APÉNDICES

VALUES OF THE CONSTANT B

Corroding System	b_a, mV	b_c, mV	B, mV
Theoretical	30	30	6.5
(Values of B calculated from arbitrary	30	60	9
b_a and b_c values using formula on	30	120	10
previous page; b_a and b_c values	30	180	11
can be interchanged.)	30	∞	13
	60	60	13
	60	90	16
	60	120	17
	60	180	20
	60	∞	26
	90	90	20
	90	120	22
	90	180	26
	90	∞	39
	120	120	26
	120	∞	52
	180	180	39
	180	∞	78
Iron, 4% NaCl, pH 1.5	–	–	17
Iron, 0.5N H_2SO_4, 30 C	–	–	17
Iron, 1N H_2SO_4	–	–	10–20
Iron, 1N HCl	–	–	18–23
Iron, 0.02M citric acid, pH 2.6, 35 C	–	–	12
Carbon steel, seawater	57	∞	25
Carbon steel, 1N Na_2SO_4, H_2, pH 6.3, 30 C	–	–	19
304L SS, 1N H_2SO_4, O_2	inf.	50	22
304 SS, lithiated water, 288 C	85	160	24
304 SS, 3% NaCl, 90 C	inf.	50	22
430 SS, 1N H_2SO_4, H_2, 30 C	–	–	20
600 alloy, lithiated water, 288 C	82	160	24
Al 1199, 1N NaCl, pH 2, 30 C	–	–	44
Aluminum, seawater	45	600	18
Zircaloy 2, lithiated water, 288 C	inf.	186	81
OFHC Copper, 1N NaCl, H_2, pH 6.2, 30 C	–	–	26

Source: Adapted from a collection of literature values compiled by Florian Mansfeld, *Electrochemical Techniques for Corrosion*, R. Baboian, Editor, NACE, pp. 18, 26, 1977.

STANDARD REFERENCE POTENTIALS AND CONVERSION TABLE

REFERENCE POTENTIALS

Electrode	Potential (V) @ 25°C		Thermal Temperature Coefficient[a] (mV/°C)
	E′[b]	E″[c]	
(Pt)/H_2 ($\alpha = 1$)/H + ($\alpha = 1$) (SHE)	0.000	•••	+0.87
Ag/AgCl/1M KCl	+0.235	•••	+0.25
Ag/AgCl/0.6M Cl^- (seawater)	+0.25	•••	•••
Ag/AgCl/0.1M Cl^-	+0.288	•••	+0.22
Hg/Hg_2Cl_2/sat KCl (SCE)	+0.241	+0.244	+0.22
Hg/Hg_2Cl_2/1M KCl	+0.280	+0.283	+0.59
Hg/Hg_2Cl_2/0.1M KCl	+0.334	+0.336	+0.79
Cu/$CuSO_4$ sat	+0.30	•••	+0.90
Hg/Hg_2SO_4/H_2SO_4	+0.616	•••	+0.09

[a] To convert from thermal to isothermal temperature coefficients, subtract 0.87 mV/°C. Thus the isothermal temperature coefficient for Ag/AgCl/1M KCl is −0.62 mV/°C.
[b] E′ is the standard potential for the half cell corrected for the concentration of the ions.
[c] E″ also includes the liquid junction potentials for a saturated KCl salt bridge.

CONVERSION FACTORS[d]

From (E′)	To SHE Scale	To SCE Scale (E′)
H_2/H^+	•••	−0.241
Ag/AgCl/1M KCl	+0.235	−0.006
Ag/AgCl/0.6M Cl^- (seawater)	+0.25	+0.009
Ag/AgCl/0.1M Cl^-	+0.288	+0.047
Hg/Hg_2Cl_2/sat KCl (SCE)	+0.241	•••
Hg/Hg_2Cl_2/1M KCl	+0.280	+0.039
Hg/Hg_2Cl_2/0.1M KCl	+0.334	+0.093
Cu/$CuSO_4$ sat	+0.30	+0.06
Hg/Hg_2SO_4/H_2SO_4	+0.616	•••

[d] To convert from one scale to another, add the value indicated.

Example:
An electrode potential of +1.000V versus SCE would be (1.000 + 0.241) = +1.241V versus SHE. An electrode potential of −1.000V versus SCE would give (−1.000 + 0.241) = −0.759V versus SHE.

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CORROSION RATE CONVERSION FACTORS

$$\text{Mils/year (mpy)} = C \times \frac{\text{weight loss}}{\text{area} \times \text{time}} \times K$$

$$\text{Millimetres/year (mm/y)} = 0.0254 \text{ mpy}$$

Weight Loss	Area	C Factors Hour	Day	Week	Month	Year
mg	cm^2	437	18.2	2.59	0.598	0.0498
	dm^2	4.37	0.182	0.0259	5.98×10^{-3}	4.98×10^{-4}
	m^2	0.0437	1.82×10^{-3}	2.59×10^{-4}	5.98×10^{-5}	4.98×10^{-6}
	in^2	67.7	2.82	0.402	0.0927	7.72×10^{-3}
	ft^2	0.470	0.0196	2.79×10^{-3}	6.44×10^{-4}	5.36×10^{-5}
g	cm^2	437×10^3	182×10^2	2590	598	49.8
	dm^2	4370	182	25.9	5.98	0.498
	m^2	43.7	1.82	0.259	0.0598	4.98×10^{-3}
	in^2	677×10^2	2820	402	92.7	7.72
	ft^2	470	19.6	2.79	0.644	0.0536
lb	cm^2	198×10^6	825×10^4	118×10^4	271×10^3	226×10^2
	dm^2	198×10^4	825×10^2	118×10^2	2710	226
	m^2	198×10^2	825	118	27.1	2.26
	in^2	307×10^5	128×10^4	182×10^3	420×10^2	3500
	ft^2	213×10^3	8880	1270	292	24.3

EXAMPLE: A 5.0 square inch specimen of copper has a weight loss of 218 mg in a 40 hour corrosion test.

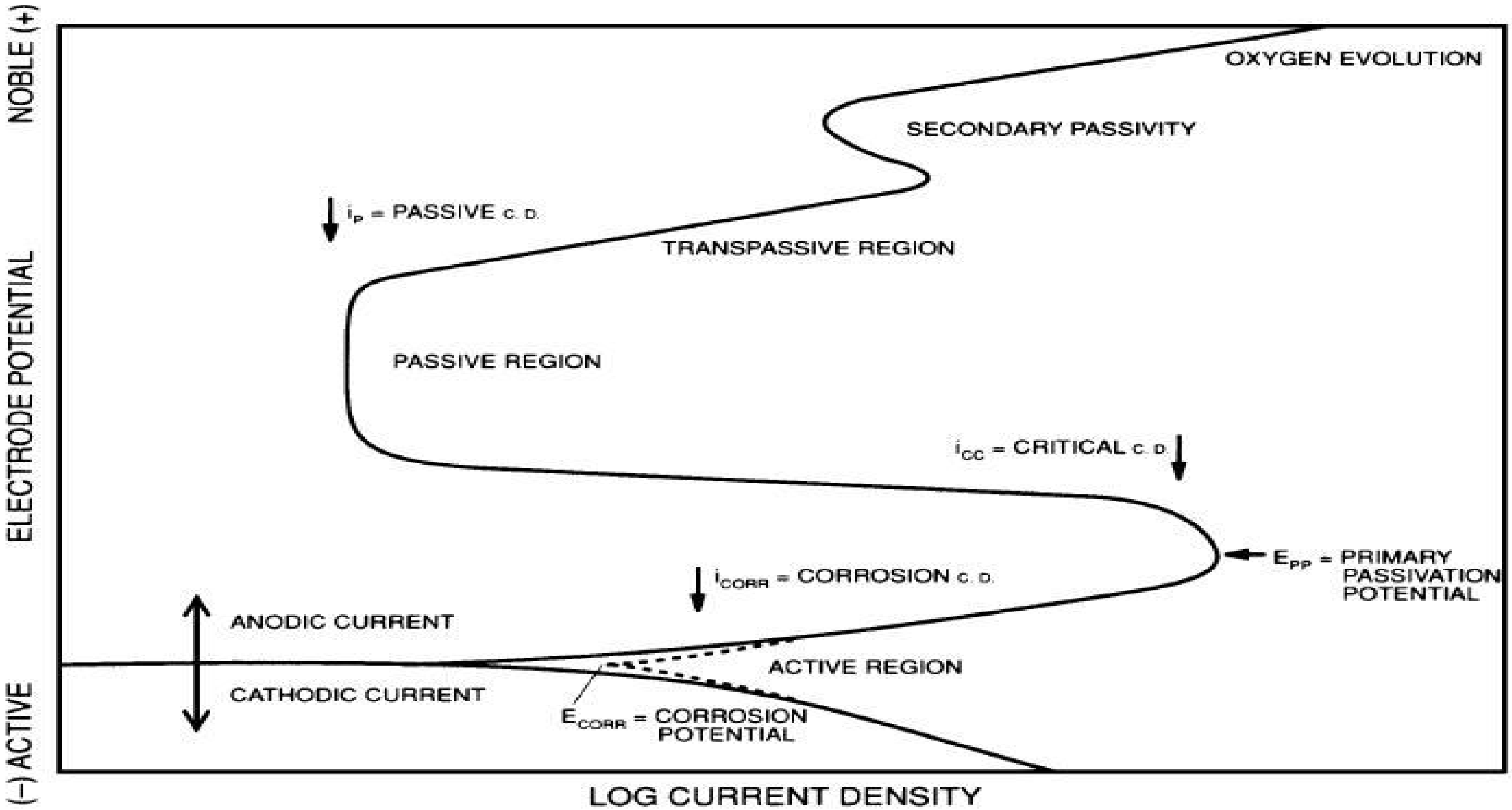
$$\text{mpy} = 67.7 \times \frac{218.}{5.0 \times 40} \times 0.88 = 65$$

$$\text{mm/y} = 0.0254 \times 65 = 1.65$$

K is a density factor.
K = 1.000 for carbon steel.
K factors for other alloys are given on the next page.

Source: Courtesy Aaron Wachter.

POLARIZATION PLOTS FOR A PASSIVE ANODE



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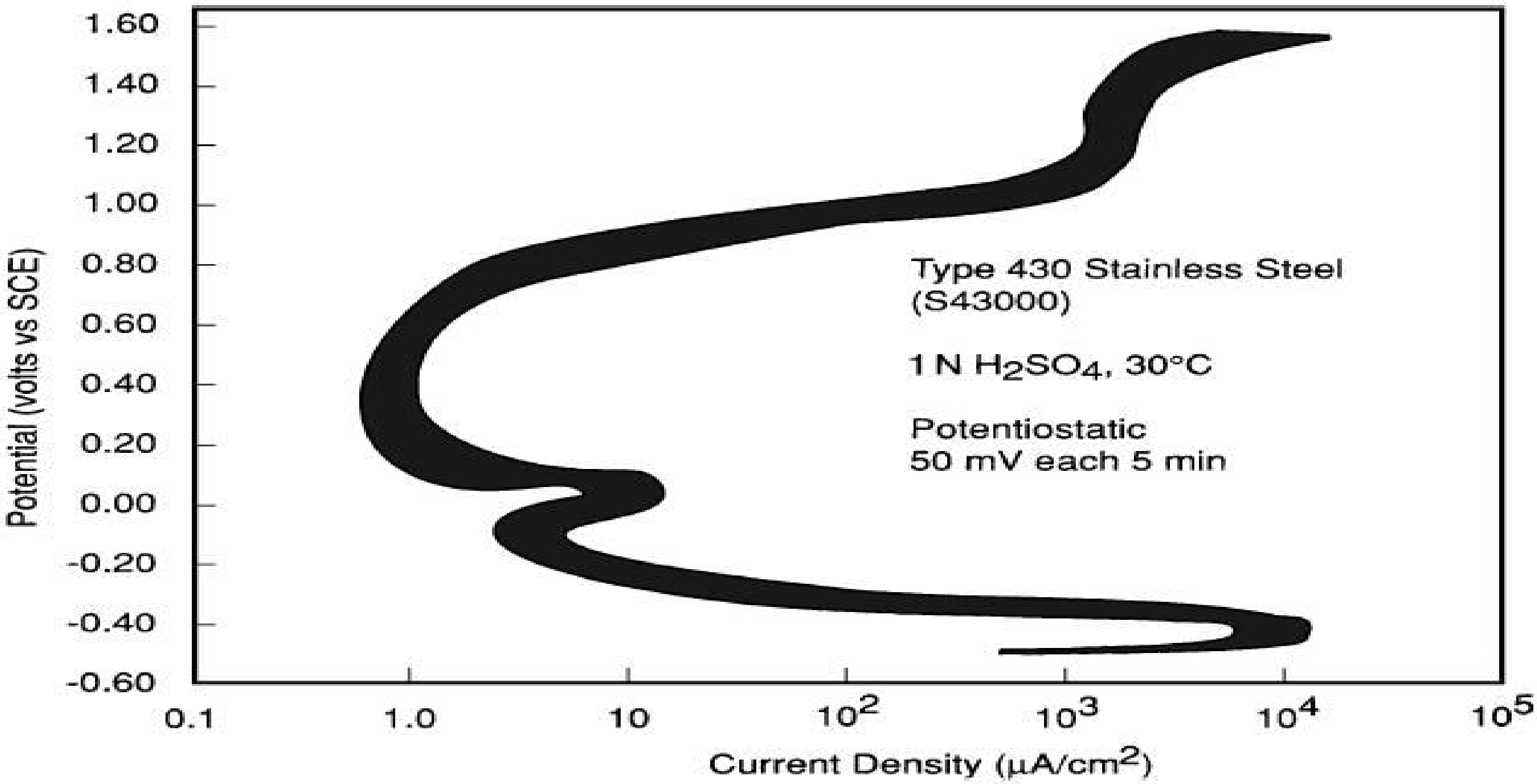
TYPICAL STANDARD POTENTIOSTATIC ANODIC POLARIZATION PLOT



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