

1 INLET

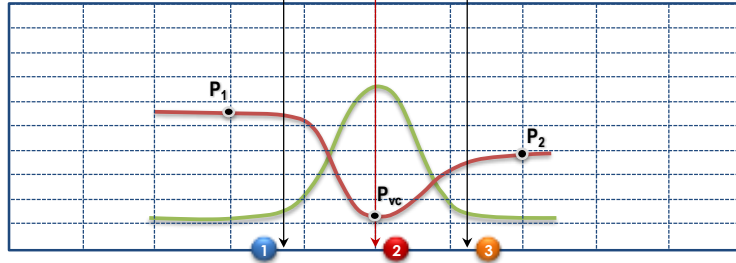
2 VENA CONTRACTA

3 OUTLET

INLET

OUTLET

— VELOCITY
— PRESSURE



$H_1 : 22 \text{ ft}$



FLOW →

200 gpm

60 °F

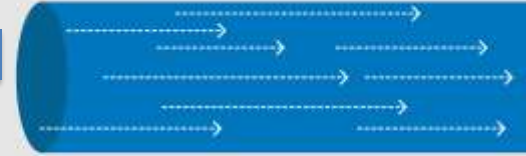
BALL VALVE
2 3/8 ϕ seat

$P_2 : \text{ATM}$

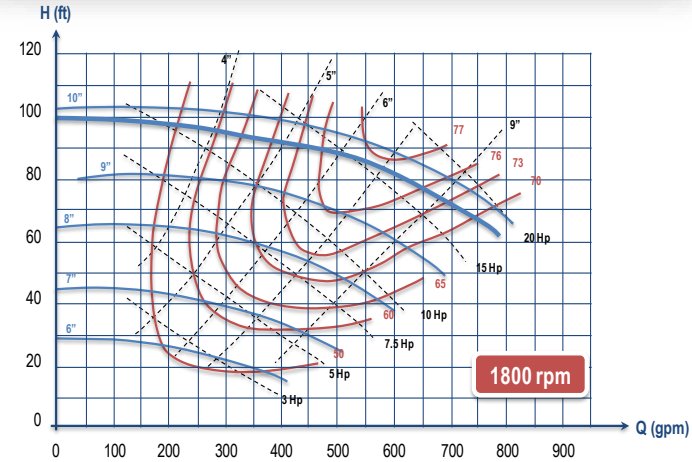


→ FLOW

LAMINAR
FLOW

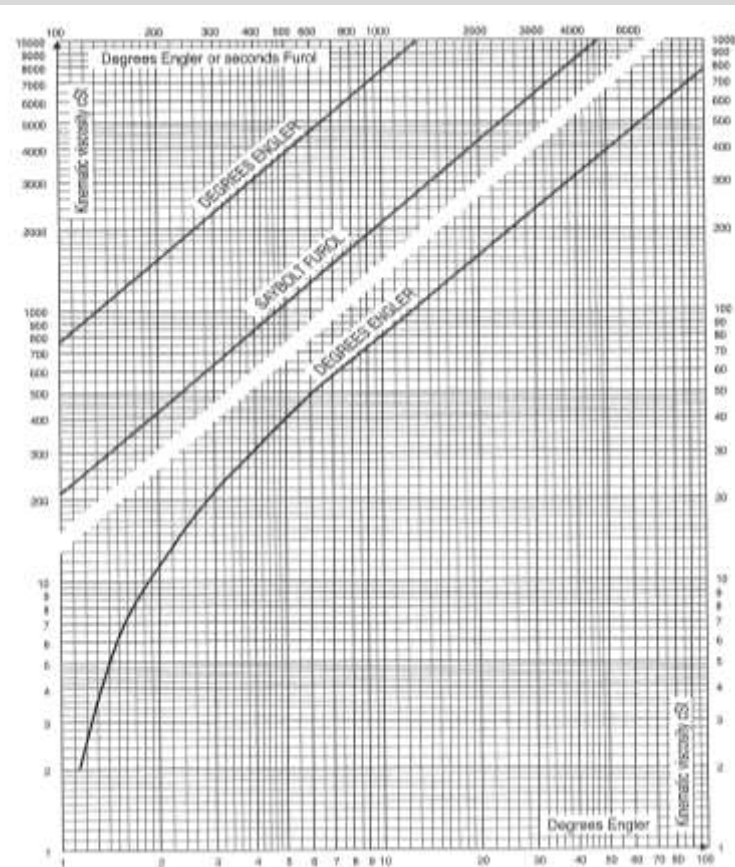
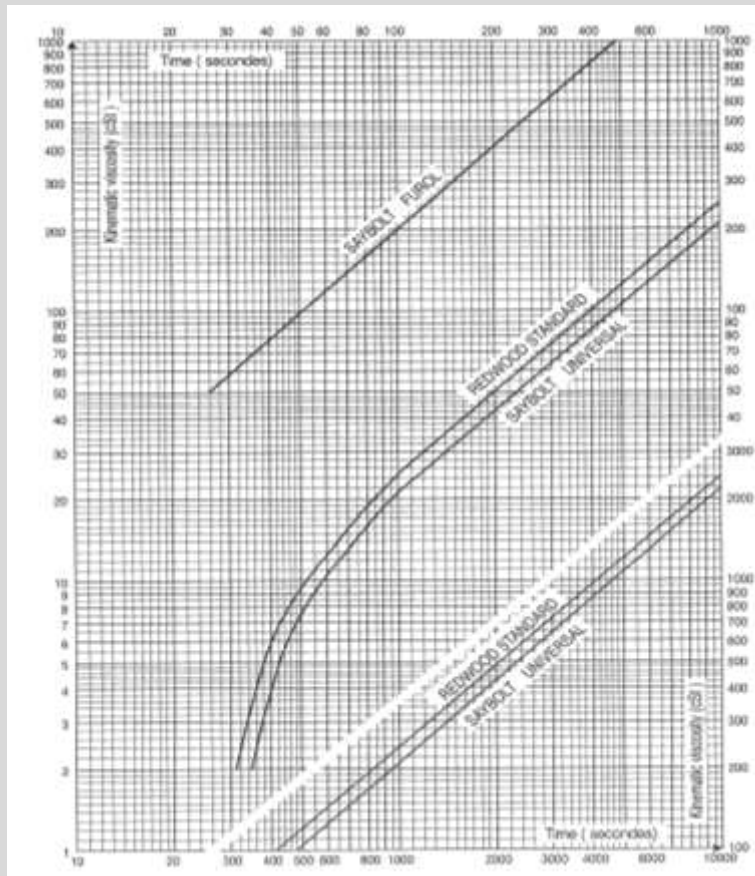


TURBULENT
FLOW

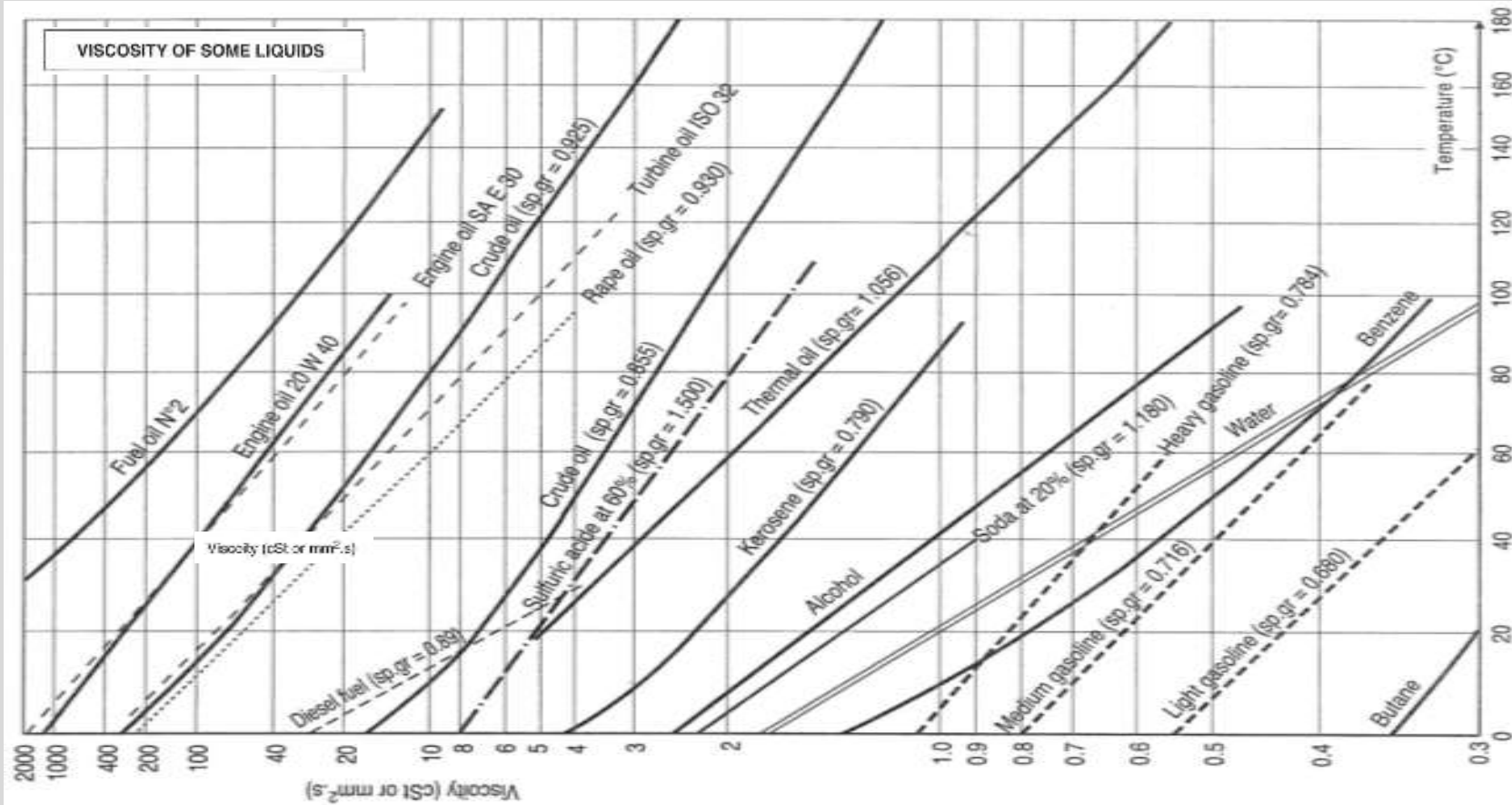


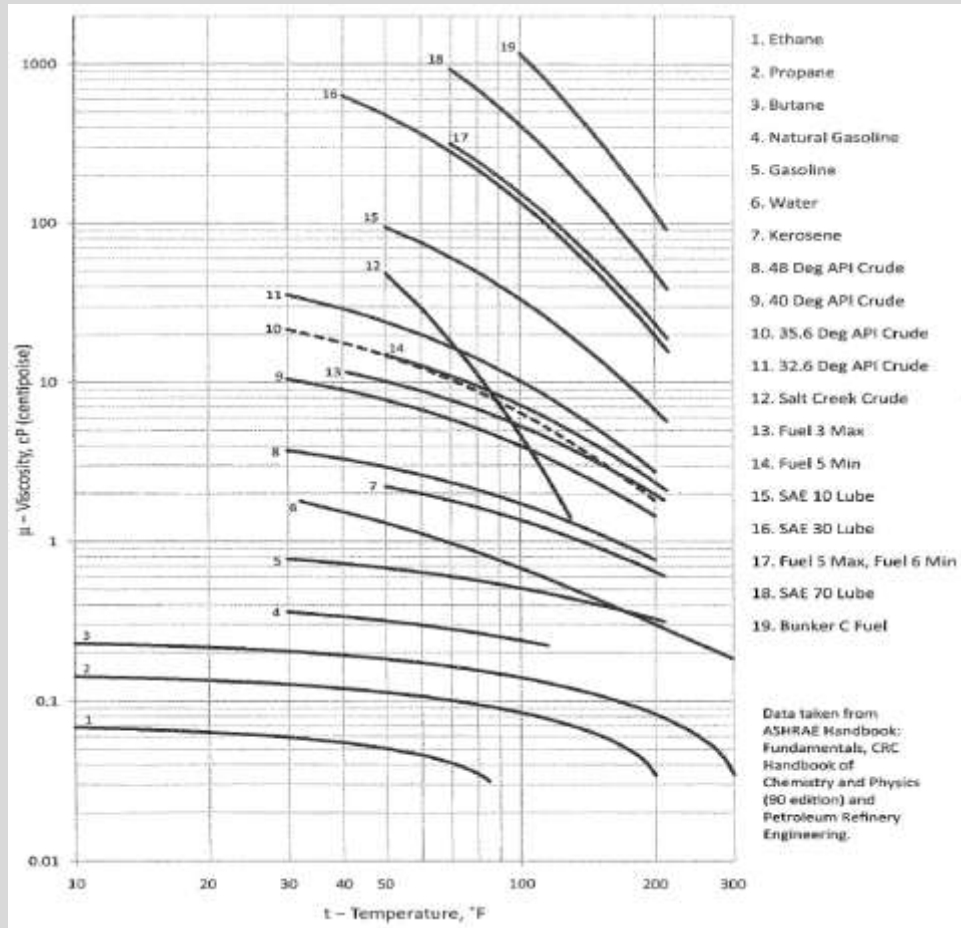
CHARTS AND DIAGRAMS

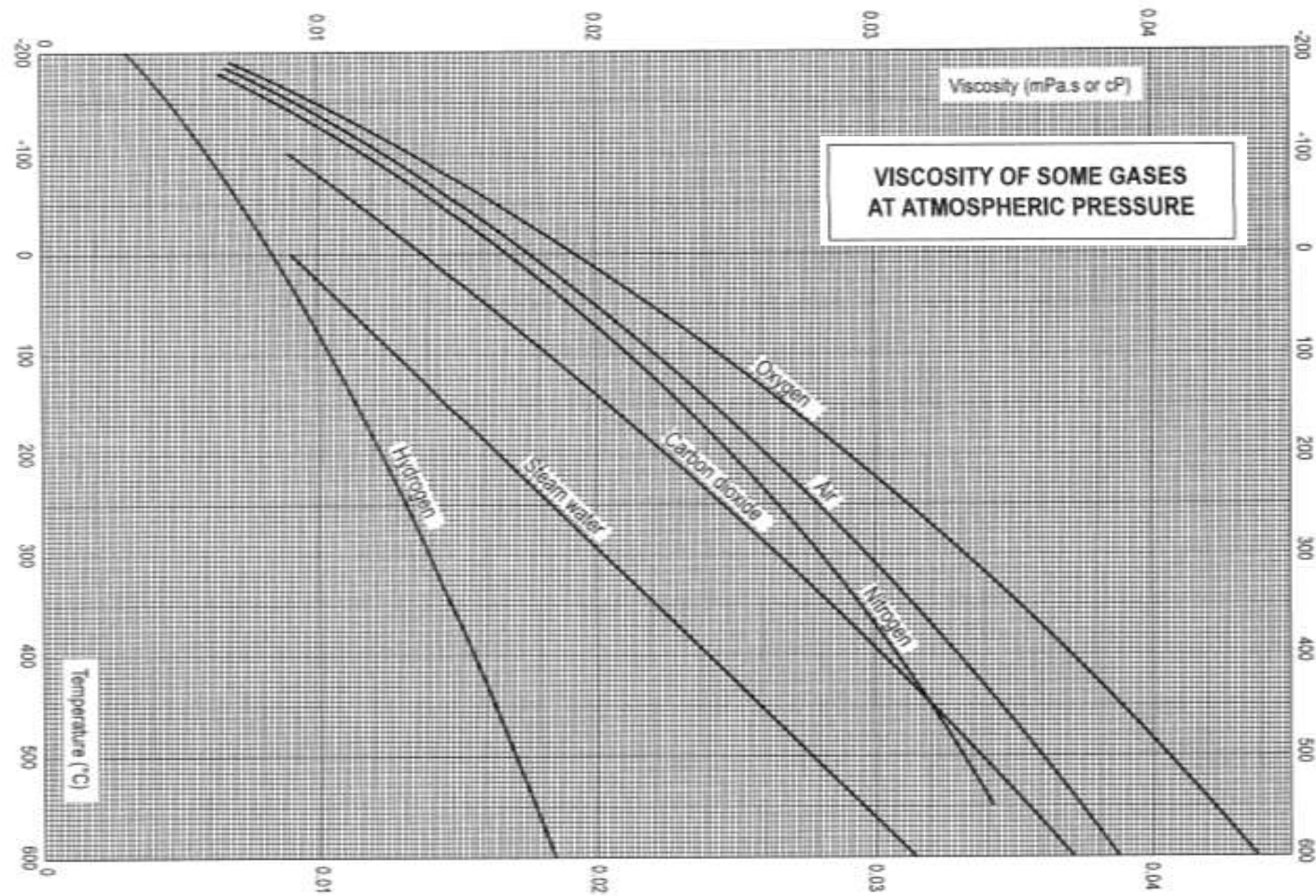
SAYBOLT - ENGLER - REDWOOD KINEMATIC VISCOSITY CONVERSION CHART



VISCOSITY OF SOME LIQUIDS



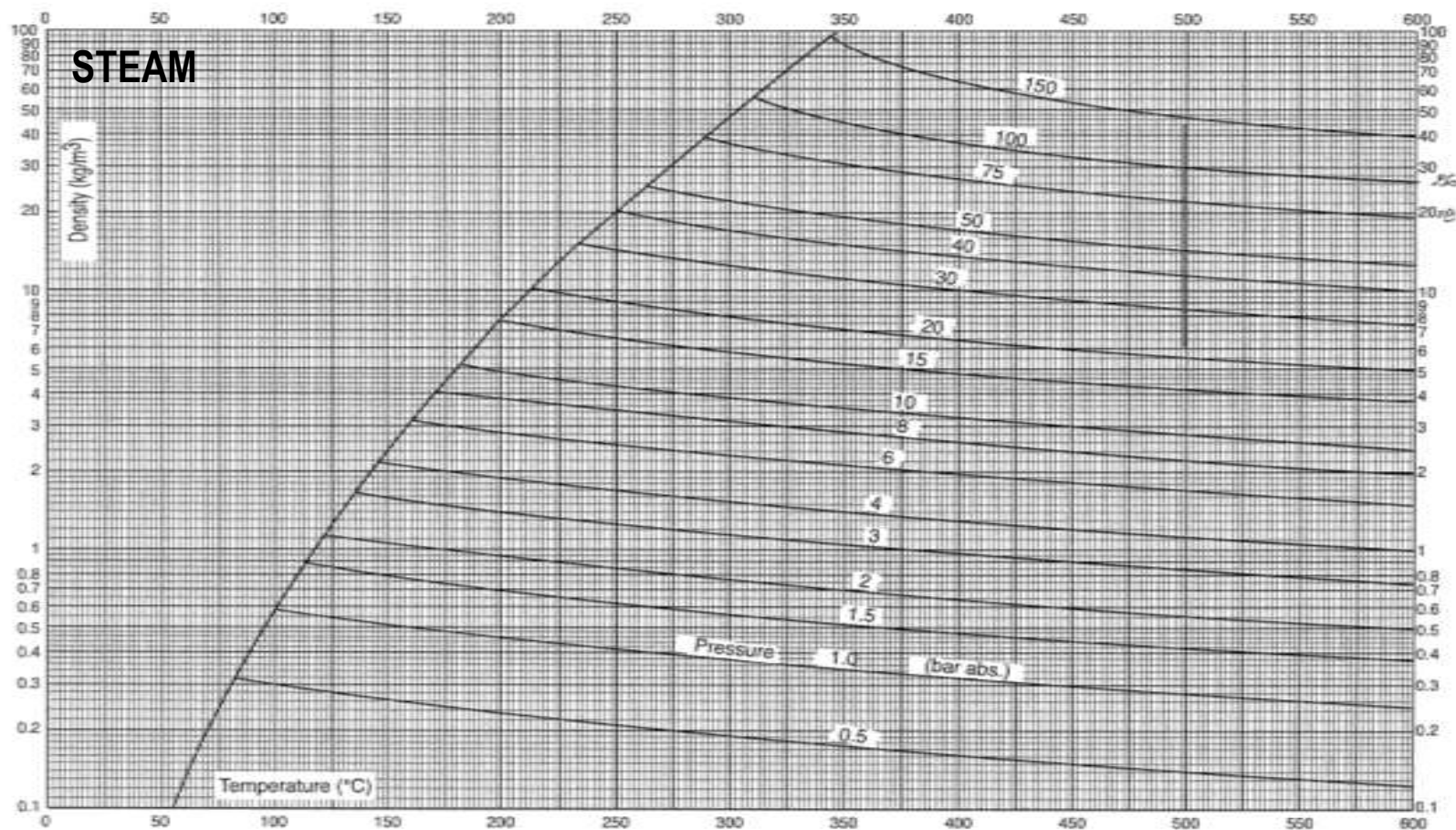


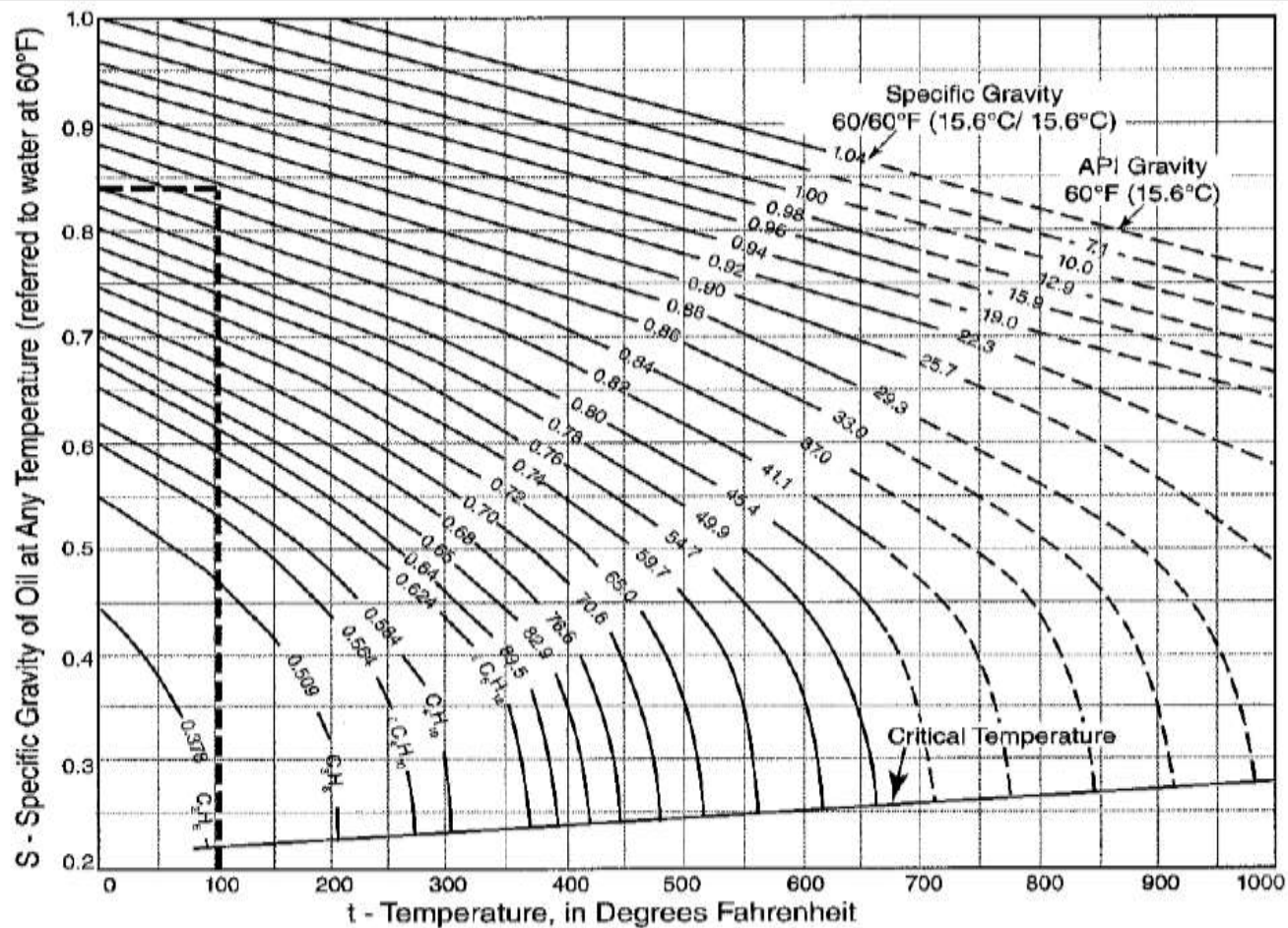


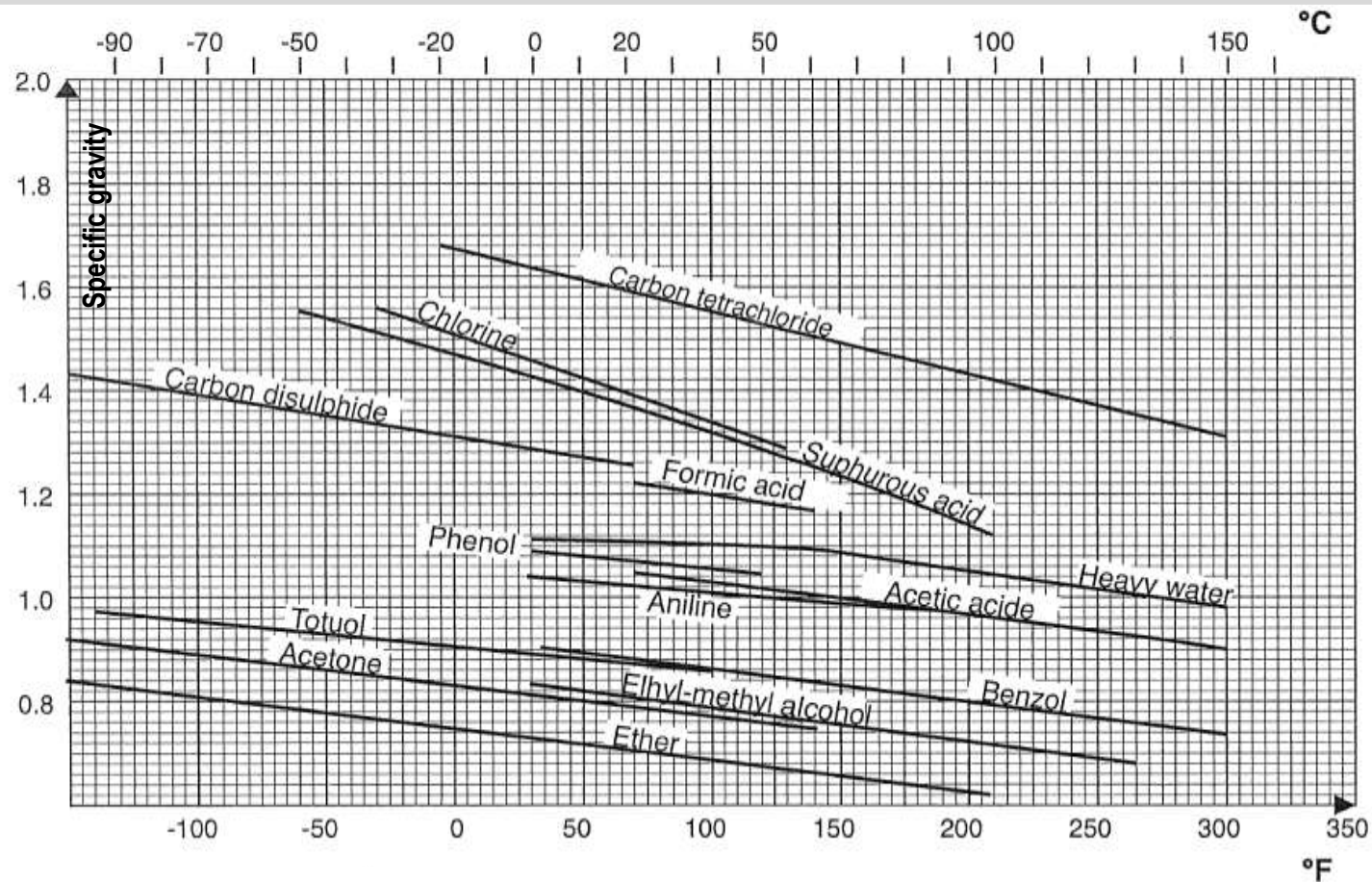
Temp. °F	Dynamic Viscosity of Steam and Water - in centipoise (cP), μ														
	1 psia	2 psia	5 psia	10 psia	20 psia	50 psia	100 psia	200 psia	500 psia	1000 psia	2000 psia	5000 psia	7500 psia	10000 psia	12000 psia
Sat. water	0.668	0.527	0.391	0.316	0.257	0.199	0.165	0.136	0.110	0.092	0.072	...	...	...	...
Sat. steam	0.010	0.011	0.011	0.012	0.013	0.014	0.014	0.016	0.017	0.019	0.022	...	...	...	...
1500	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.042	0.043	0.045	0.048	0.050
1450	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.041	0.042	0.045	0.047	0.049
1400	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.040	0.041	0.044	0.046	0.049
1350	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.038	0.039	0.041	0.043	0.046	0.048
1300	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.037	0.040	0.042	0.045	0.048
1250	0.035	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.036	0.039	0.041	0.045	0.048
1200	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.035	0.038	0.041	0.044	0.048
1150	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.033	0.034	0.034	0.034	0.037	0.040	0.044	0.048
1100	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.033	0.033	0.036	0.039	0.045	0.049
1050	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.031	0.032	0.035	0.039	0.046	0.051
1000	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.030	0.031	0.034	0.039	0.048	0.054
950	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.029	0.030	0.033	0.041	0.051	0.058
900	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.033	0.044	0.056	0.063
850	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.027	0.033	0.051	0.062	0.068
800	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.038	0.060	0.069	0.074
750	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.024	0.025	0.056	0.069	0.076	0.080
700	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.023	0.070	0.078	0.083	0.087
650	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.022	0.080	0.086	0.090	0.094
600	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.020	0.082	0.089	0.094	0.098	0.101
550	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.020	0.019	0.019	0.093	0.099	0.103	0.107	0.110
500	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.018	0.018	0.102	0.104	0.109	0.113	0.117	0.120
450	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.115	0.116	0.118	0.122	0.126	0.130	0.133
400	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.132	0.132	0.134	0.139	0.143	0.146	0.149
350	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.153	0.154	0.154	0.156	0.161	0.165	0.169	0.172
300	0.014	0.014	0.014	0.014	0.014	0.014	0.184	0.184	0.185	0.185	0.187	0.192	0.196	0.200	0.203
250	0.013	0.013	0.013	0.013	0.013	0.230	0.230	0.230	0.230	0.231	0.233	0.238	0.243	0.247	0.251
200	0.012	0.012	0.012	0.012	0.303	0.303	0.303	0.303	0.303	0.304	0.306	0.312	0.316	0.321	0.325
150	0.011	0.011	0.429	0.429	0.430	0.430	0.430	0.430	0.430	0.431	0.433	0.438	0.443	0.447	0.451
100	0.681	0.681	0.681	0.681	0.681	0.681	0.681	0.681	0.681	0.681	0.682	0.684	0.687	0.690	0.693
50	1.305	1.305	1.305	1.305	1.305	1.305	1.304	1.303	1.301	1.298	1.291	1.275	1.265	1.258	1.254
32	1.790	1.790	1.790	1.790	1.790	1.789	1.789	1.787	1.782	1.774	1.758	1.719	1.693	1.673	1.661

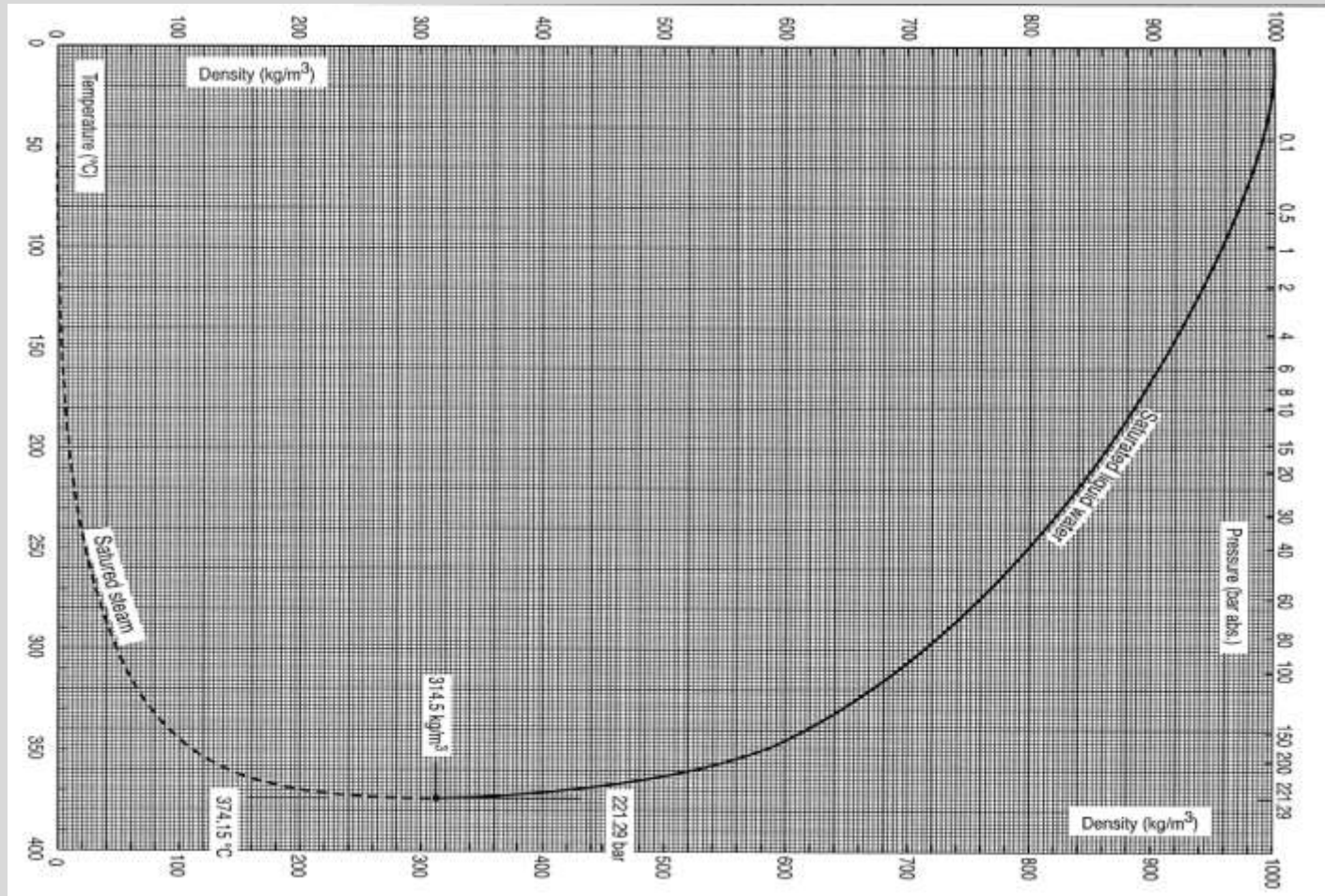
• Critical point (704.93°F, 3200.11 psia). Values directly below underscored viscosities are for water.

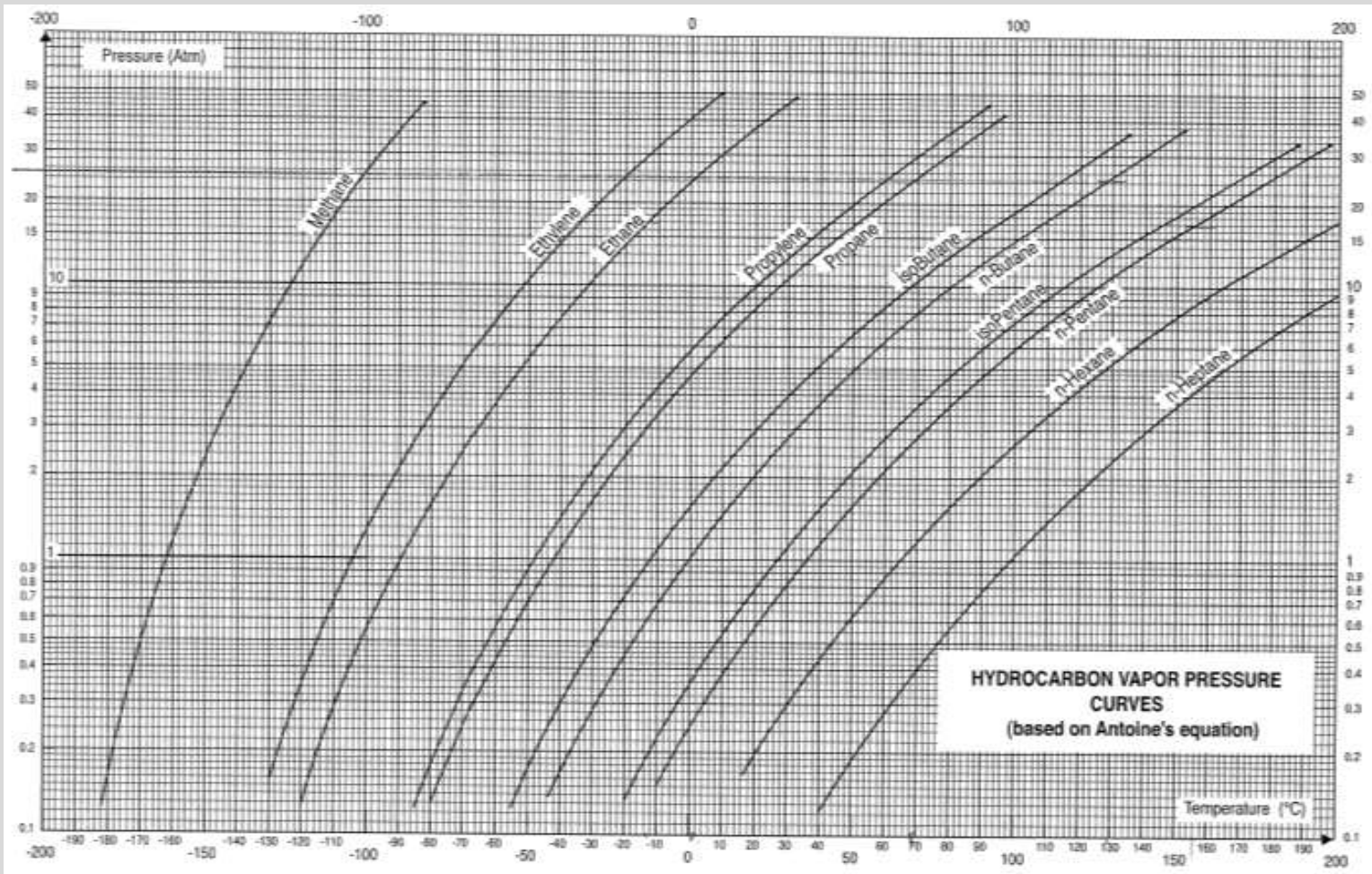
STEAM



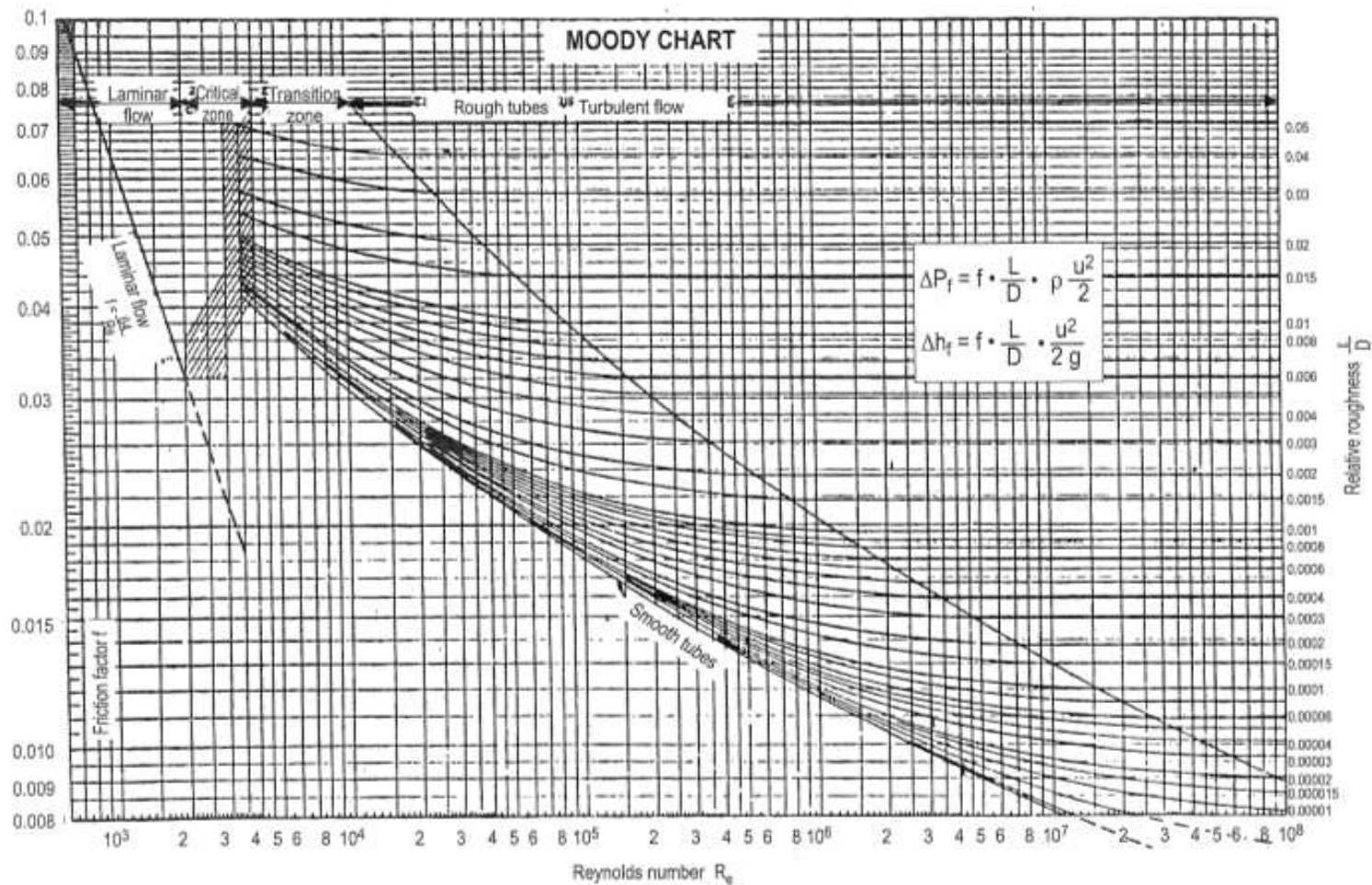


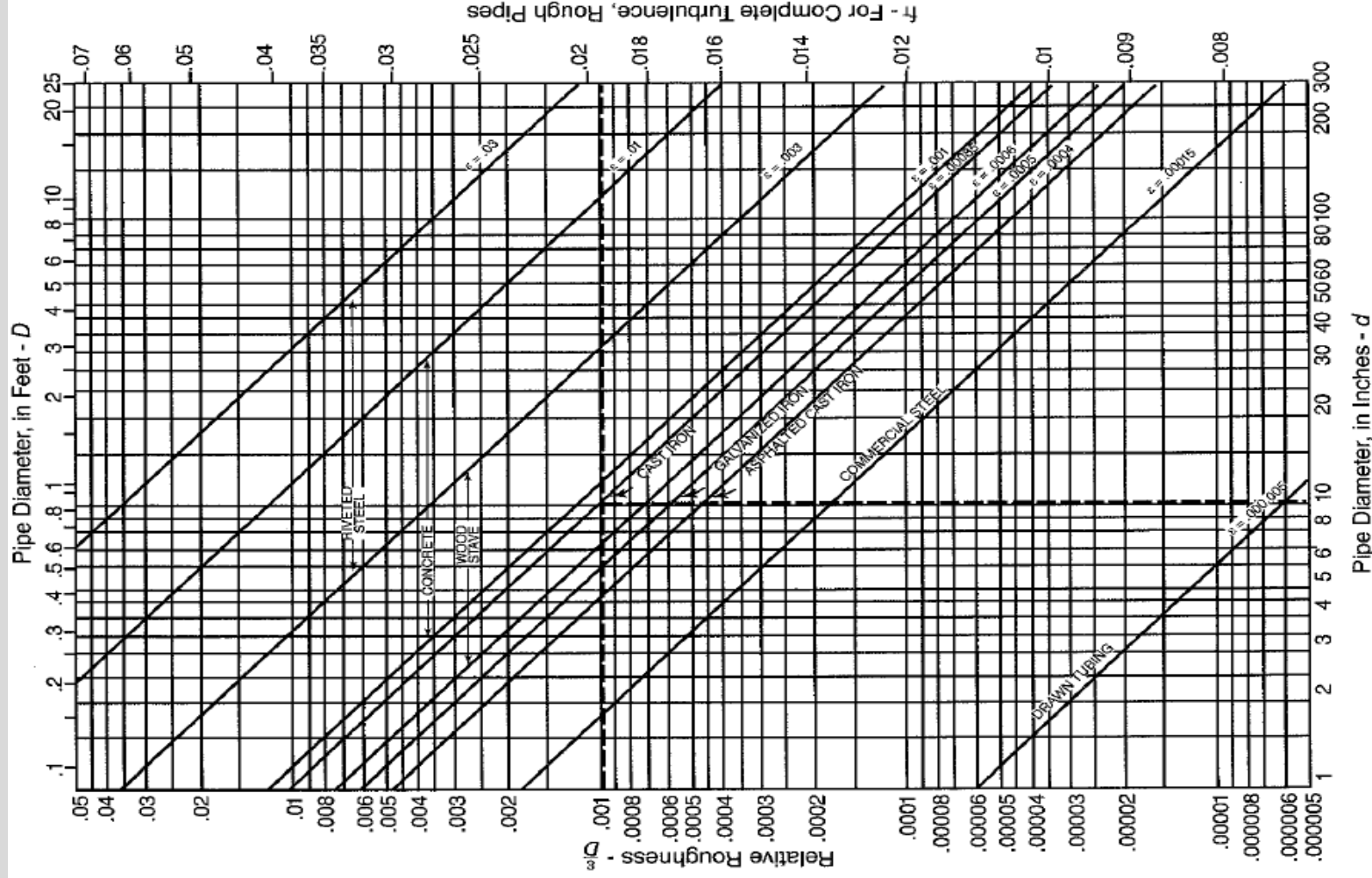




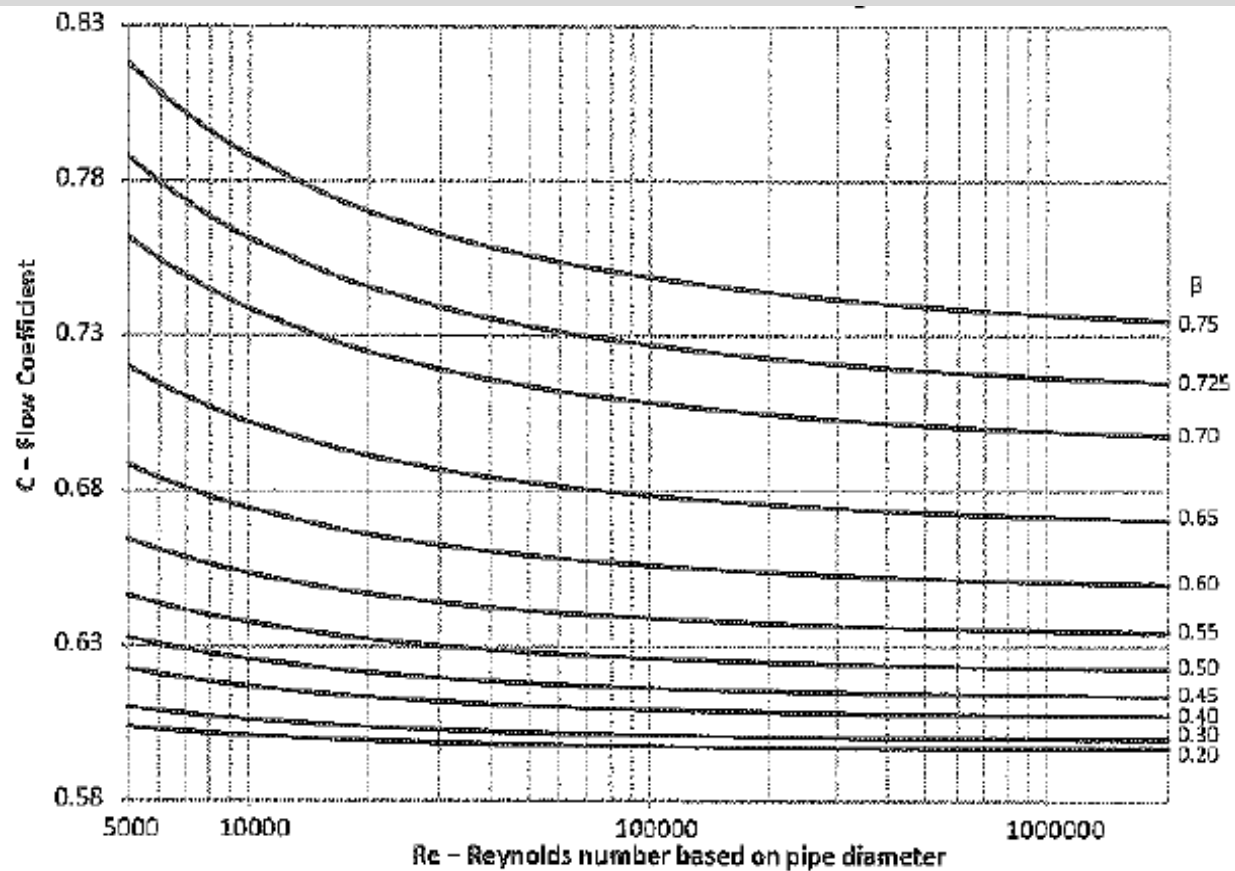


HYDROCARBON VAPOR PRESSURE
CURVES
(based on Antoine's equation)

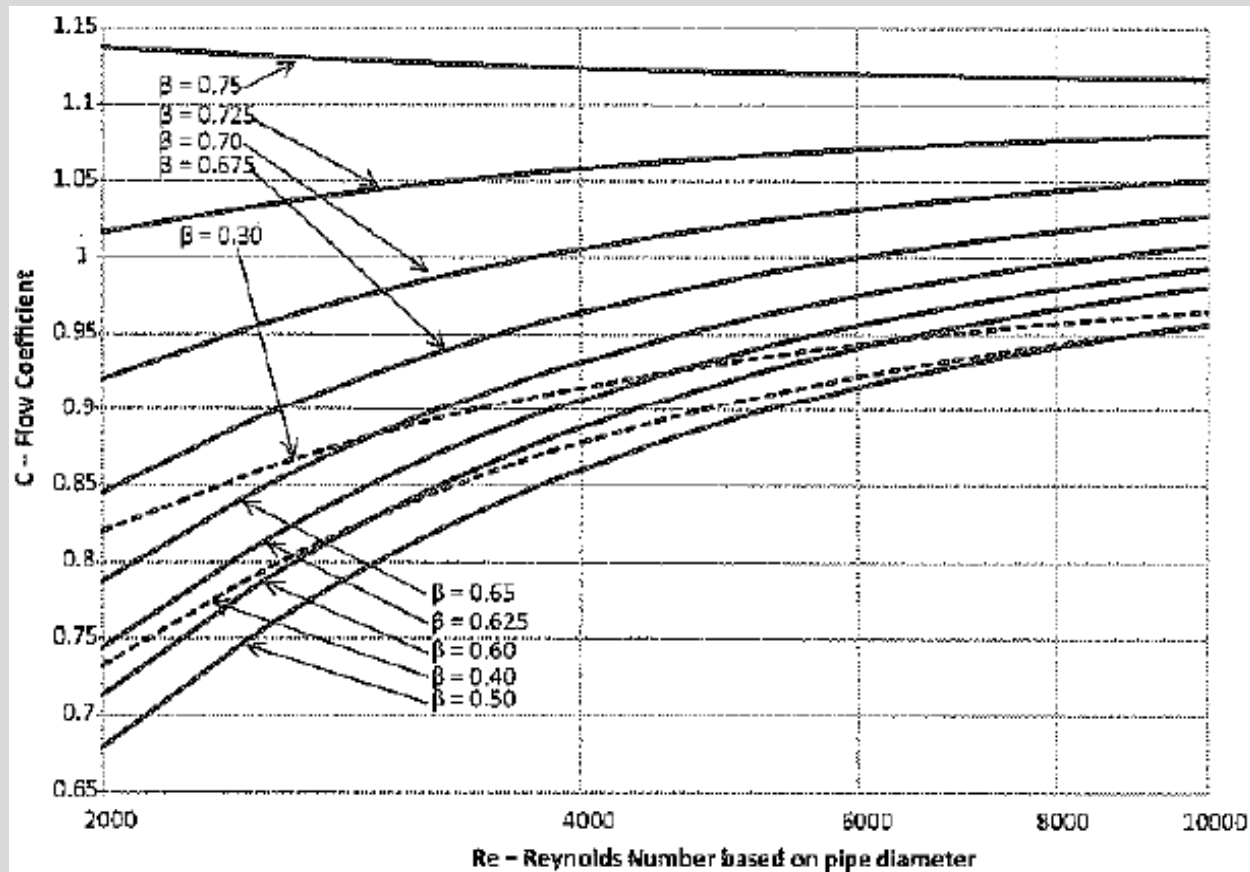




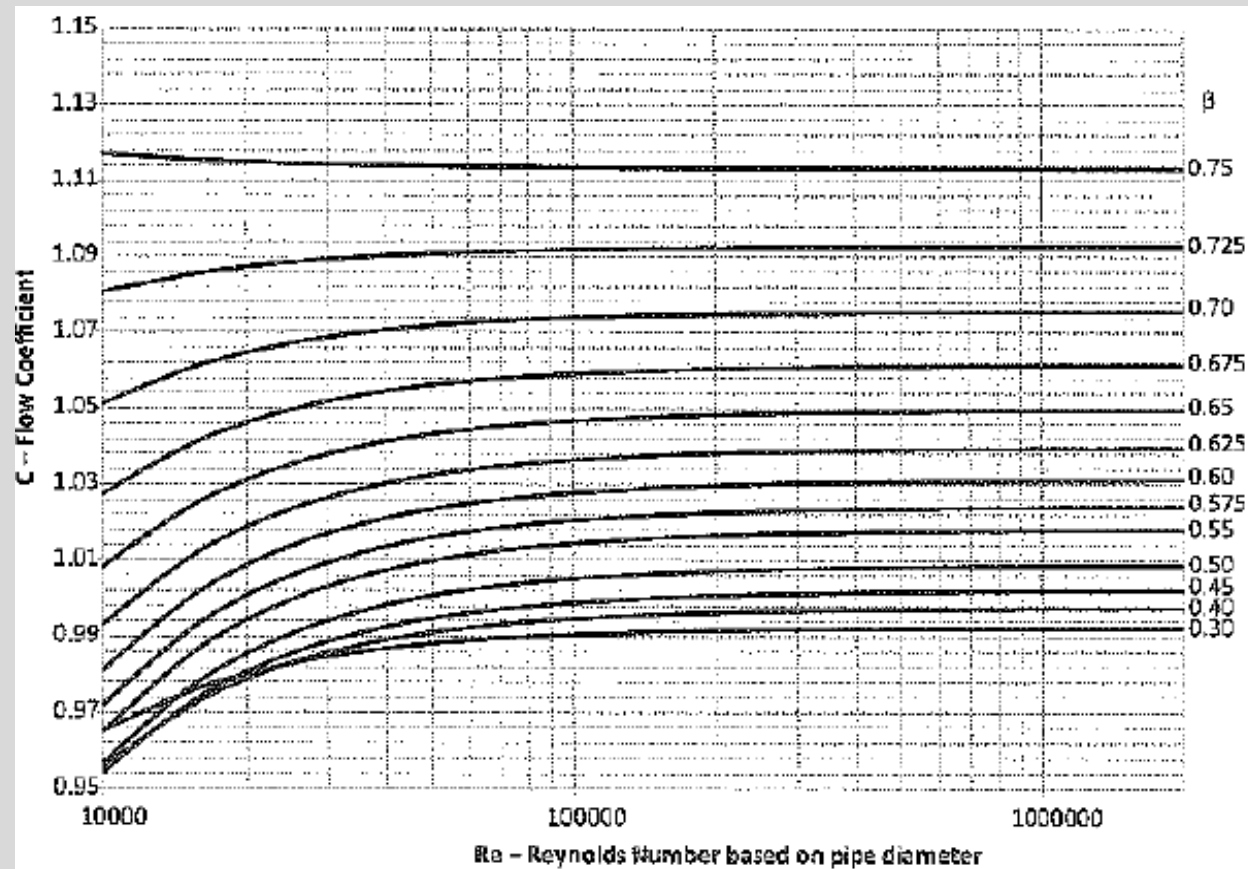
ORIFICE



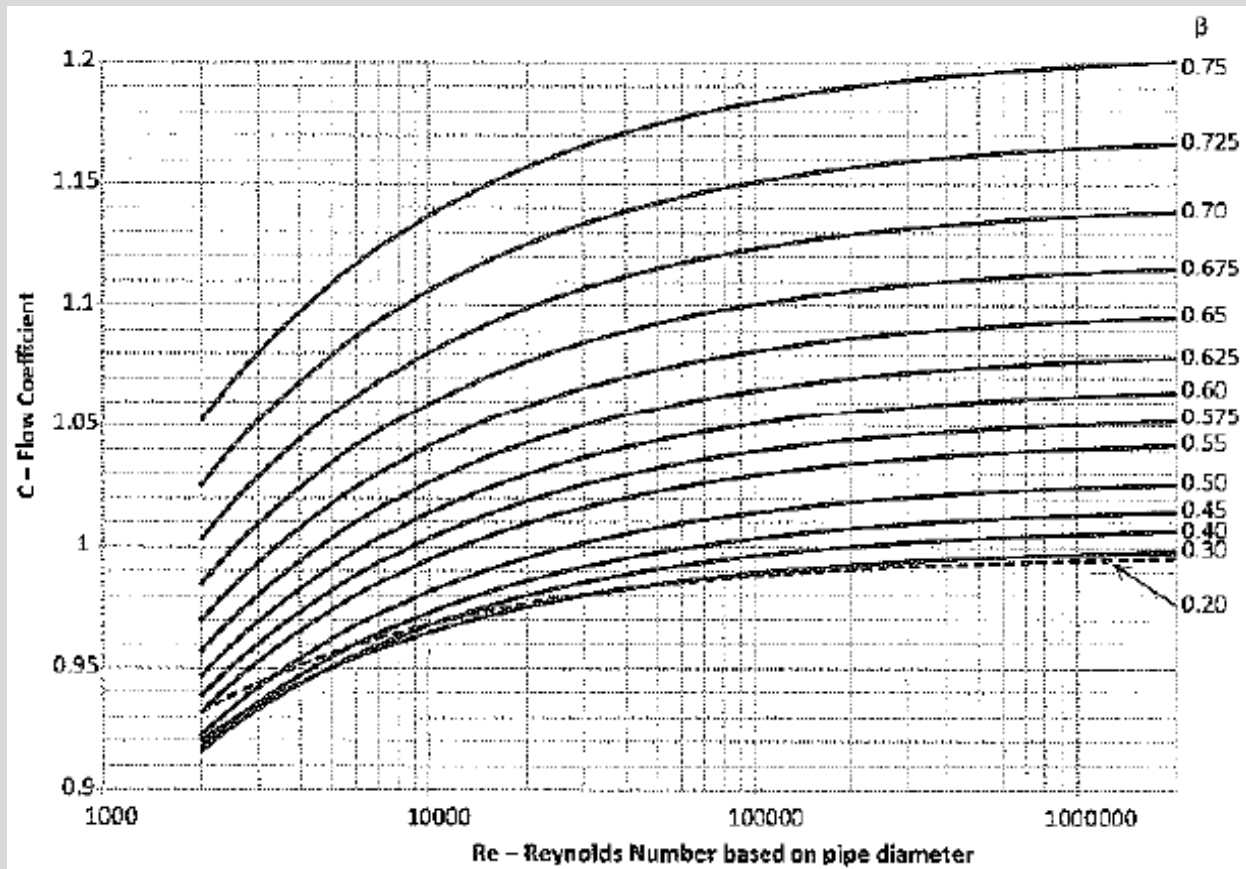
ISA 1932
NOZZLE



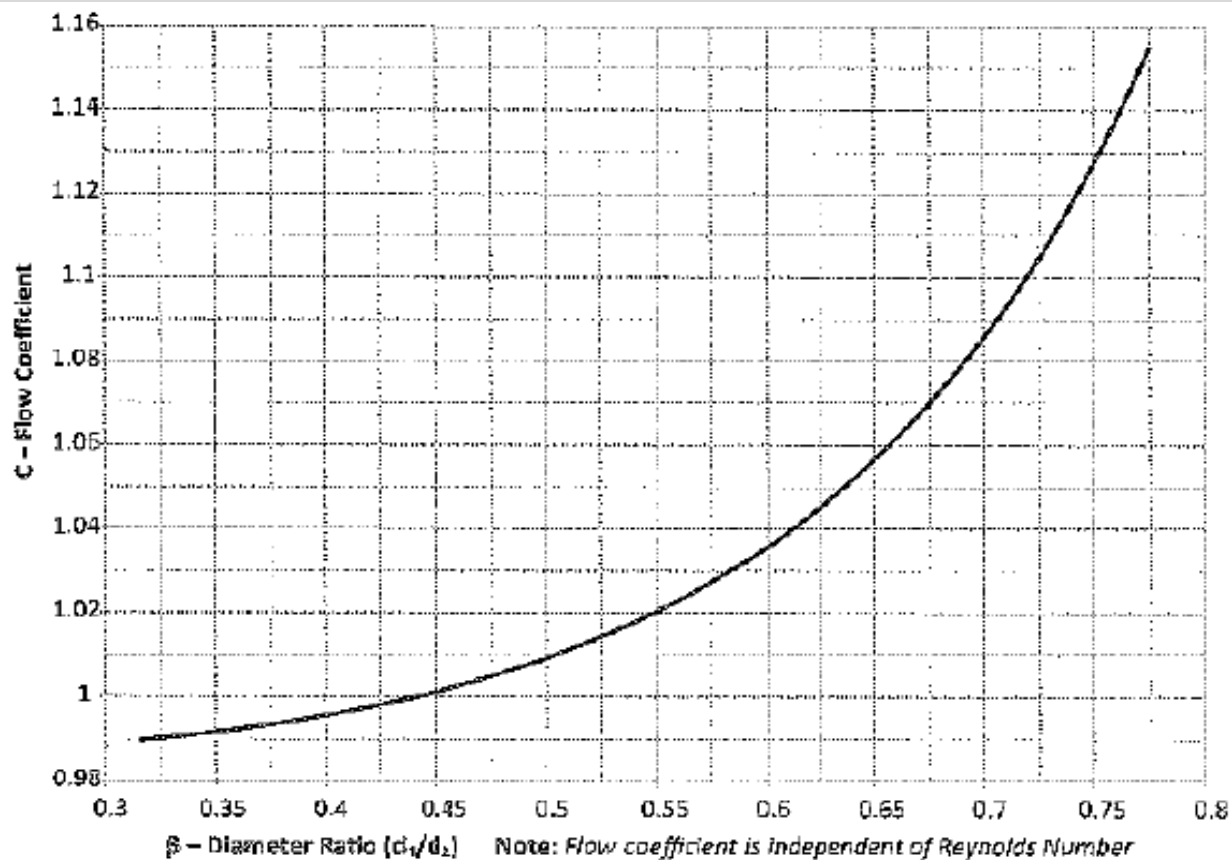
ISA 1932 NOZZLE

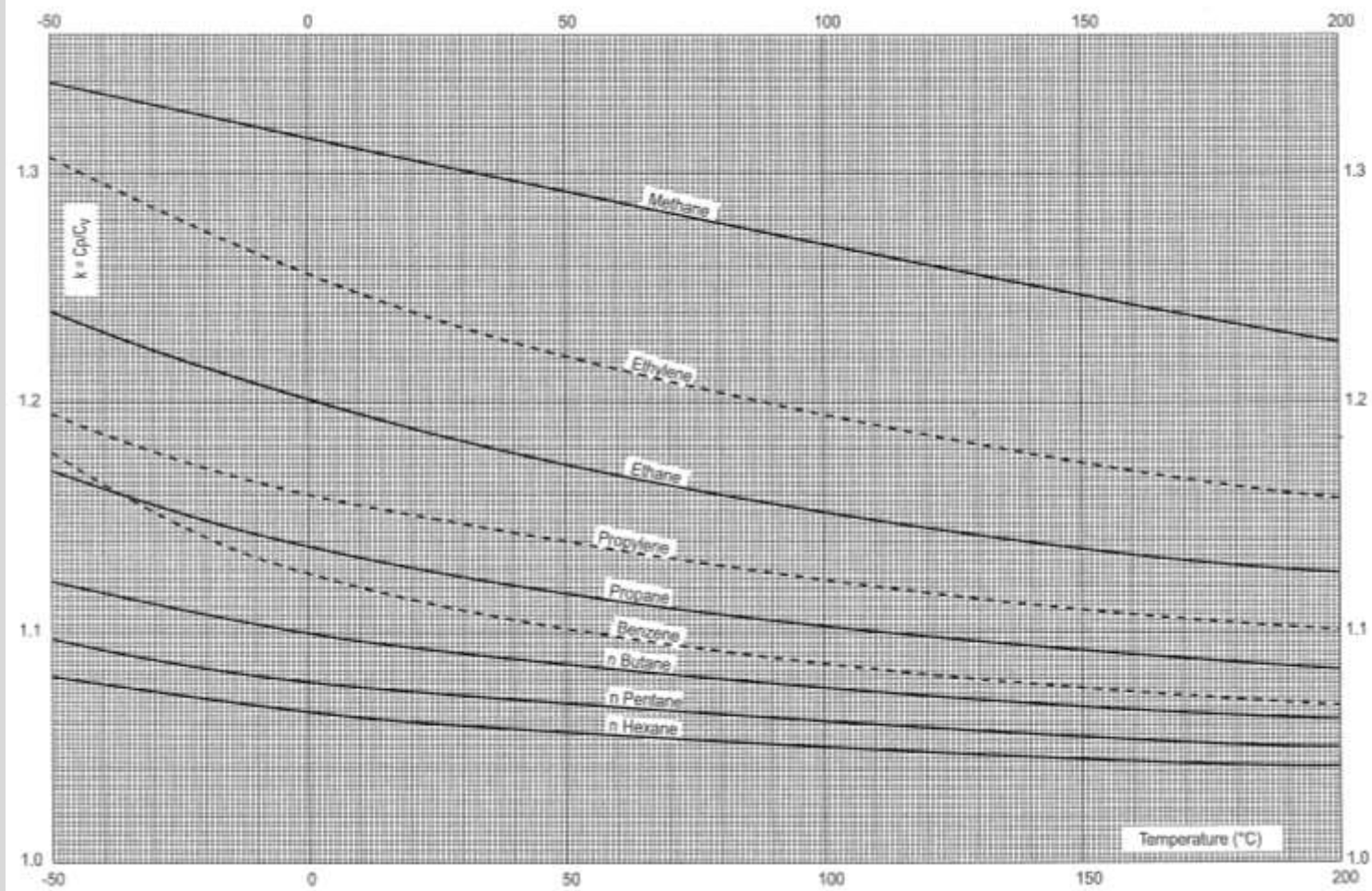


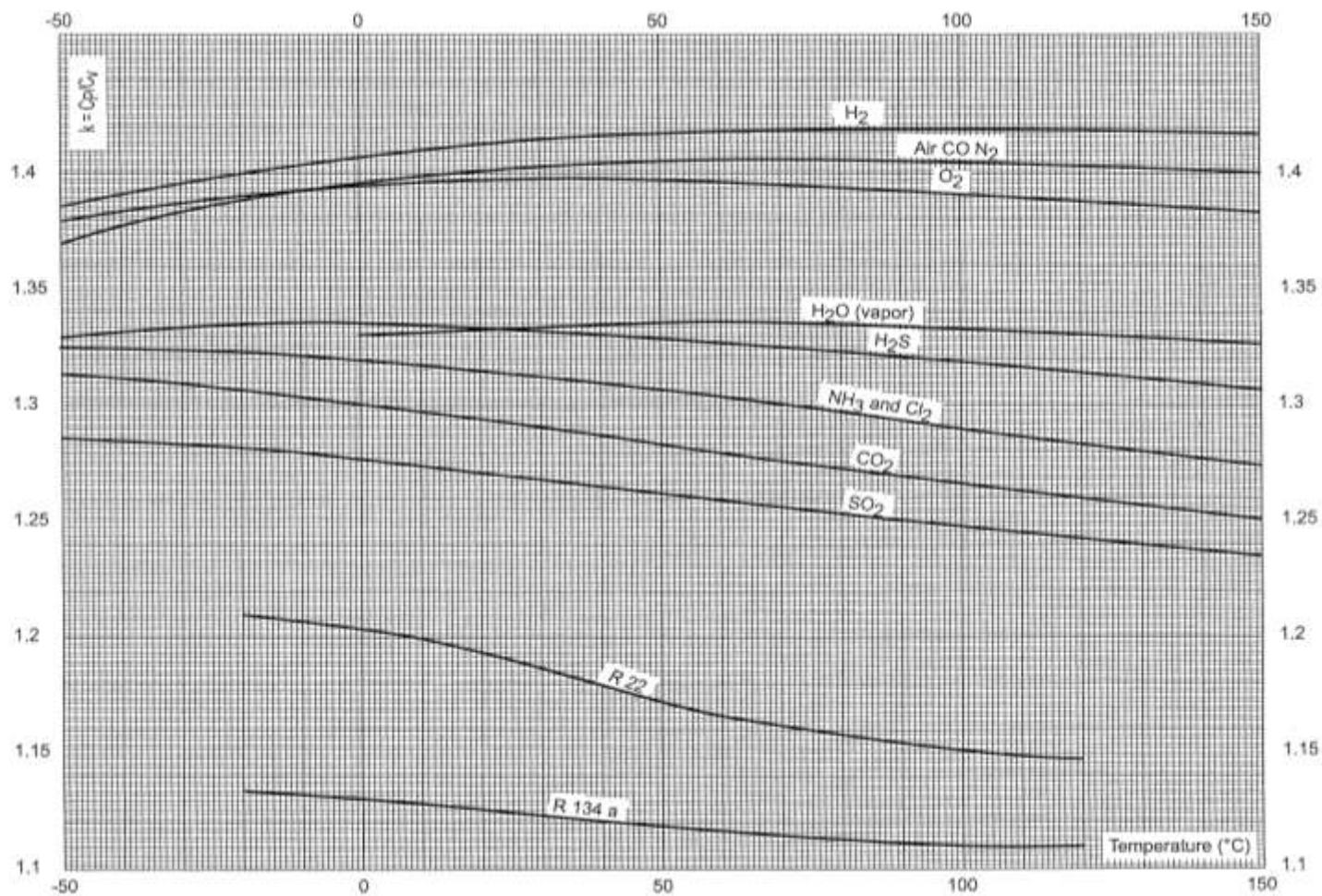
LONG
RADIUS
NOZZLE

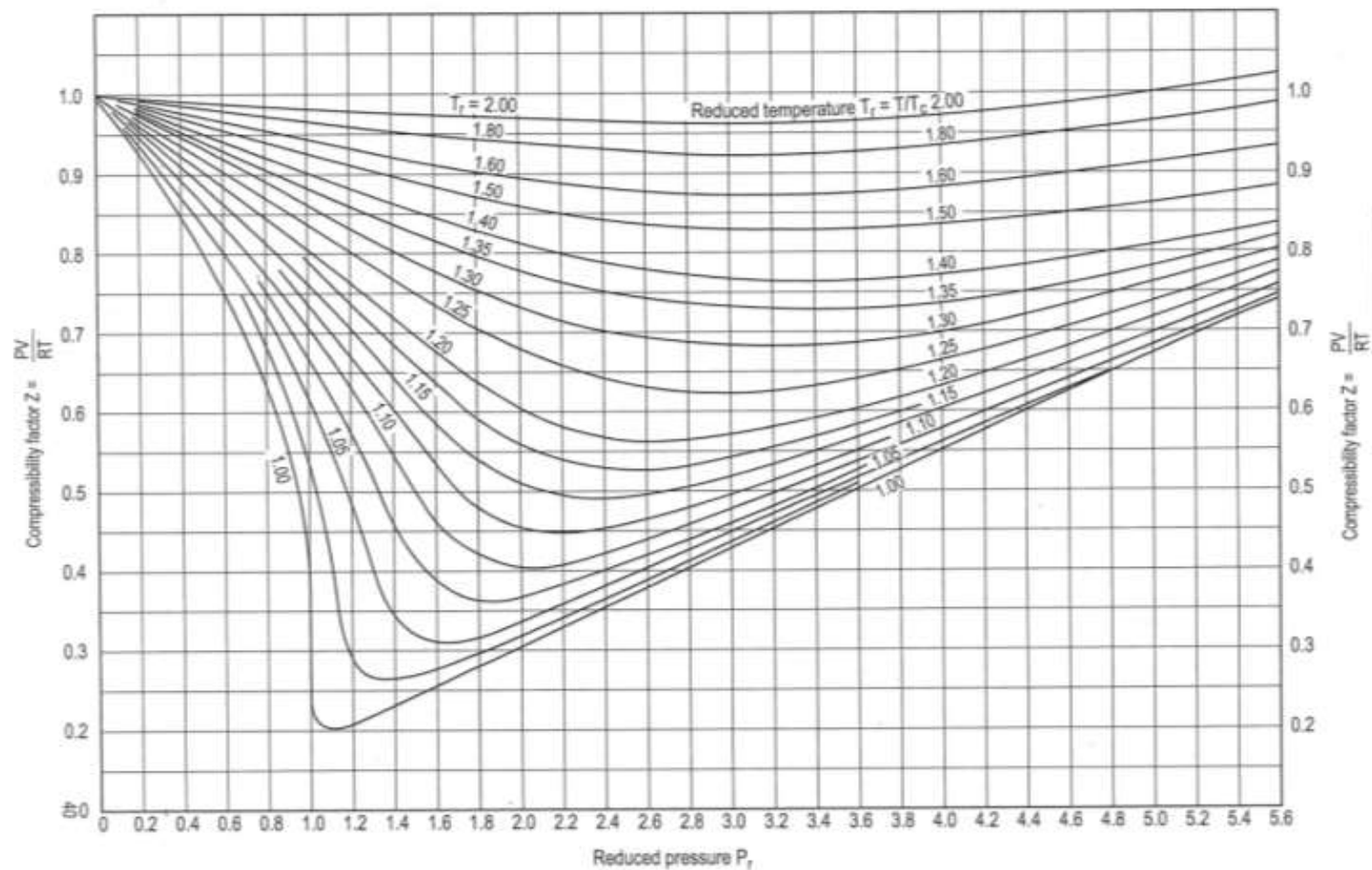


VENTURI



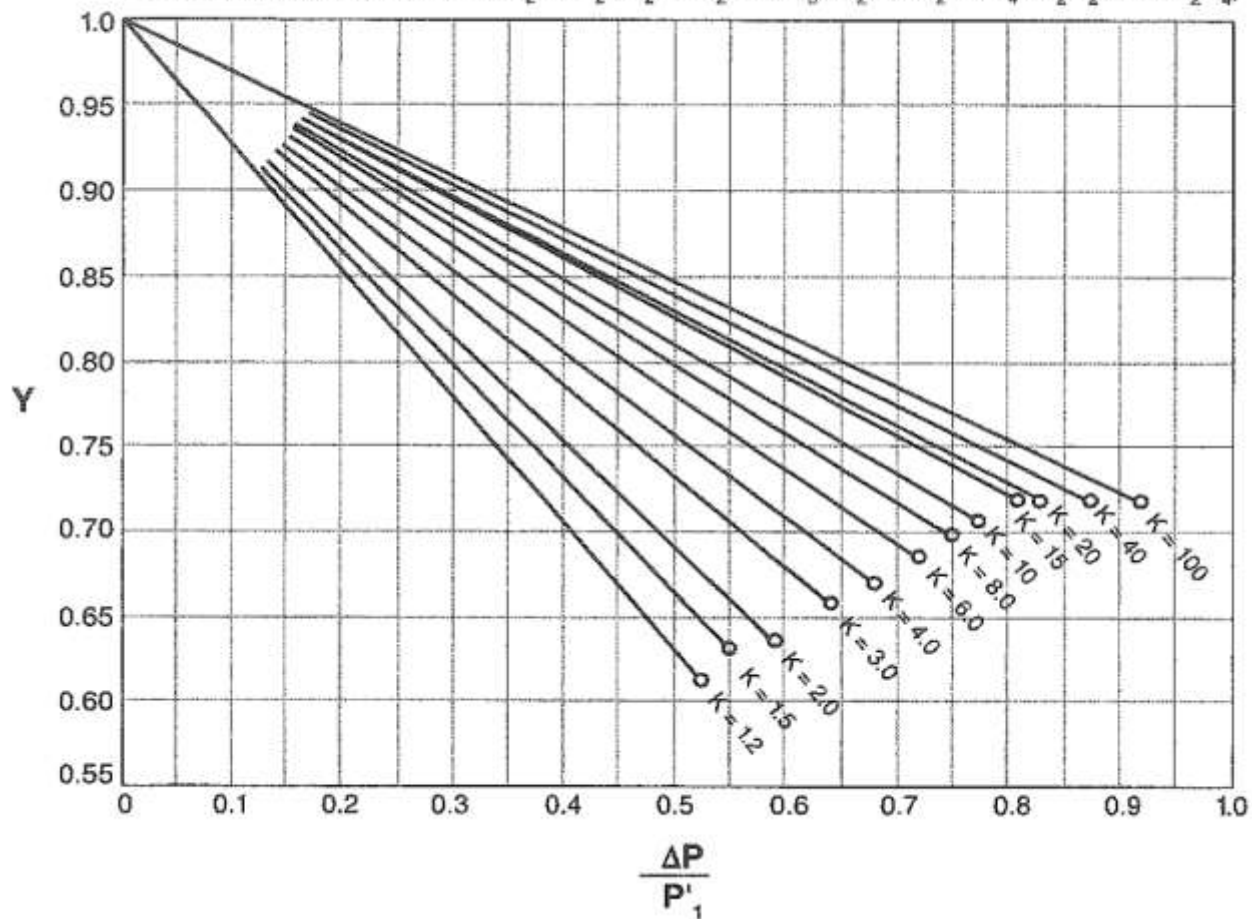






k = 1.3

(k = approximately 1.3 for CO₂, SO₂, H₂O, H₂S, NH₃, N₂O, Cl₂, CH₄, C₂H₂ and C₂H₄)



k = 1.4

(k = approximately 1.4 for Air, H₂, O₂, N₂, CO, NO, and HCl)

