

TABLE OF CONTENTS

I. WATER DATA

General

<i>Section</i>	<i>Subject</i>	<i>Page</i>
1	Water Equivalents	2
2	Tank Capacities, vertical—cylindrical	2
3	Pressure Equivalents	6
4	Impurities in Water, systems of expressing; conversion table	6
5	Water Analysis, conversion table for units employed; equivalents	7
6	Parts per Million to Grains per U. S. Gallon	8
7	Grains per U. S. Gallons \leftrightarrow Pounds per 1000 Gallons	9
8	Parts per Million \leftrightarrow Pounds per 1000 Gallons	9
9	Boiler Feedwater Makeup Requirements	10
10	Temperature Conversions Examples	12
11	Requirements in U. S. gpm for Boiler Feed Water	13
12	Saturated Steam Table	14
13	Solubility of Oxygen, from air in water at atmospheric pressure	16
14	Solubility of Air in Water at Atmospheric Pressure	17
15	Solubility of Gases in Water at 760 mm	18
16	Properties of Water, conversion for Specific Gravity, Density and Head of Water at various temperatures	19
17	Electrolyte Content and Specific Conductivity of Water vs. Specific Resistance at 25°C	20
18	Pump Power Requirements	21
19	Friction of Water in Pipes (Standard Weight Steel)	22
20	Hydraulic Conversion Factors for Various Types of Pipes	24
21	Friction Loss in Pipe Fittings, expressed as equivalent number of feet of straight pipe	26
22	Flow from Vertical Pipe	26
23	Frictional Resistance to Flow of Water, Saunders Patent valves, expressed as loss of head in feet of water	27
24	Discharge of Pipes in gpm- $\frac{3}{4}$ " to 6"	28
25	Drain Pipes, Carrying Capacities in gpm-3" to 18"	29
26	Backwash Flows, vertical rise \leftrightarrow gpm flow	29
27	Rectangular Weir Table, for weirs with free discharge into atmosphere	30

II. PIPES AND FITTINGS

28	"Standard Weight" Welded and Seamless Steel Pipe	34
28A	Discharge from Rectangular Weirs	35
28B	Discharge from Triangular Notch Weirs	36
29	American Standard Steel Pipe Flanges	37

TABLE of CONTENTS (cont.)

<i>Section</i>	<i>Subject</i>	<i>Page</i>
30	Resistance of Valves and Fittings to Flow of Fluids	38
31	General Dimensions, standard cast iron flanged fittings	39
32	Economical Pipe Sizes for Pressure Mains	40
33	Pressure Drop in Steam Piping	41
34	Orifice Table for orifice board controls	42
35	Dimensions for Screwed Fittings	46
36	Pressure Loss through Design-5 Multiport Valves, sizes 2", 3" 4" and 6"	47
37	Pressure Loss through Disc and Crest Meters	49

III. CHEMICAL PROPERTIES AND DATA

38	International Atomic Weights Table	52
39	Formulae, Molecular and Equivalent Weights and conversion factors to CaCO ₃ of substances frequently appearing in the chemistry of water softening	54
40	Coagulant, Acid and Sulfate, 1 ppm equivalents	58
41	Alkali and Lime, 1 ppm equivalents	58
42	Sulfuric, Hydrochloric Acid equivalents	58
43	Salt and Brine Equivalents	58
44	Chemicals Used in Water Treatment	59
45	Sodium Chloride Solutions	66
46	Specific Gravities (at 20°/40°C)	67
47	Sodium Cation Exchanger (Zeolite) Reactions	75
48	Hydrogen Cation Exchanger Reactions	76
49	Anion Exchanger Reactions (weakly basic and strongly basic exchangers)	77
50	Removal and Recovery (Ion Exchange Reactions)	78
51	Cold Lime (or Lime-Soda) Water Softening processes as carried out in the Permutit Precipitator	79
52	Solubilities of Calcium Carbonate-pH values	81
53	Solubilities of Magnesium Hydroxide-pH values	82
54	Dosages and Effects of Coagulants; Modified Water Analysis; definition of terms	84
55	Reduction of Calcium Alkalinity by the Cold Lime-Soda process	85
56	Reduction of Calcium and Magnesium Alkalinities by the Cold Lime-Soda process	86
57	Reduction of Alkalinity and Noncarbonate Hardness by the Cold Lime-Soda process	88

TABLE of CONTENTS (cont.)

<i>Section</i>	<i>Subject</i>	<i>Page</i>
58	Railway Lime-Soda Treatment; excess chemical treatment	92
59	Reduction of Alkalinity in Waters Containing Sodium Alkalinity by the Cold Lime-Calcium Chloride (or Sulfate) process	94
60	Chemical Reactions in Cold Lime, Lime-Soda and Calcium Chloride processes	96
61	Hot Lime-Soda Chemical Charges	98
62	Hot Lime-Soda Effluent Curve	99
63	Sodium Sulfite dosages for dissolved oxygen	99
64	Ferrous Sulfate dosages for dissolved oxygen	101
65	Phosphate Treatment of Boiler Feedwaters; amounts of di-sodium phosphate required	102
66	Phosphate Conversion Factors	104
67	Bicarbonates and Carbonates; reactions on heating	104
68	Phosphate Reactions	105
69	Coagulation Reactions	106
70	Oxidation and Reduction Reactions	106
71	Purification by Dilution	107
72	The Alkalinity Relationships	107
73	Effect of Bicarbonate Alkalinity and CO_2 on pH	108
74	Effect of Mineral Acidity on pH	108
75	Effect of Carbonate and Bicarbonate Alkalinity on pH	109
76	Stability Indexes	110
76	CaCO_3 Saturation Index (Langelier Index)	110
76	Ryznar Stability Index	111

IV. MISCELLANEOUS

77	Motor Wiring at Standard Speeds	113
78	Standard NEMA Enclosures	115
79	Fundamental Data Relating to Sieves of the Standard Screen Scale	116
80	Weights and Measures—miscellaneous	118
81	Equivalent Weights and Measures—miscellaneous	119
82	English to Metric — Conversion Factors	120

V. WASTE TREATMENT DATA

50	Chromic Acid Recovery by Ion Exchange — see page 78
----	---

TABLE OF CONTENTS (cont.)

V. WASTE TREATMENT DATA

<i>Section</i>	<i>Subject</i>	<i>Page</i>
83	Water Requirements	125
84	Aeration	126
85	Saturation of Oxygen In Pure Water at Various Temperatures	127
86	Usage of Treatment Chemicals	130
87	Addition of Flocculant and Flocculant Aid Solutions	134
88	Sludge Production	135
89	Sludge Dewatering and Concentration	136
90	Sludge Carrying Capacity for Conveyors	137

VI. INDEX

138