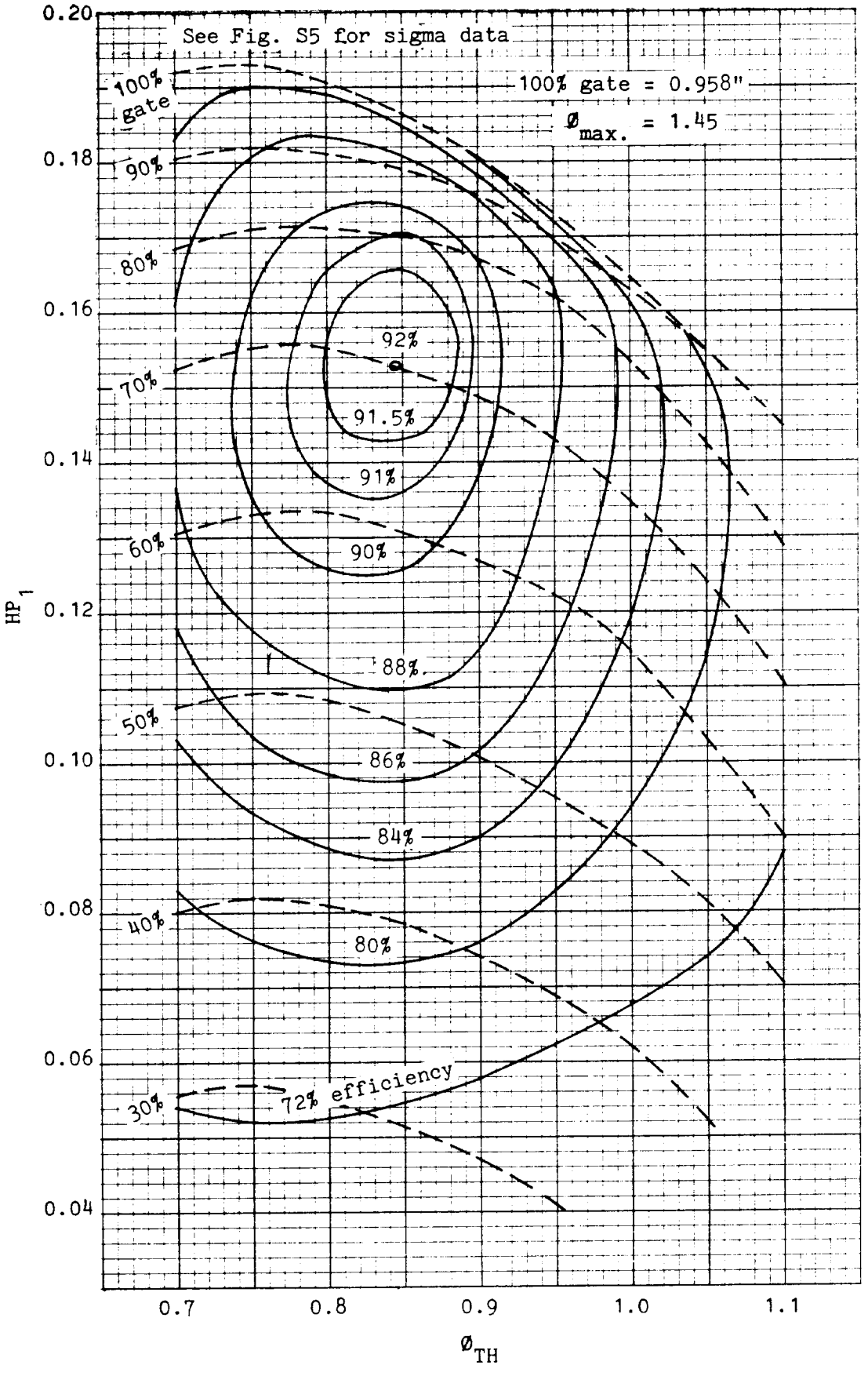

Figure F5. MODEL TEST DATA - FRANCIS TURBINE

D_{TH} = 12" ONE FOOT HEAD N_S = 50.6

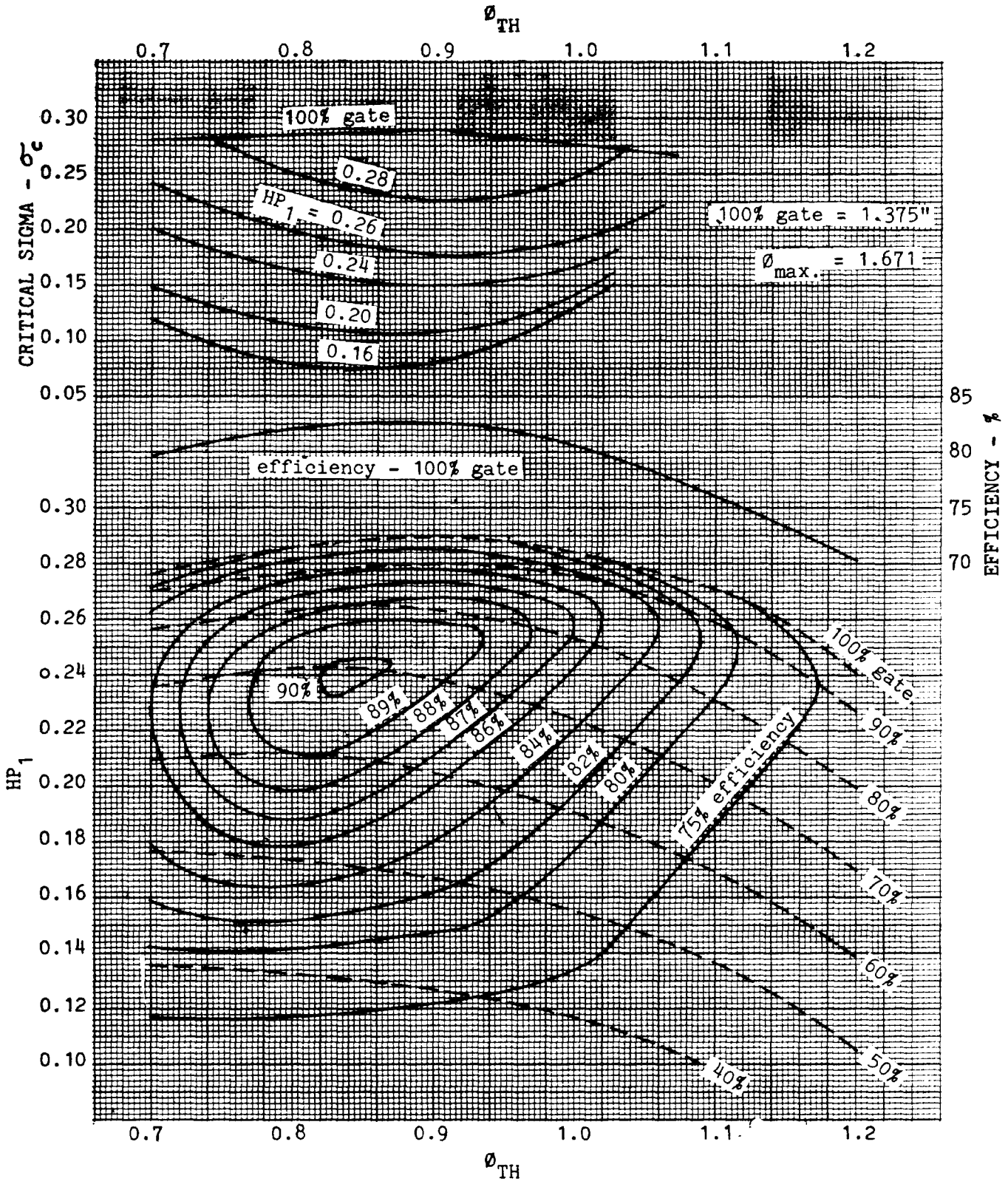

Figure F6. MODEL TEST DATA - FRANCIS TURBINE

D_{TH} = 12" ONE FOOT HEAD N_s = 63.1

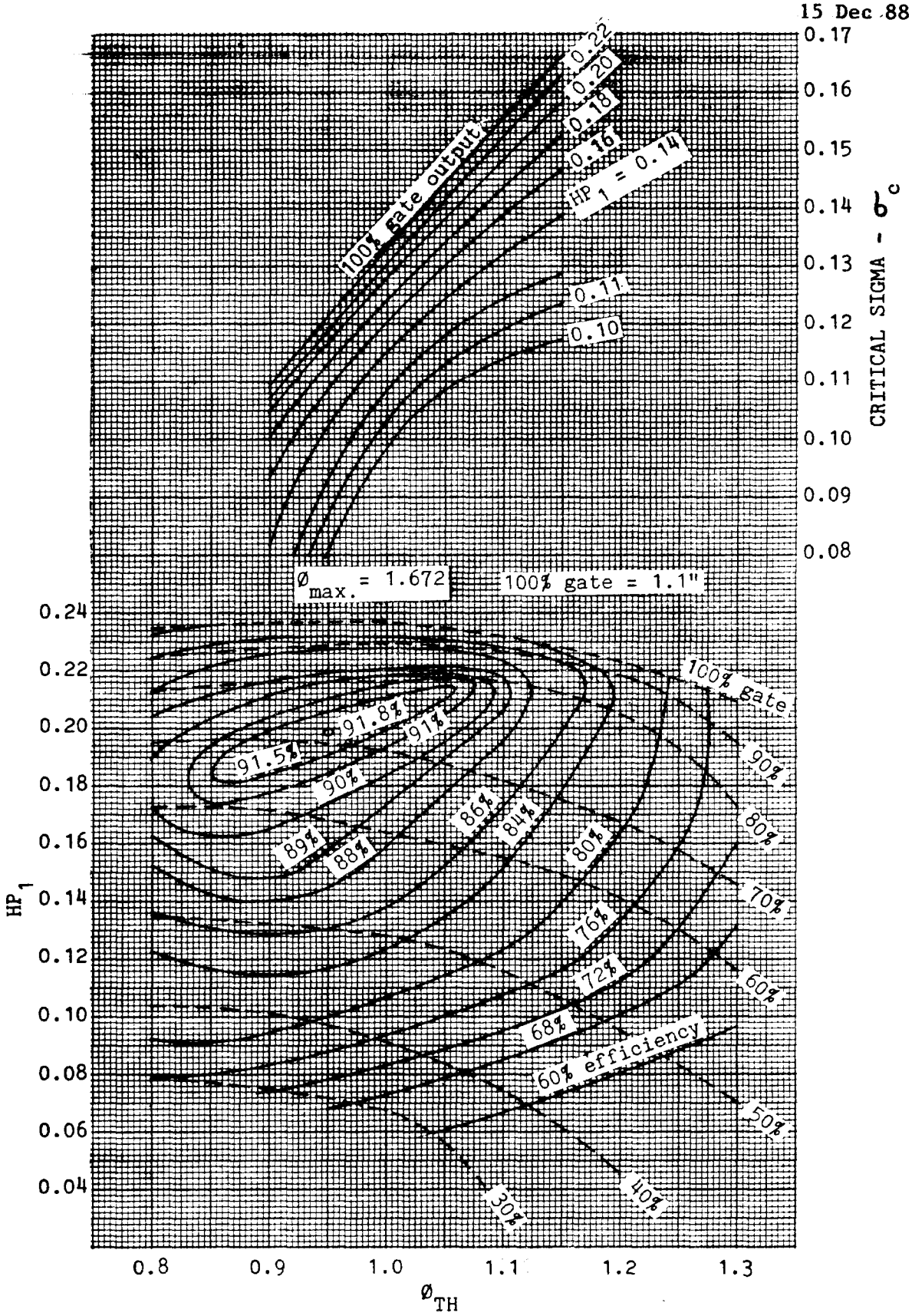

Figure F7. MODEL TEST DATA - FRANCIS TURBINE

D_{TH} = 12" ONE FOOT HEAD N_s = 65

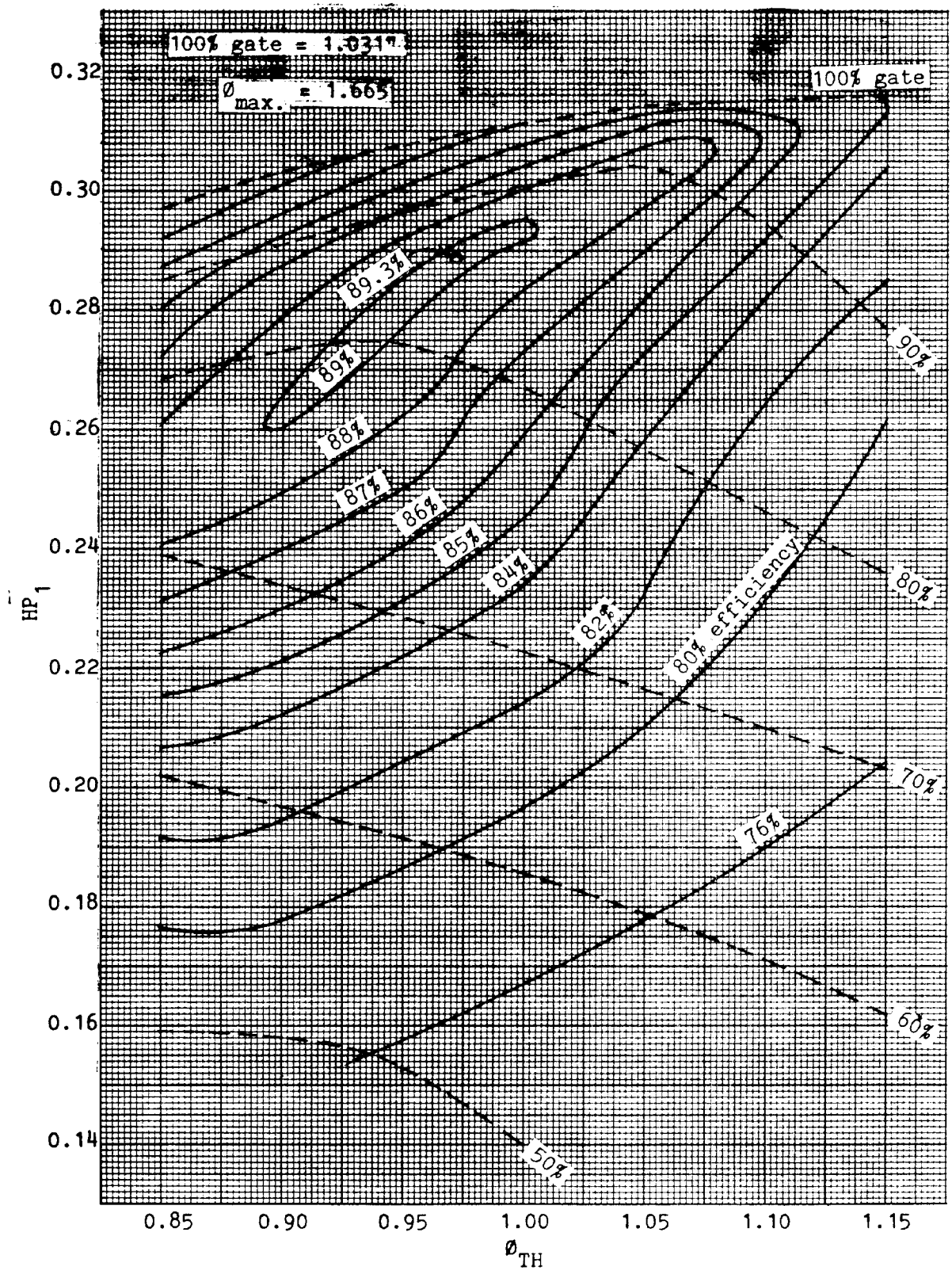

Figure F8. MODEL TEST DATA - FRANCIS TURBINE

D_{TH} = 12" ONE FOOT HEAD N_s = 80

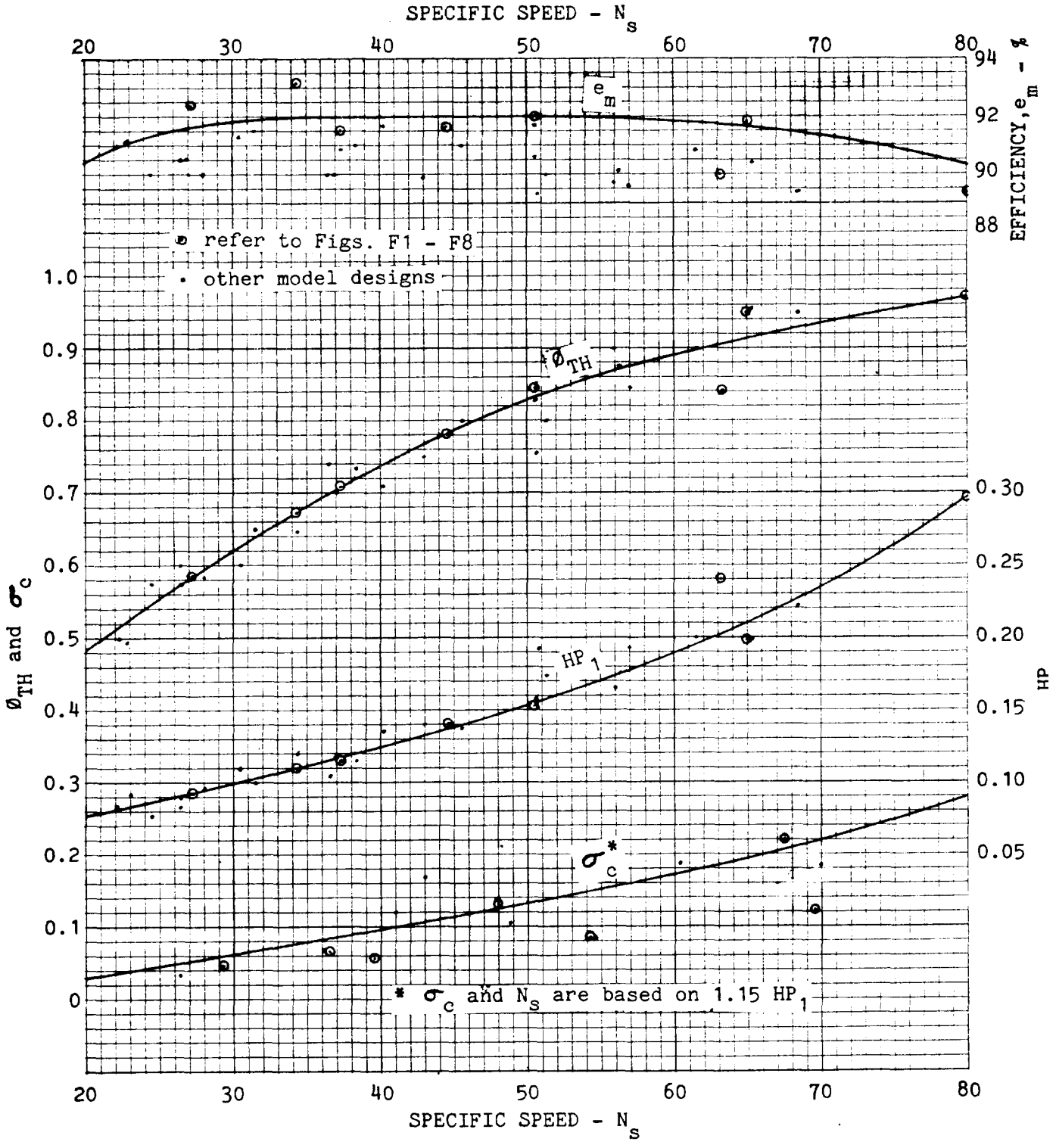

Figure F9. FRANCIS TURBINES; PERFORMANCE HILL DATA - BEST PHI CONDITIONS. D_{TH} = 12" ONE FOOT HEAD

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SECTION II

FRANCIS PUMP-TURBINE MODEL TEST CURVES FOR D_{TH}= 12 INCHES AND H = 1 FOOT

FIGURE	DESCRIPTION	PAGE
PT1	N_S = 2,170	D-15
PT2	N_S = 3,160	D-16
PT3	N_S = 4,670	D-17

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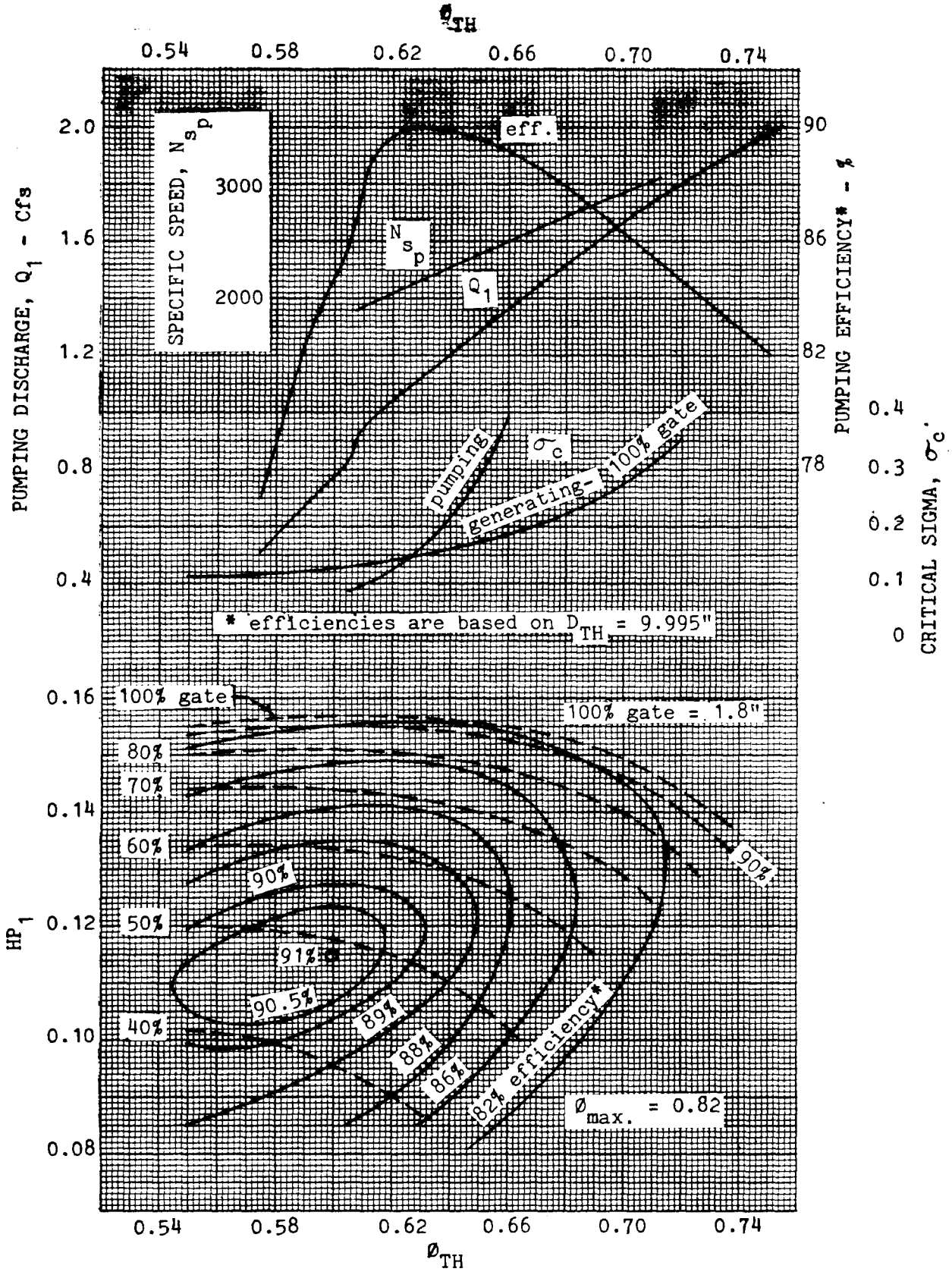

Figure PT1. MODEL TEST DATA - FRANCIS PUMP-TURBINE

D_{TH} = 12" ONE FOOT HEAD N_S = 2,170

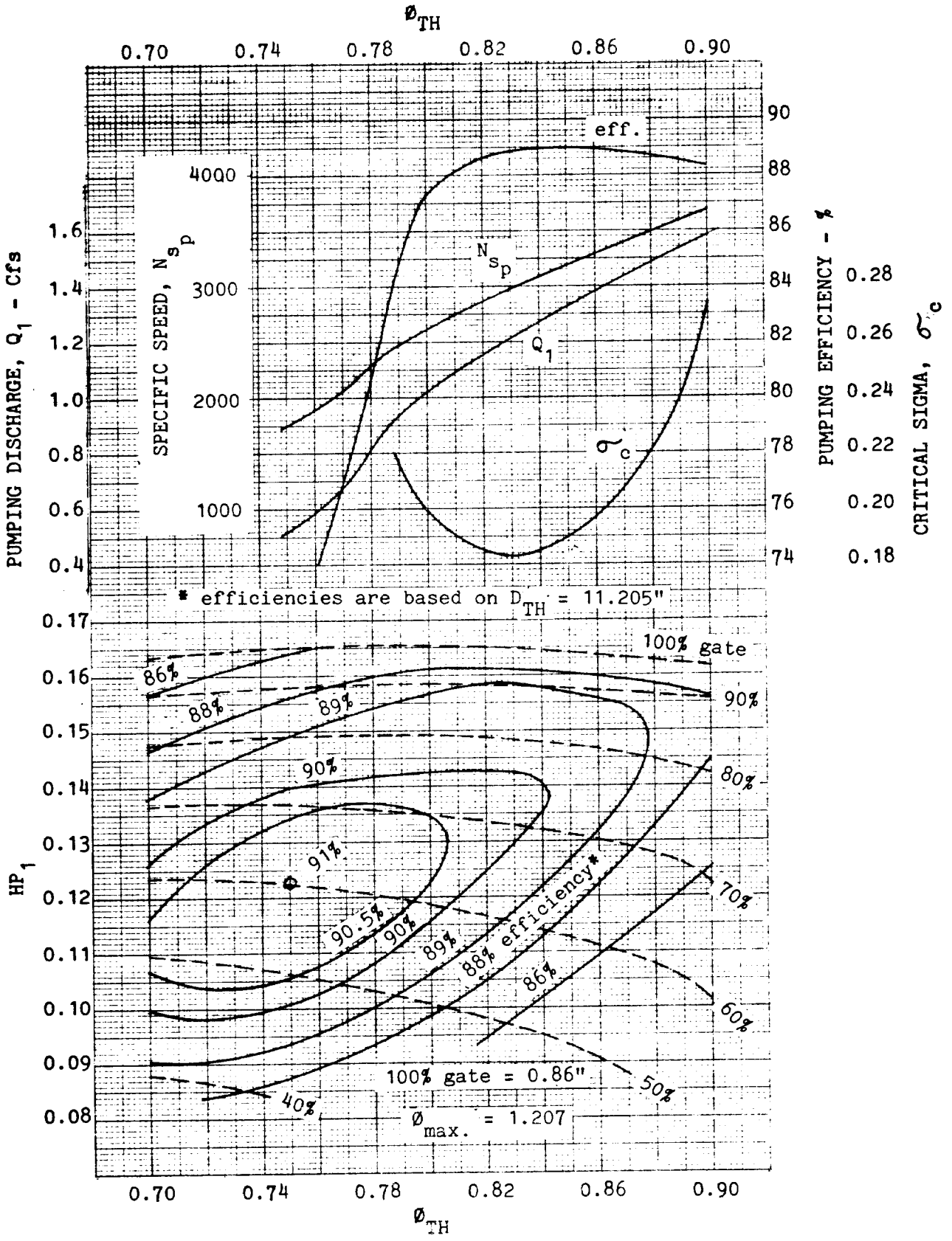

Figure PT2. MODEL TEST DATA - FRANCIS PUMP-TURBINE
D_{TH} = 12" ONE FOOT HEAD N_S = 3,160

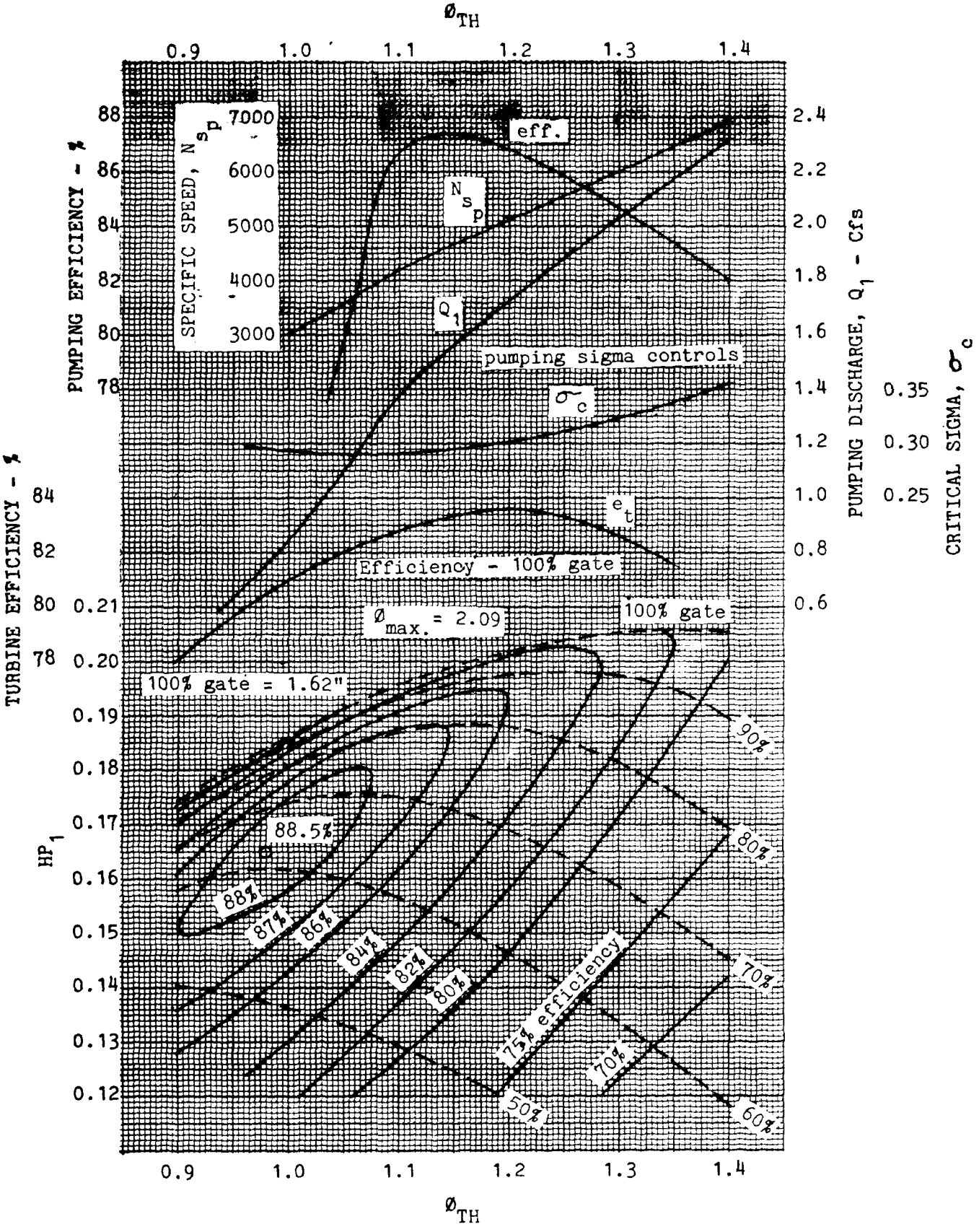

Figure PT3. MODEL TEST DATA - FRANCIS PUMP-TURBINE

D_{TH} = 12" ONE FOOT HEAD N_S = 4,670

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SECTION III

PROPELLER TURBINE MODEL TEST CURVES FOR D_{TH}= 12 INCHES AND H = 1 FOOT

FIGURE	DESCRIPTION	PAGE
FB1	FOUR BLADES FIXED AT 24° BLADE ANGLE	D-21
FB2	FIVE BLADES FIXED AT 31° BLADE ANGLE	D-22
FB3	SIX BLADES FIXED AT 27° BLADE ANGLE	D-23
K1	FOUR BLADE KAPLAN TURBINE	D-24
K2	FIVE BLADE KAPLAN TURBINE	D-25
K3	SIX BLADE KAPLAN TURBINE	D-26

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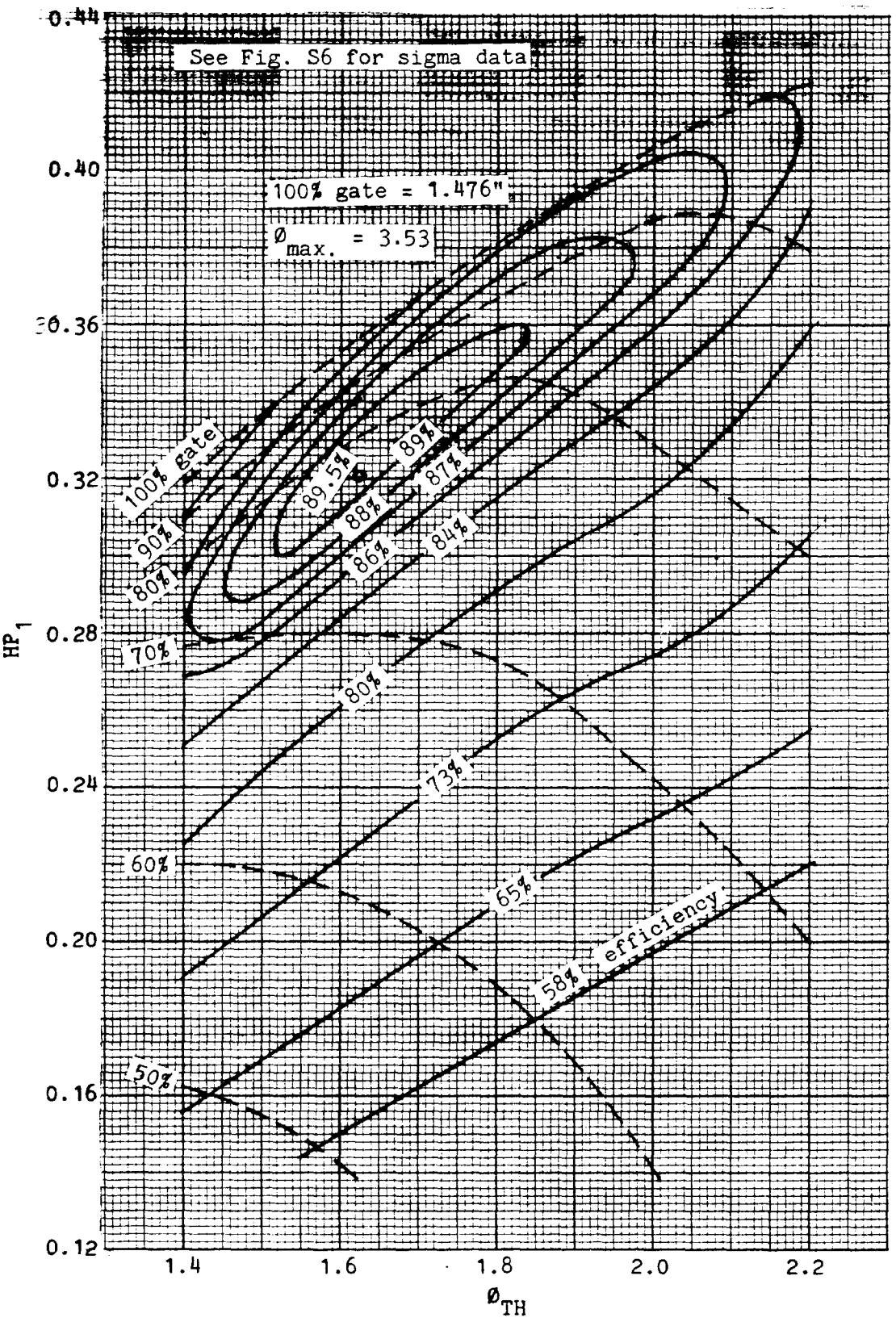

Figure FB1. MODEL TEST DATA - FIXED BLADE PROPELLER TURBINE
FOUR BLADES 24^{o} BLADE ANGLE
D_{TH} = 12" ONE FOOT HEAD

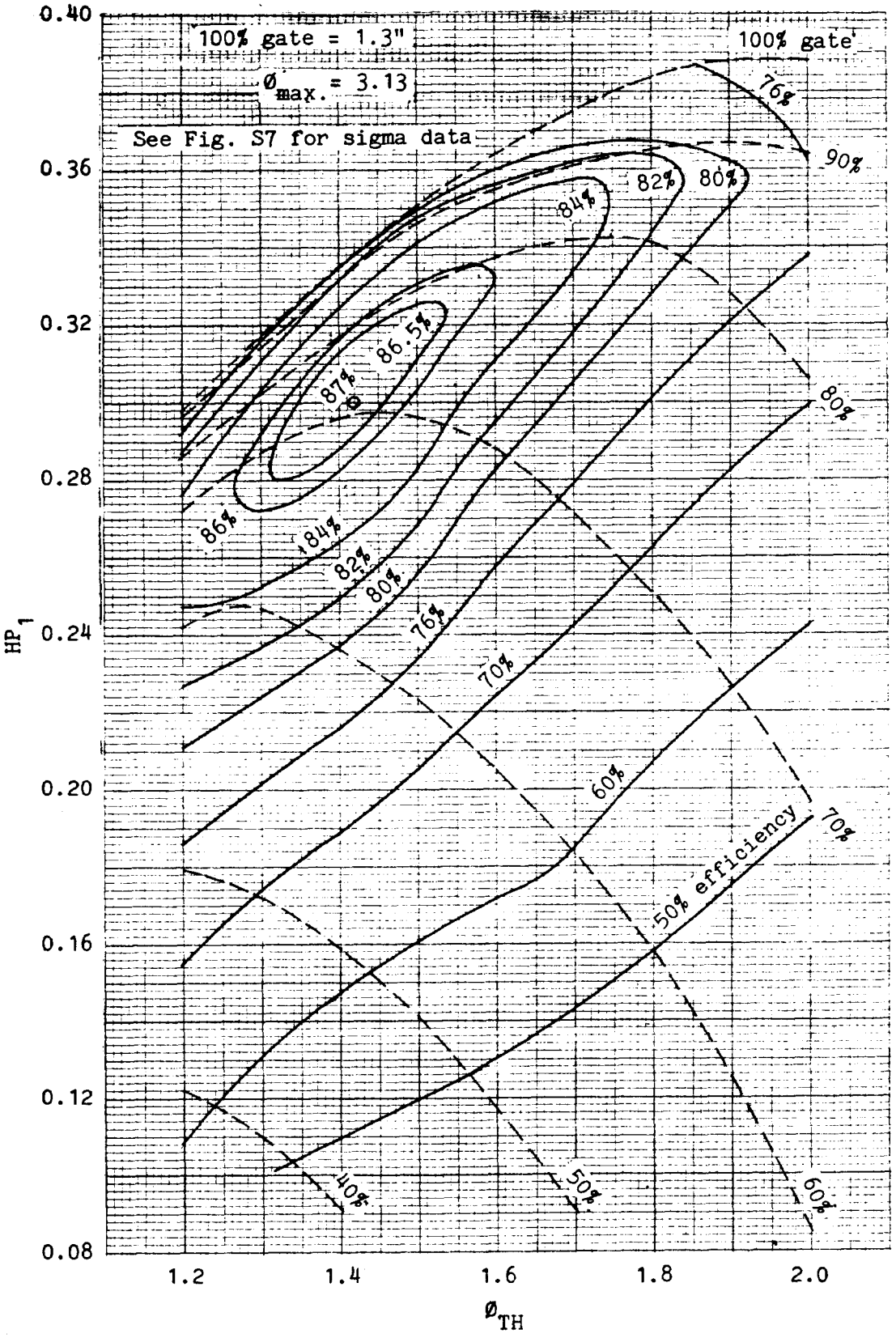

Figure FB2. MODEL TEST DATA - FIXED BLADE PROPELLER TURBINE
FIVE BLADES 31° BLADE ANGLE
D_{TH} = 12 " ONE FOOT HEAD

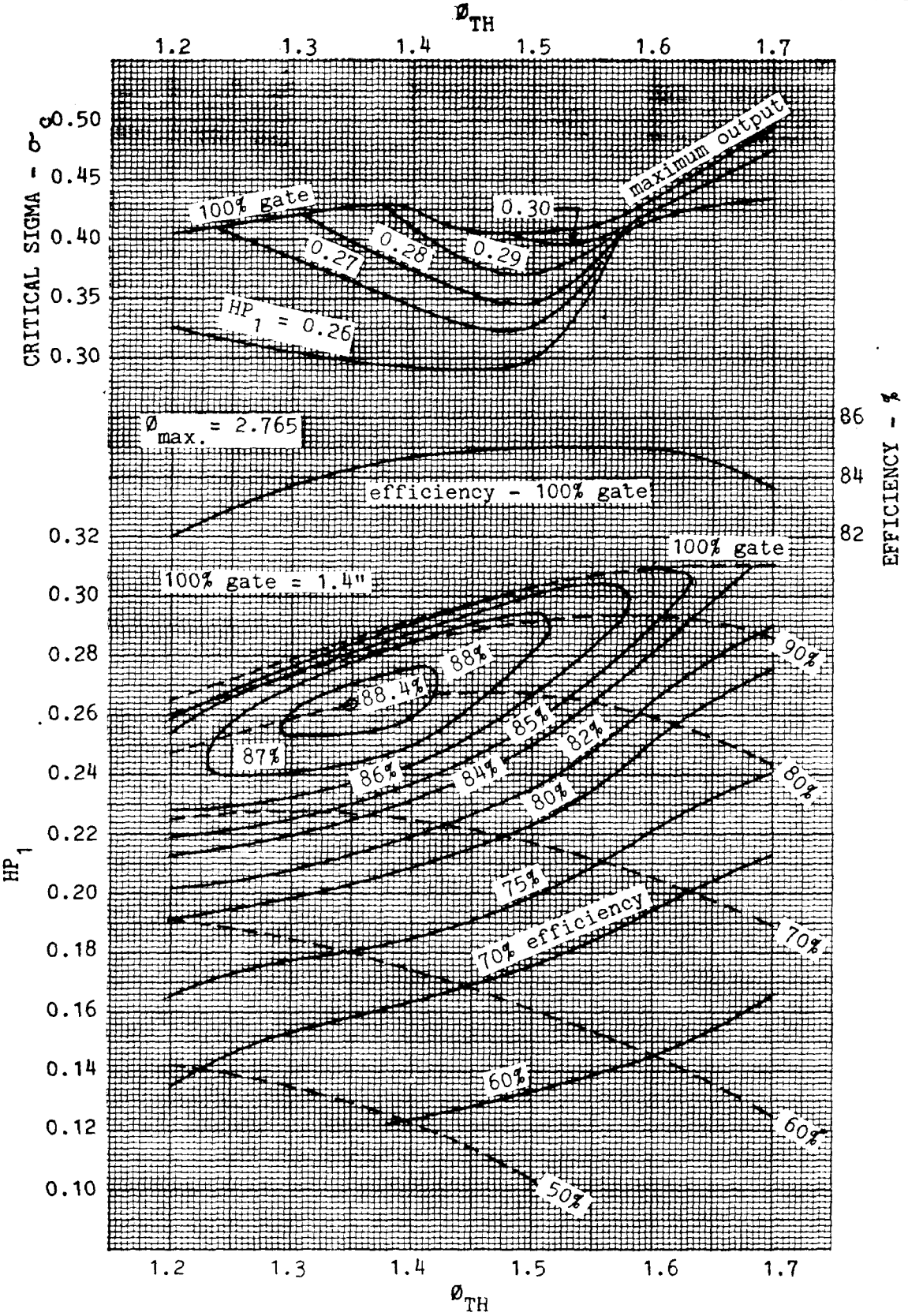

Figure FB3. MODEL TEST DATA - FIXED BLADE PROPELLER TURBINE
SIX BLADES 27^{o} BLADE ANGLE
D_{TH} = 12" ONE FOOT HEAD

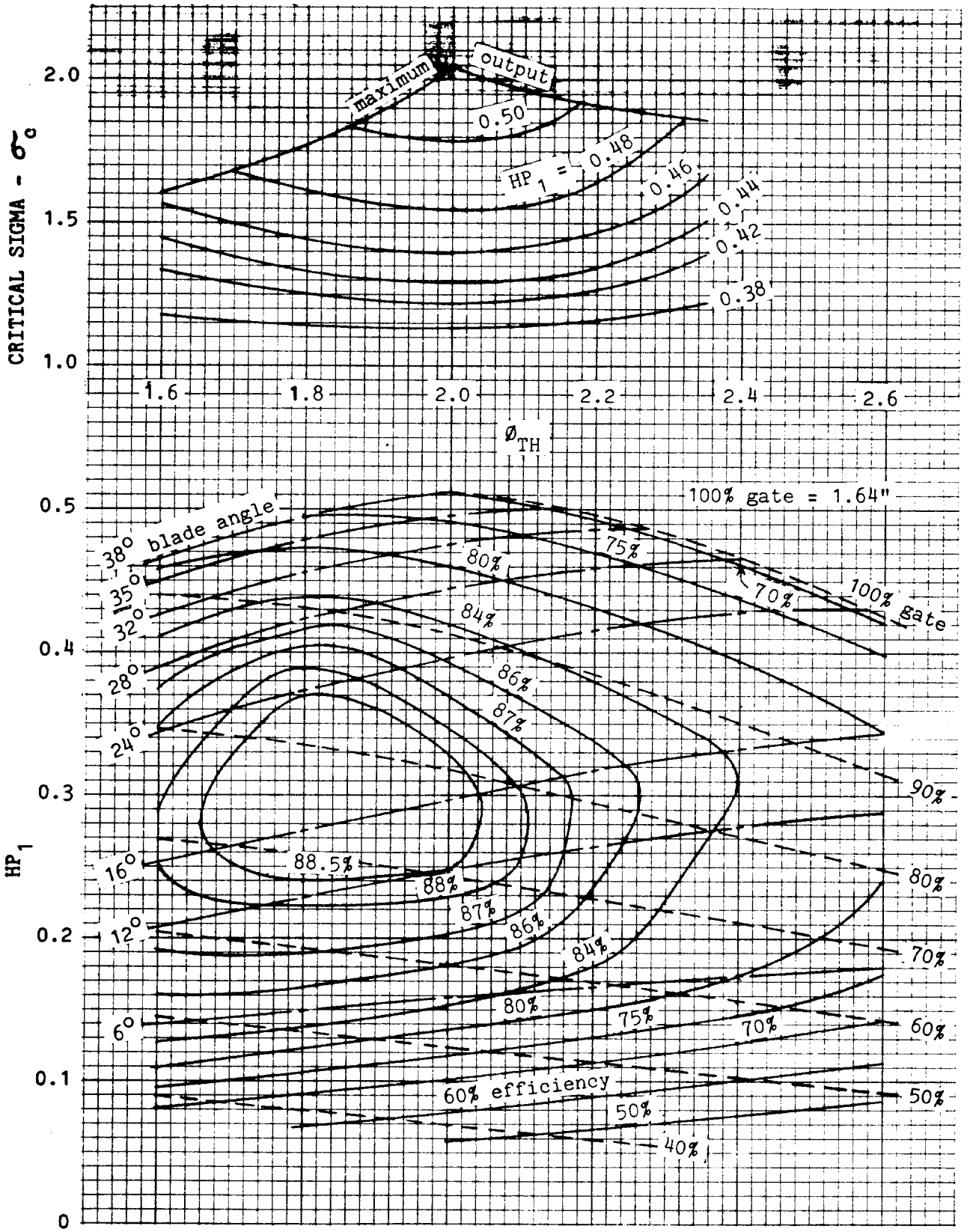

Figure K1. MODEL TEST DATA - FOUR BLADE KAPLAN TURBINE

D_{TH} = 12" ONE FOOT HEAD

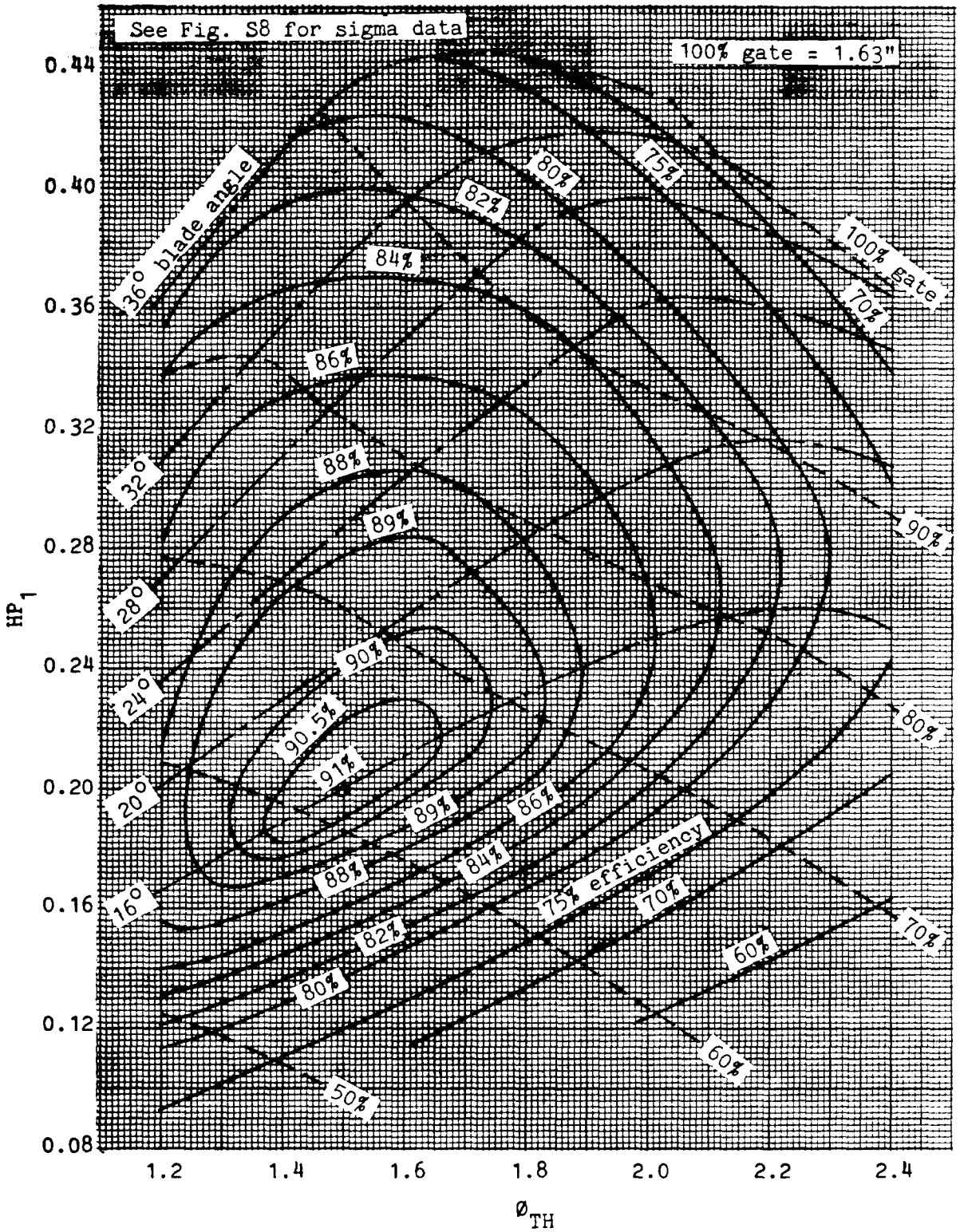

Figure K2. MODEL TEST DATA - FIVE BLADE KAPLAN TURBINE

D_{TH} = 12" ONE FOOT HEAD

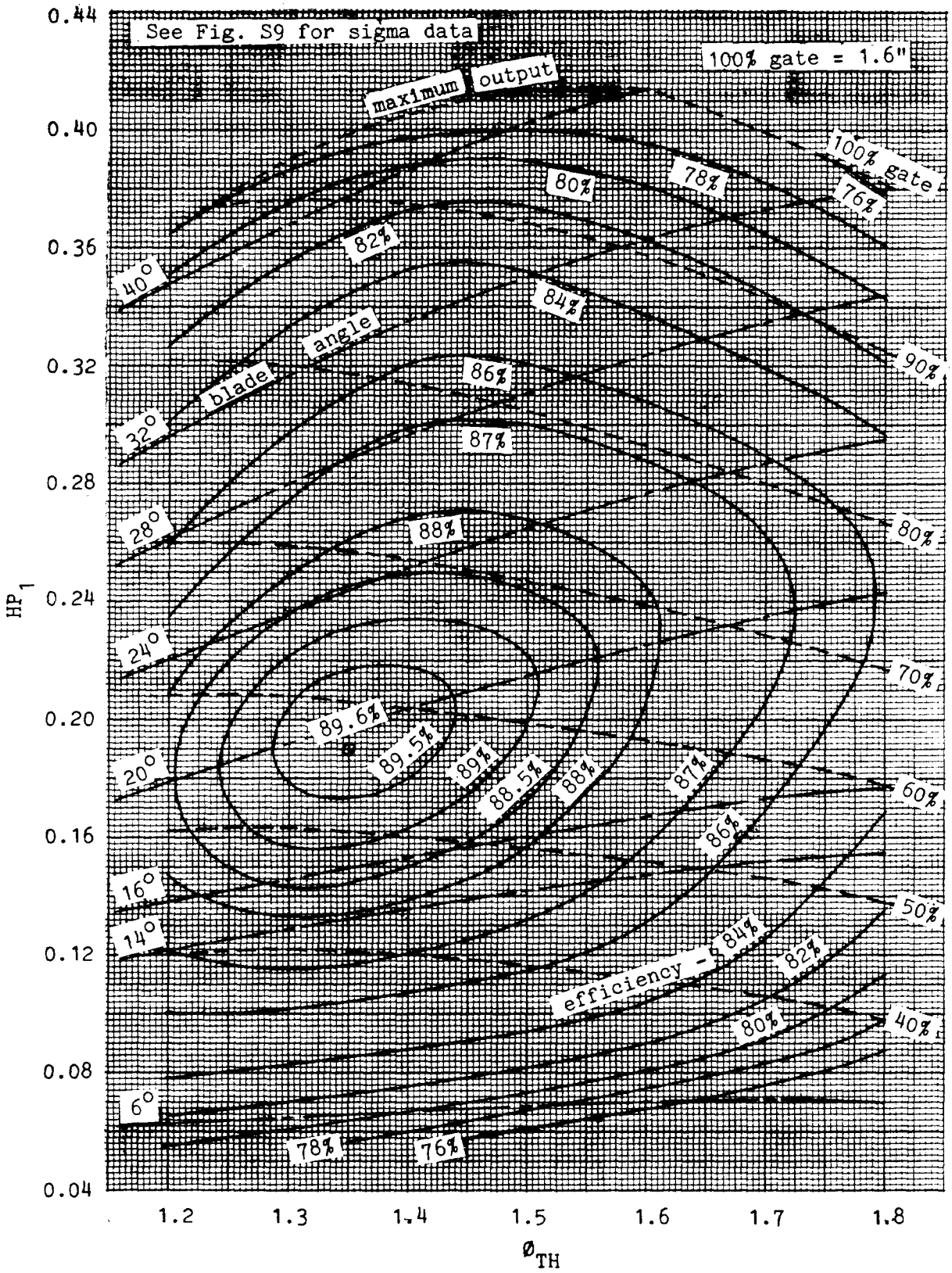

Figure K3. MODEL TEST DATA - SIX BLADE KAPLAN TURBINE

D_{TH} = 12" ONE FOOT HEAD

SECTION IV

CRITICAL RUNNER SIGMAS

FIGURE	DESCRIPTION (FRANCIS)	PAGE
S1	REFERS TO FIGURE F1	D-29
S2	REFERS TO FIGURE F2	D-29
S3	REFERS TO FIGURE F3	D-30
S4	REFERS TO FIGURE F4	D-30
S5	REFERS TO FIGURE F5	D-31

FIGURE	DESCRIPTION (FIXED BLADE PROPELLER)	PAGE
S6	REFERS TO FIGURE FB1	D-32
S7	REFERS TO FIGURE FB2	D-32

FIGURE	DESCRIPTION (KAPLAN)	PAGE
S6	REFERS TO FIGURE K2	D-33
S7	REFERS TO FIGURE K3	D-34

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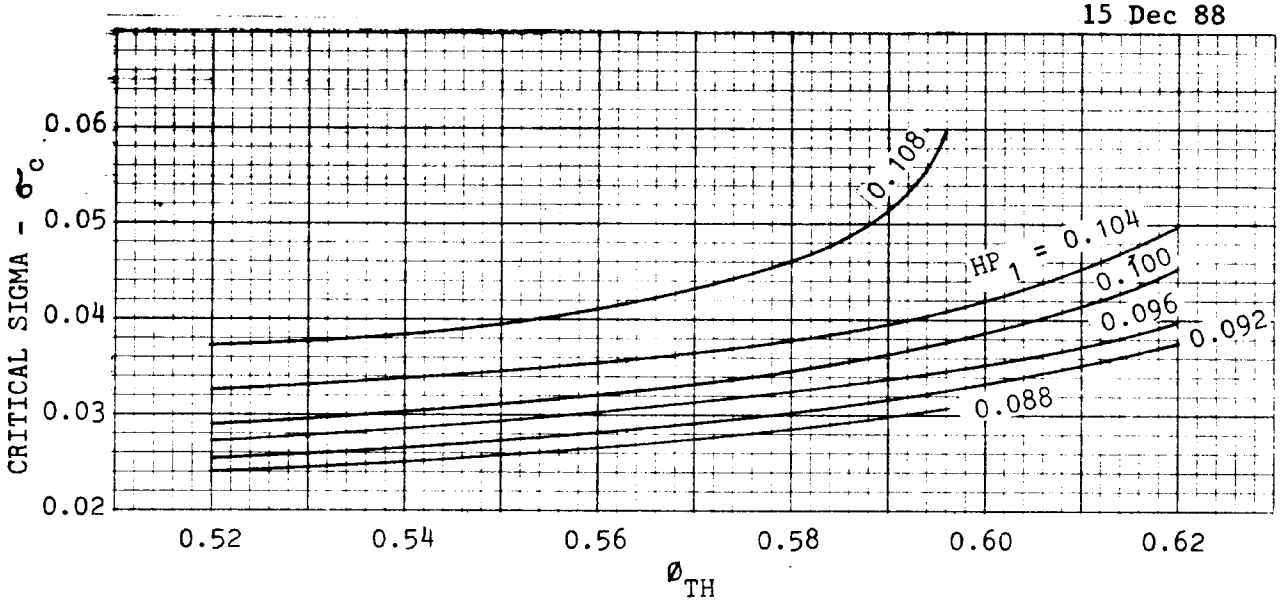


Figure S1

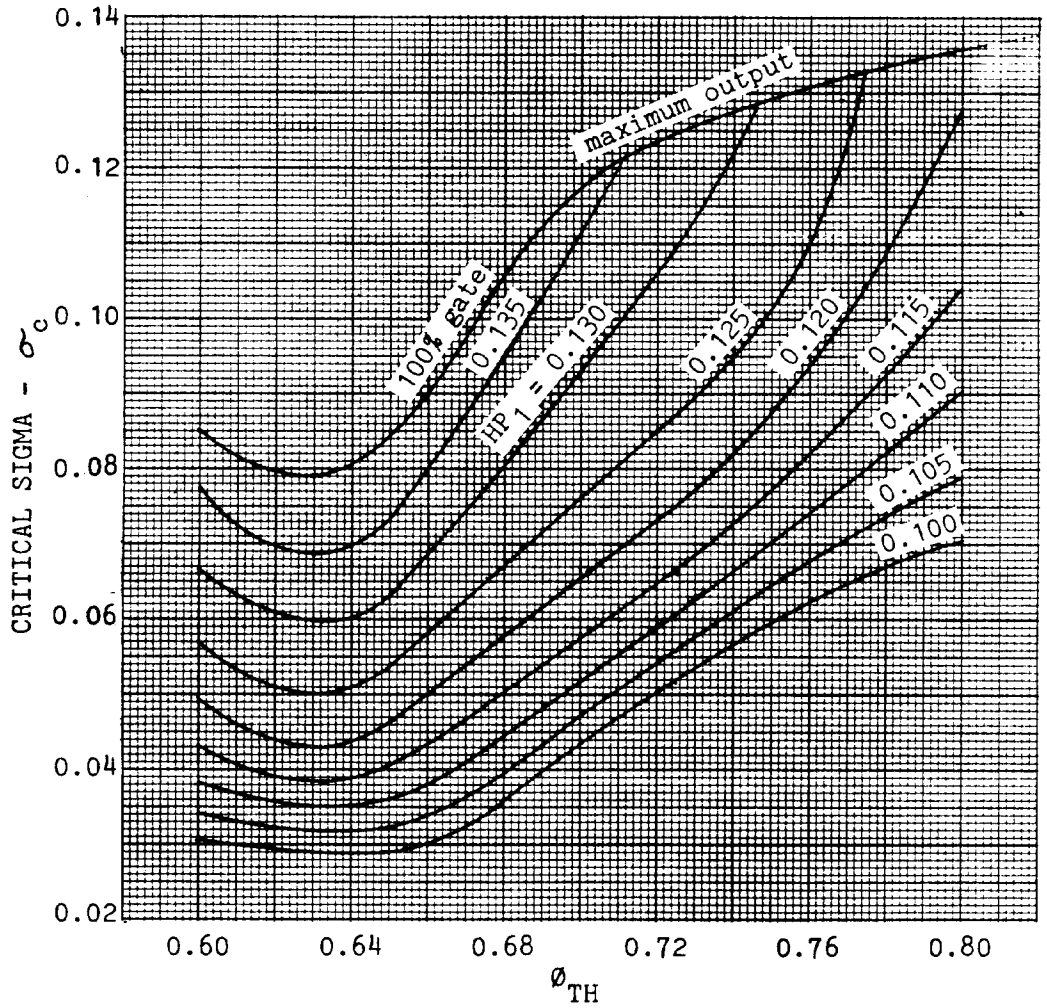


Figure S2

FRANCIS TURBINES

CRITICAL RUNNER SIGMAS

Figures S1 and S2

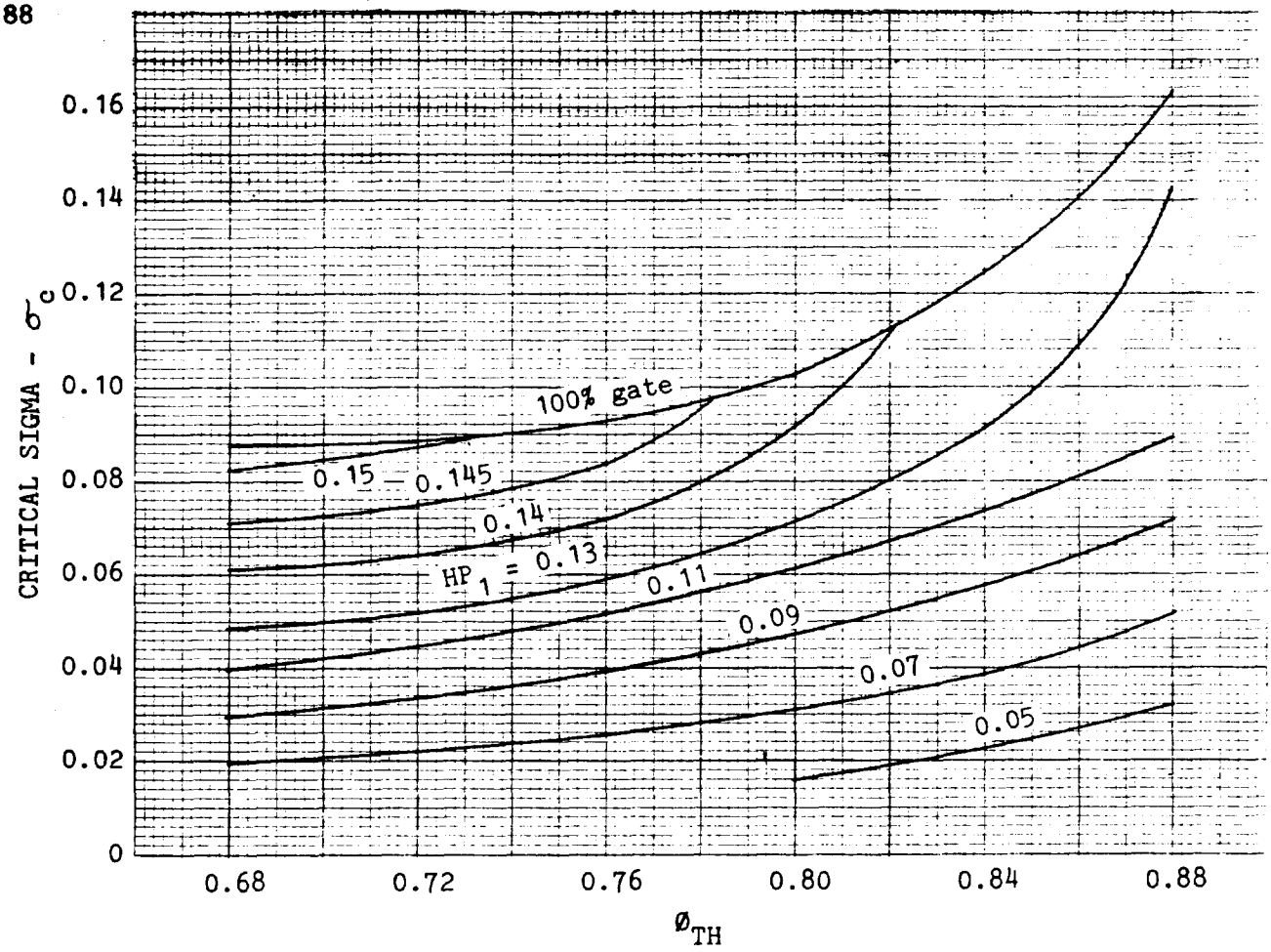


Figure S3

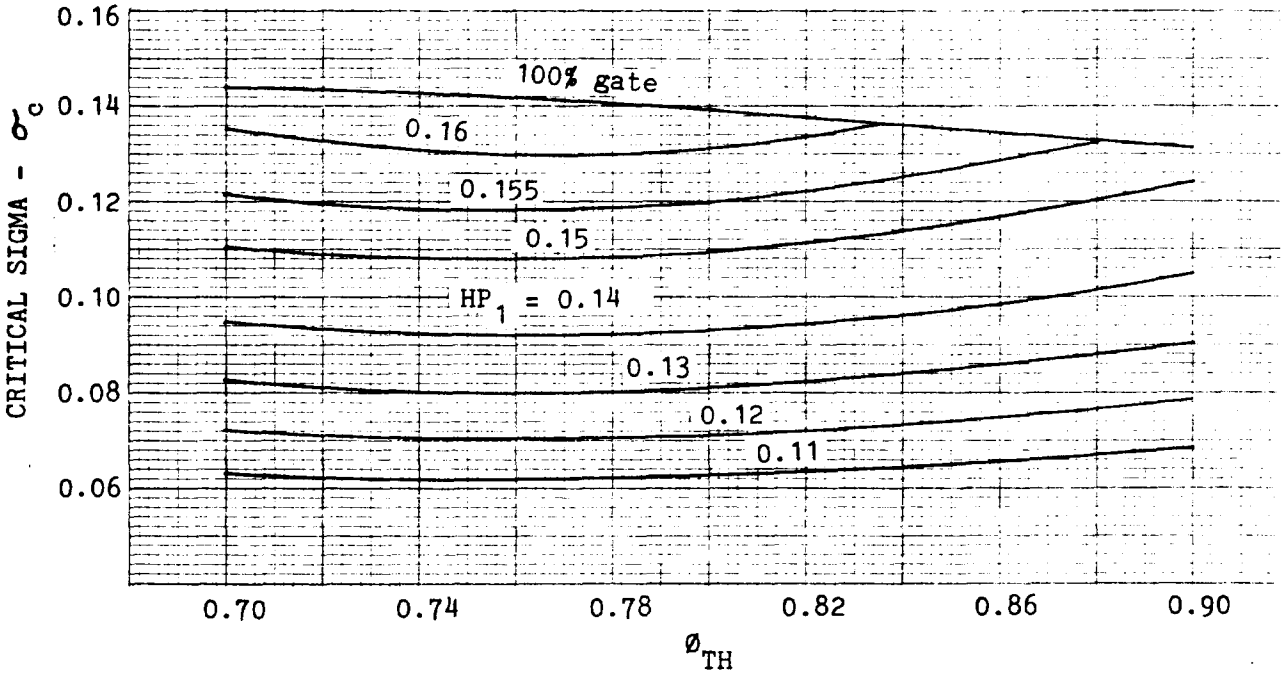
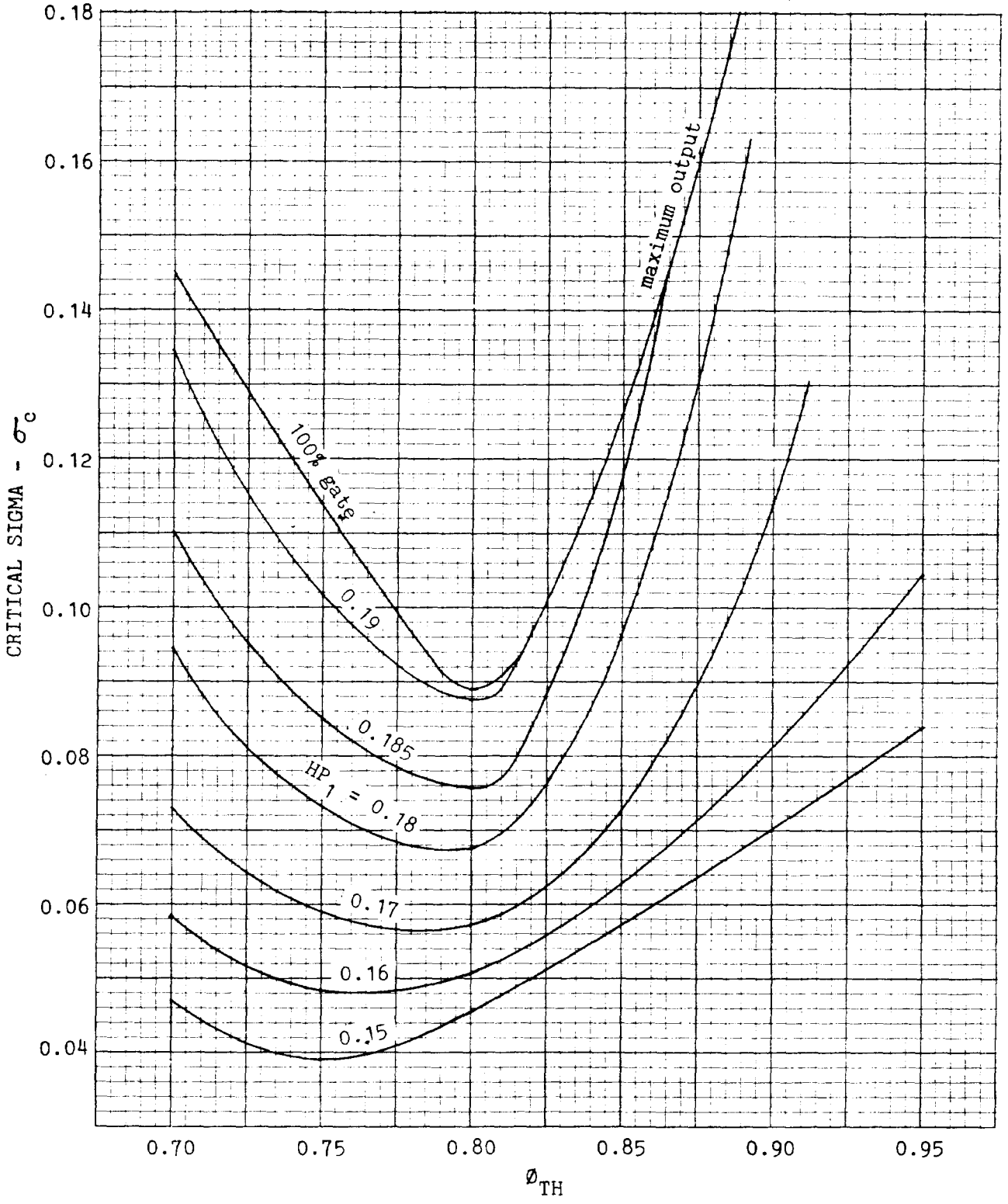


Figure S4

FRANCIS TURBINES

CRITICAL RUNNER SIGMAS

Figures S3 and S4



FRANCIS TURBINE

CRITICAL RUNNER SIGMAS

Figure S5

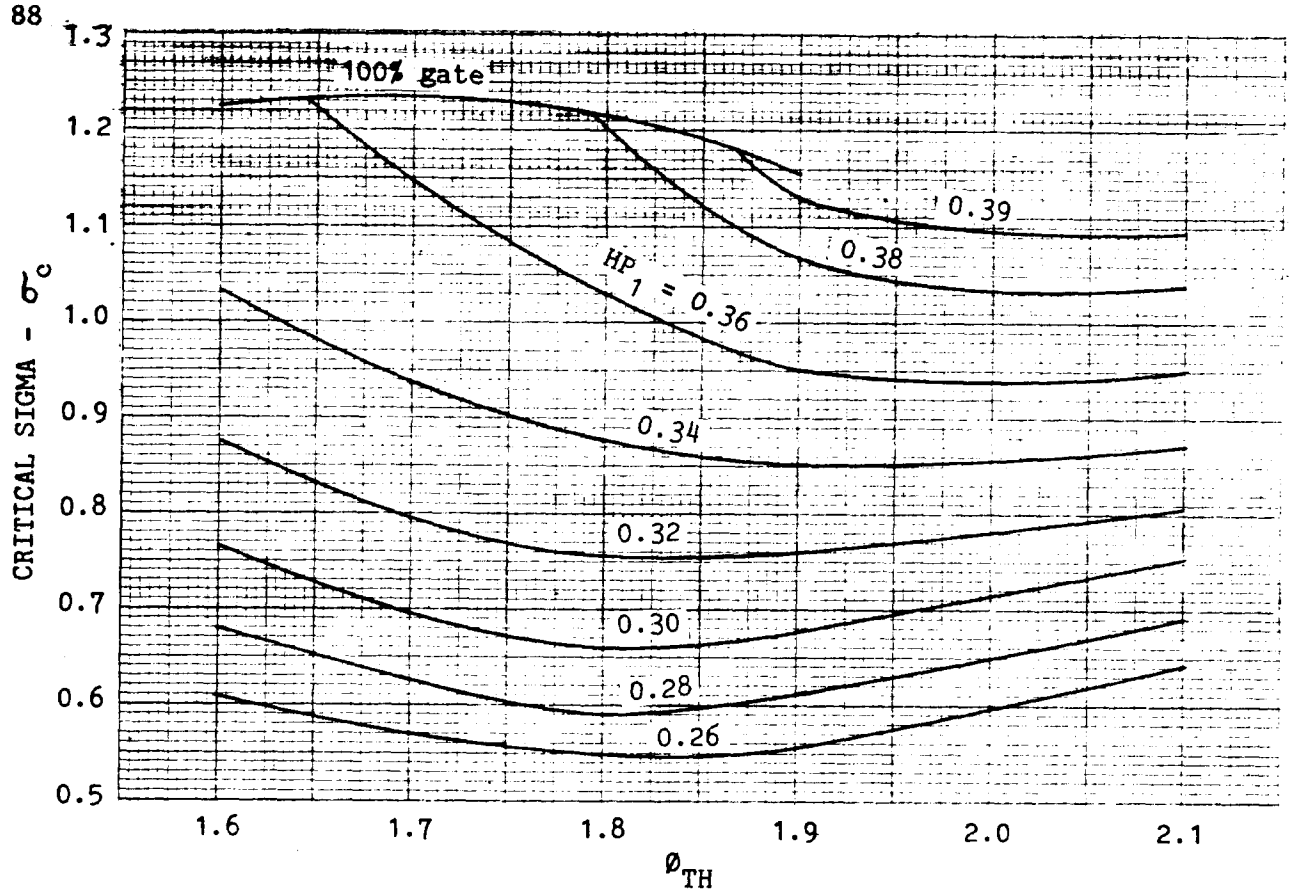


Figure S6

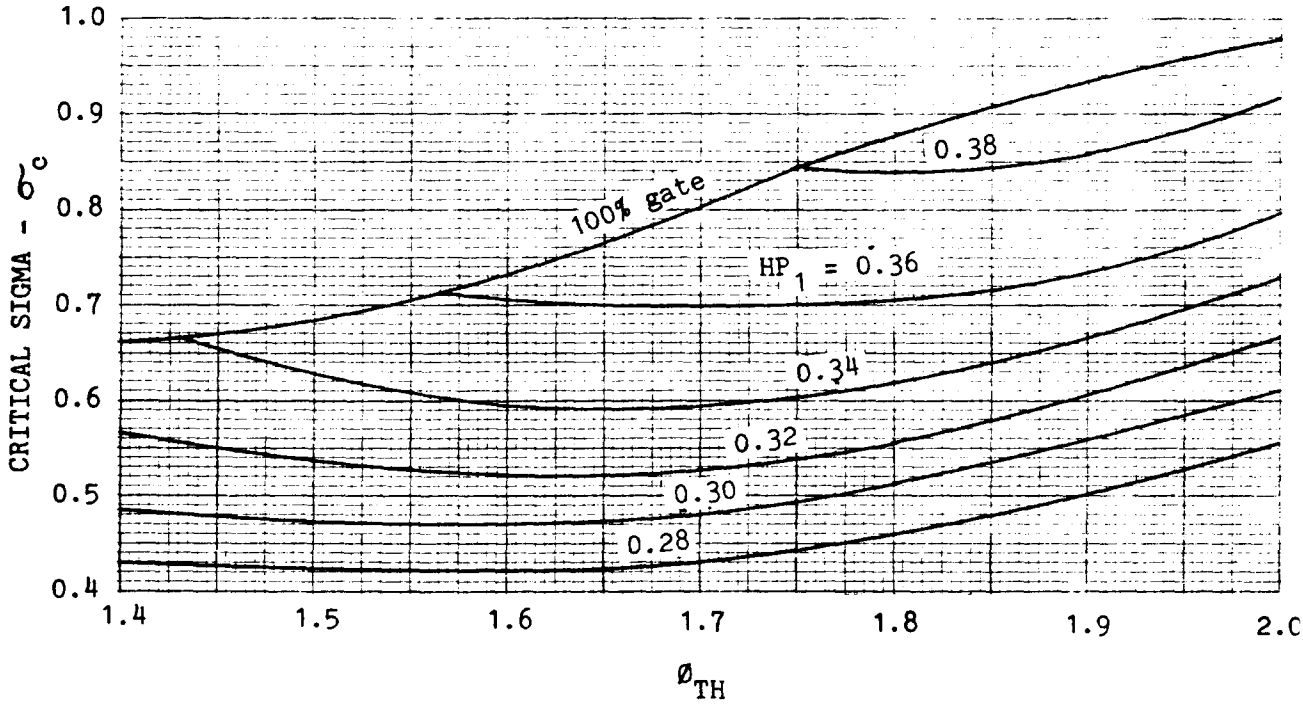
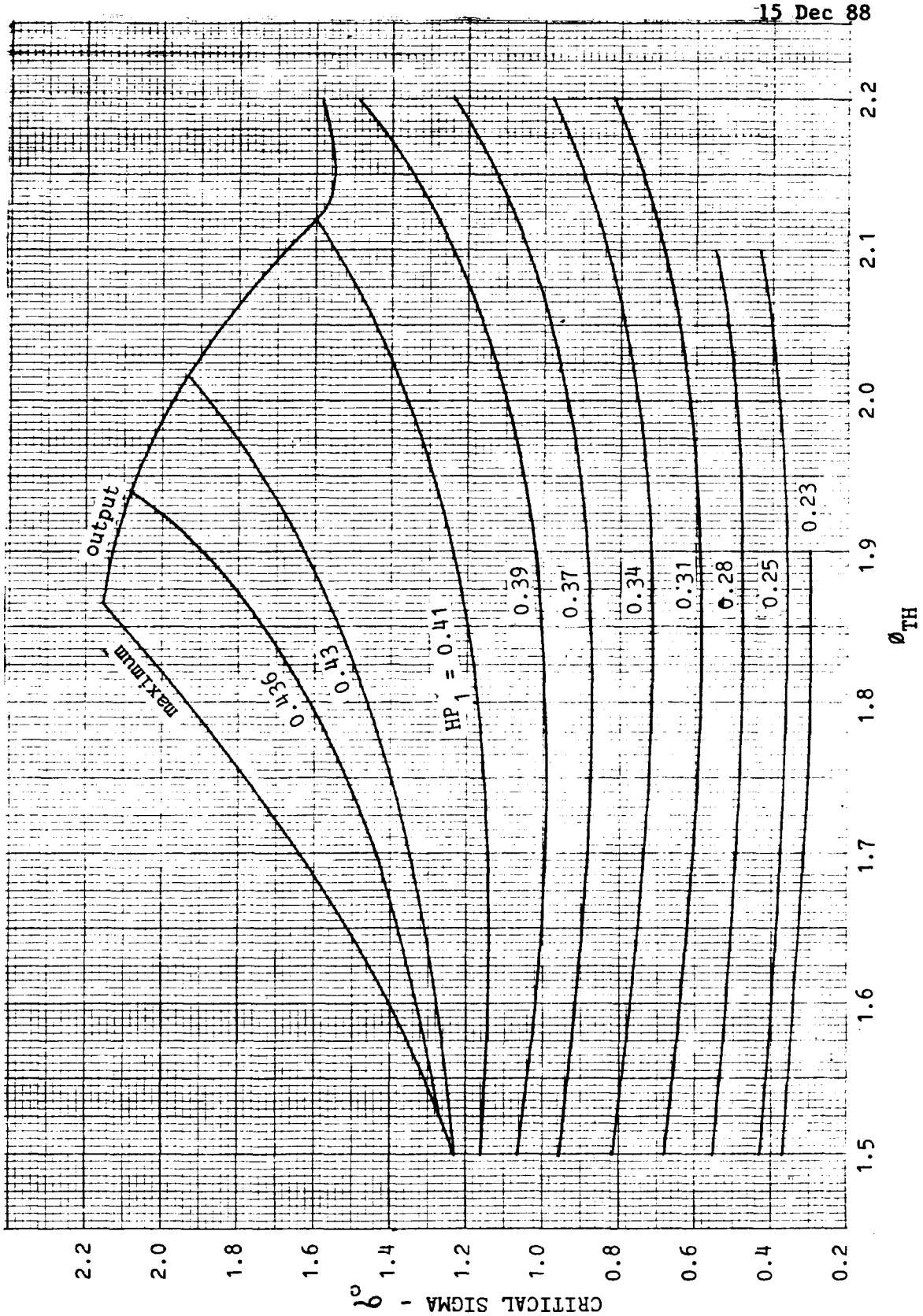


Figure S7

FIXED BLADE PROPELLER TURBINES

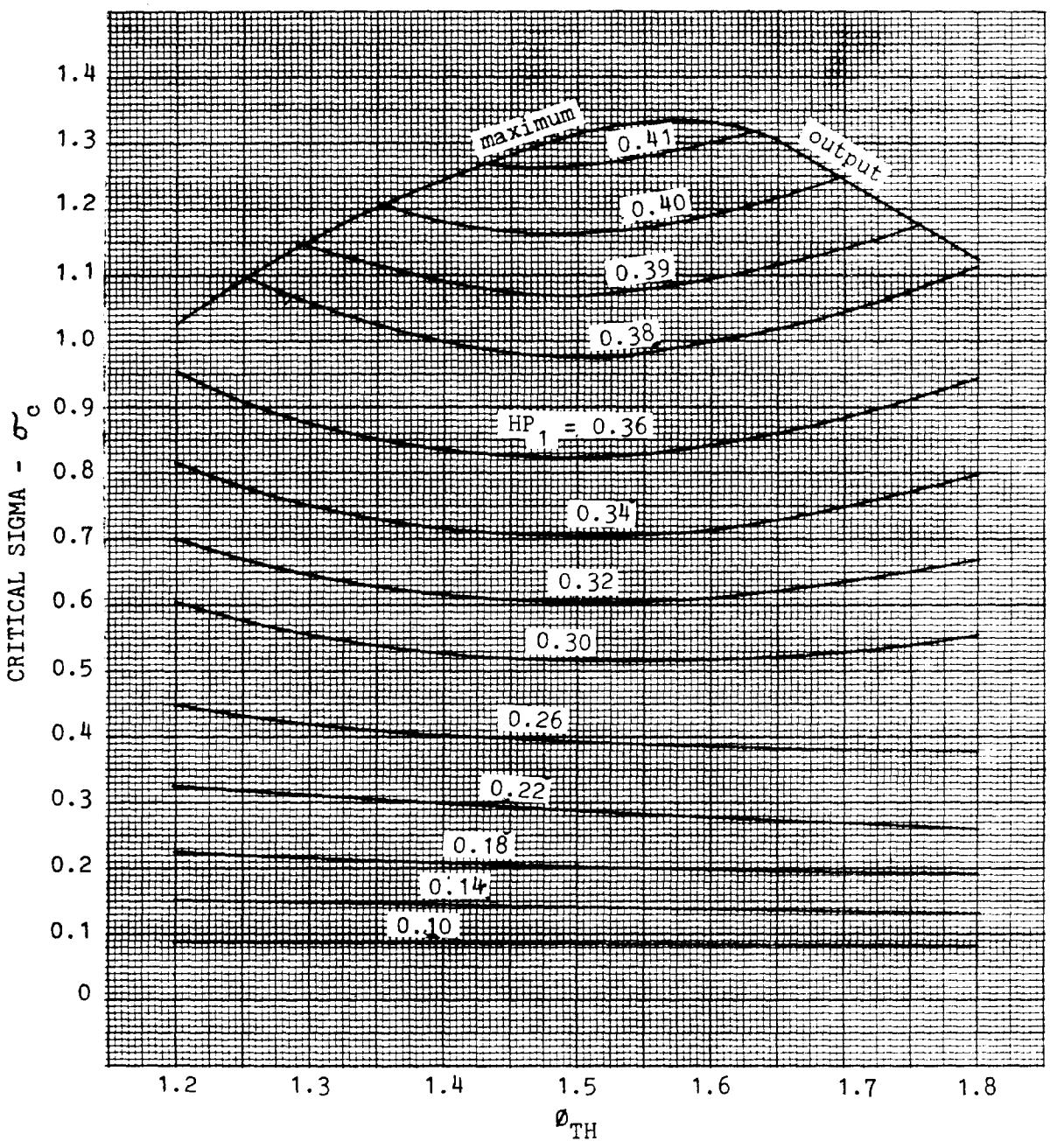
CRITICAL RUNNER SIGMAS



KAPLAN TURBINE

CRITICAL RUNNER SIGMAS

Figure S8



KAPLAN TURBINE

CRITICAL RUNNER SIGMAS

Figure S9