

اطلاعات ضروری

فنی - مہندسی

Technical
Information



اطلاعات و جداول فنی انواع فولادهای ضد زنگ



Stainless Steel In Special -1

Material Type		Chemical Composition									Application
STS/ Others	Din/ Others	C	Si	Mn	P	S	Ni	Cr	Mo	Etc	
<u>Typical</u> <u>RA446</u>		0.05	0.5	0.7	-	-	-	25	-	Nit=0.1 Iron=73	Oil Burners/Stack damper/Combustion chamber,... Rolling Mills; Furnace Rollers, Framework
<u>Typical</u> <u>253MA</u>	1.4835	0.09	1.7	-	-	-	11.0	21.0	-	N=17+Ce	Heat Treatment Furnace; Muffle, Heat Exchanger Mineral Preparation & Cement Production Good creep strength & good Scaling resistant-sintering plants ; Grids/Boxes /Burners
<u>Typical</u> <u>153MA</u>	1.4818	0.05	1.3	-	-	-	9.5	18.5	-	N=15+Ce	-Blast Furnace plants; Piping/Expansion Bellows -Steel Melting, Smelters; Flue Gas Ducts,..
<u>439AISI</u>	1.4509/10/110 SUS 430LX	0.03 Max	0.75 Max	1.0 Max	0.04 Max	0.03 Max	-	16.0 19.0	-	Ti or Nb	Exhaust System Component, Washing Machine, Tubes
<u>410(S)</u>	1.4000	0.08 Max	0.75 Max	1.0 Max	0.04 Max	0.015 Max	-	12.0 13.0	-	-	Petro-Chemical Industries
<u>347</u>	1.4550	0.08 Max	0.50 Max	2.0 Max	0.04 Max	0.03 Max	17.0 19.0	9.0 13.0	-	Na+ Ta	Corrosion Resistant parts & Welding Processes, Chemical parts, Paper & Pulp, Fertilizer Industries, Exhaust System
<u>321</u>	1.4541	0.08 Max	1.0 Max	2.0 Max	0.045 Max	0.03 Max	9.0 13.0	17.0 19.0	-	Ti=6 x C^0.75	Corrosion Resistant parts & Welding Processes, Chemical parts, Paper & Pulp, Exhaust System Component, Pipe & Tubing
<u>317(L)</u>	1.4438	0.03 Max	1.0 Max	2.0 Max	0.04 Max	0.03 Max	18.0 20.0	11.0 15.0	3.0 4.0	-	Acid Resistant material for Severe-Corrosion-Chemical Industries, Especially used for Welding Processes
<u>316TI</u>	1.4571	0.08 Max	1.0 Max	2.0 Max	0.045 Max	0.03 Max	10.0 14.0	16.0 18.0	2.0 3.0	Ti 5 x C	Acid Resistant material for Severe-Corrosion-Chemical Industries, Especially used for Welding Processes
<u>316(L)</u>	1.4404	0.03 Max	0.75 Max	2.0 Max	0.04	0.015	12.50 13.00	17.0 18.0	2.50 3.00	-	Corrosion Resistant suitable as a roofing material, Chemical parts, Paper & Pulp industries, Dye industries, Fertilizer Industries
<u>315SN</u> <u>in Japan</u>		0.05 Max	2.0 2.5	1.0 1.5	0.04 Max	0.03 Max	9.0 10.0	17.50 18.50	0.7 1.0	Cu, Nb, Nb	Heat Resistant parts & Anti-Stress Corrosion Cracking parts, Tank Reservation, Food-processing Machine, Exhaust System, Chemical Industries
<u>310(S)</u>	1.4845	0.08 Max	1.5 Max	2.0 Max	0.045 Max	0.03 Max	19.0 22.0	24.0 26.0	-	-	Heat Resistant parts, Exhaust System, Radiant Tube, Cooker Units
<u>ER-1 in</u> <u>Japan</u>		0.07 Max	3.0 4.0	-	-	-	12.0 13.50	18.50 20.0	-	Nb 0.05- 0.2	Heat Resistant parts, Exhaust System, Muffles
<u>309(S)</u>	1.4833	0.08 Max	1.0 Max	2.0 Max	0.045 Max	0.03 Max	12.0 15.0	22.0 24.0	-	-	Temperature Range in 800°C~900°C Grill Elements, Cooker Units, Radiant Tube, Exhaust System Component
<u>309</u>	1.4828	0.2 Max	1.5 2.5	2.0 Max	0.045 Max	0.03 Max	11.0 13.0	19.0 21.0	-	-	High Scaling Temp.(aro. 1100°C in Air) Heating Elements, Muffles, Exhaust System Component
<u>305</u> <u>302B in</u> <u>SUS</u>	1.4303	0.04 0.15	- 2.0 3.0	- 2.0 Max	- 0.045 Max	- 0.03 Max	11.5 8.0 10.0	18.5 17.0 19.0	-	N=0.04 -	Severe Deep-dwg. Stamping Operation TV parts, Electric parts, Auto parts

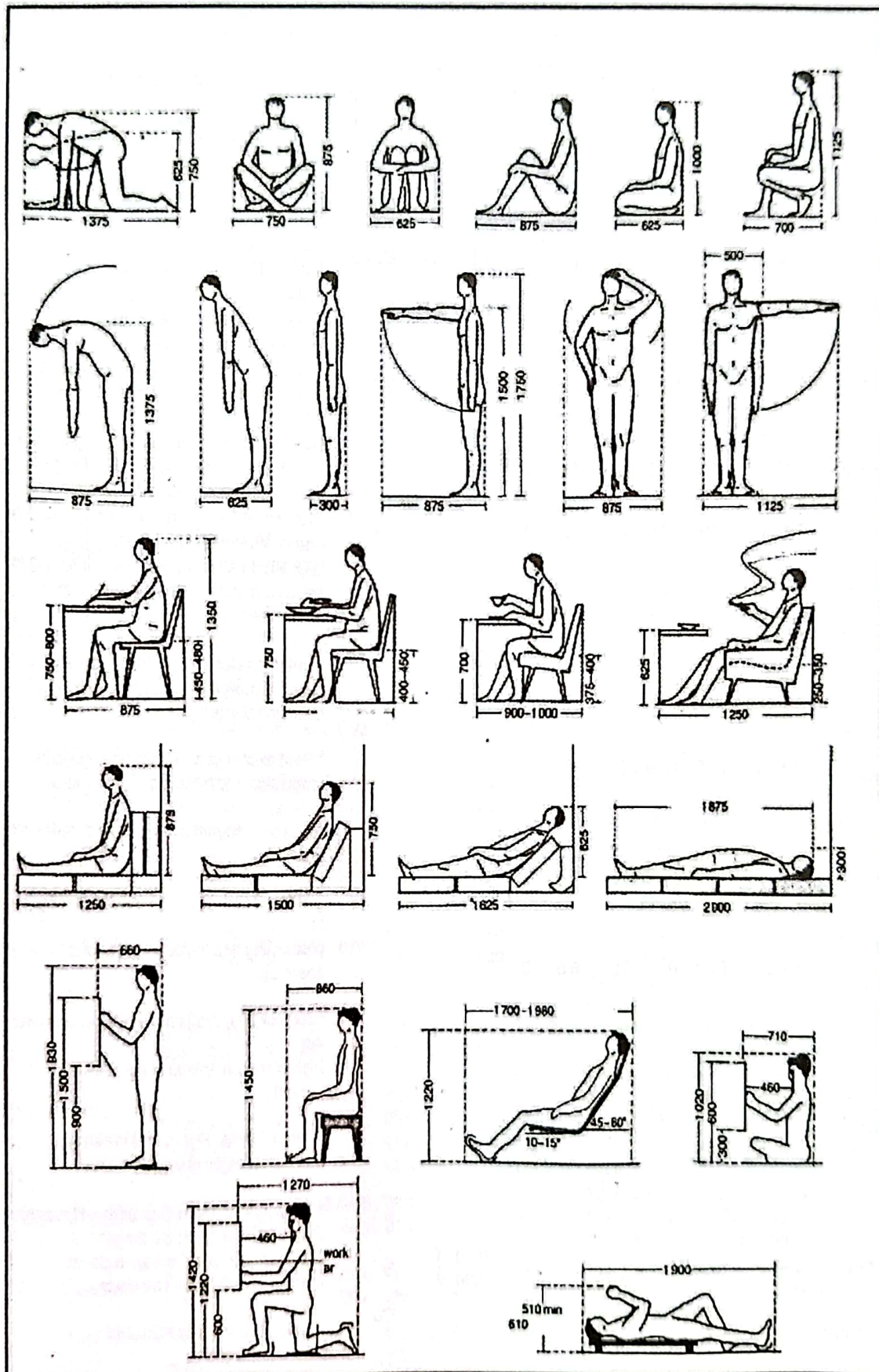


Stainless Steel in Special -2

Material Type	Chemical Composition										Application	
	Typical	Din	C	N	Cr	Ni	Mo	Mn	Si	Etc		
<u>353MA</u>	-		0.05	-	25	35	-	-	1.5	N		For Waste fired boiler tube shields, Heat treating Muffles, Retorts, Burners, Kiln, Damper, Gate valve
<u>RA330</u>	-		0.05	-	19	35	-	1.5	1.25	Iron		Fumaces containers, Conveyors bar, Frame Heat Treating Baskets
<u>RA333</u>	2.4608		0.05	-	25	45	3.0	1.5	1.0	Co,Iron		Radiant Tube, Heat Treating fixtures, Muffles, Retorts, Gas turbine
<u>85H</u>	-		0.20	-	18.5	14.5	-	0.8	3.5	Al Iron		Incinerator for waste, Radiant Tube heat treatment fixtures, Coal burner Nozzel
<u>654SMO</u>	1.4652		0.01	0.50	24	22	7.3	-	-	Mn,Cu		Heat exchanger in contact with hot sea-water, Applications for use in acids containing halides and for condenser tubes
<u>254SMO</u>	1.4547		0.01	0.20	20	18	6.1	-	-	Cu		Cooling water piping, Heat exchanger, Pulp bleach plant component, FDG, Flue gas desulphurization, Tall oil distillation
<u>904L</u>	1.4539		0.01	0.06	20	25	4.5	-	-	Cu		Process equipment in the chemical industry, Tanks, Vessel and Pipelines
<u>High Nickel Alloy Austenitics</u>												High Nickel Alloy Austenitics are designed to solve corrosion problem in various wet environments.
DUPLEX												Duplex grades provide high resistance to stress corrosion cracking and have high mechanical-strength.
<u>-SAF 2304</u>	1.4362		0.02	0.10	23	45	-	-	-	-		* Heat exchangers, Tubes and Pipes for production and handling of gas and oil.
												*Heat exchangers and Pipes in desalination plant.
<u>-SAF 2205</u>	1.4462		0.02	0.17	22	5.5	3	-	-	-		*Pressure vessel,Tanks and Heat xchanger for processing and transport of various chemicals.
												*Rotors,Fans,Shafis and Press rolls where the high corrosion fatigue strength can be utilised.
<u>-SAF 2507</u>	1.4410		0.02	0.27	25	7	4	-	-	-		*Cargo tanks, Piping and Welding consumables for chemical tanks.
<u>S-Ten</u>	-		0.14	-	0 1.30	-	-	0.70 0.90	11. 1.0	P S		* Sulfur Dew-Point Corrosion-Resistant Steel for Atmospheric Corosion of Air/Fuels/ Smokes for Sea-water or Contaminated Water Corosion
										Cu		-Ducts / Expansions / Casting
										Ti+		-Baskets & Cases
<u>Carfen</u>	-		0.09	-	0.52	0.30	-	0.38	0.46	Sb		-Tube type Pipes

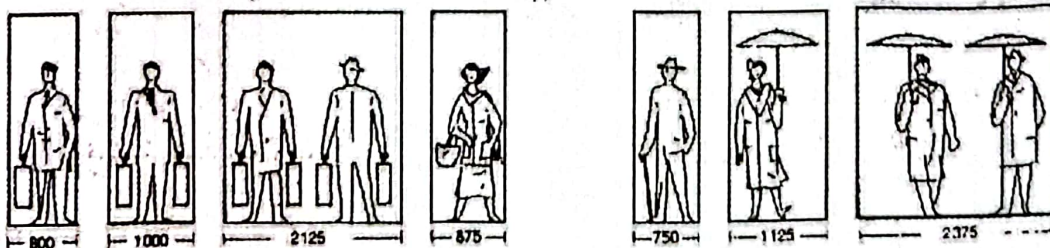
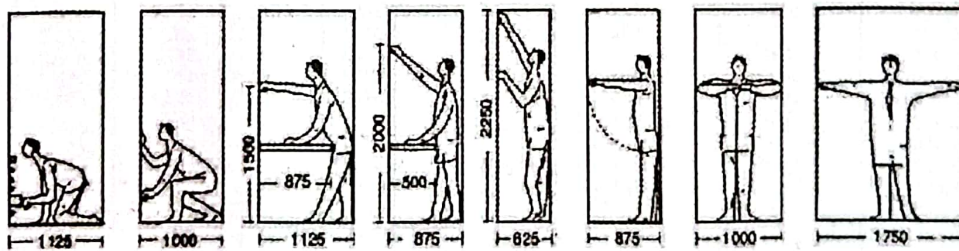
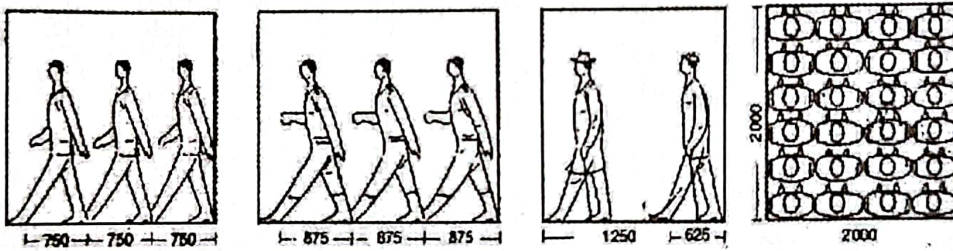
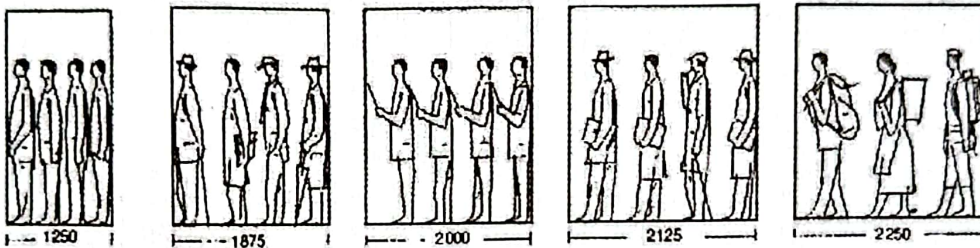
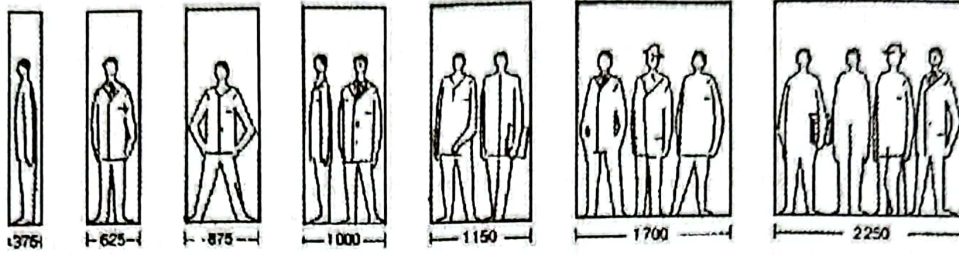


ابعاد انسانی جهت طراحی فضاهای مورد نیاز





ابعاد انسانی جهت طراحی فضاهای مورد نیاز





جدول مشخصات بخار آب اشباع در درجه حرارت های مشخص



Temperature °C t	Pressure KP/cm ² P	Sp. Liquid m ³ /kg v'.10 ⁻³	Volume Vapor m ³ /kg v'	Density Vapor kg/m ³ ρ*	Entropy Kcal/kg deg.		Enthalpy Kcal/kg		Heat of vaporization Kcal/kg r
					Liquid s'	Vapor s''	Liquid i'	Vapor i''	
0	0,006228	1,0002	206,3	0,004846	0	2,1863	0	597,2	597,2
5	0,008890	1,0000	147,2	0,006795	0,0182	2,1561	5,03	599,4	591,4
10	0,012513	1,0004	106,4	0,009396	0,0361	2,1253	10,04	601,6	591,6
15	0,017376	1,0010	77,99	0,01282	0,0538	2,0970	15,04	603,8	588,8
20	0,02383	1,0018	57,84	0,01729	0,0708	2,0697	20,03	606,0	580,0
25	0,03229	1,0030	43,41	0,02304	0,0878	2,0436	25,02	608,2	583,2
30	0,04326	1,0044	32,93	0,03036	0,1042	2,0187	30,00	610,4	580,4
35	0,05733	1,0061	25,25	0,03960	0,1205	1,9947	34,99	612,6	577,6
40	0,07520	1,0079	19,55	0,05114	0,1366	1,9718	39,98	614,7	574,7
45	0,09771	1,0099	15,28	0,06644	0,1524	1,9498	44,96	616,8	571,8
50	0,12578	1,0121	12,05	0,08298	0,1679	1,9287	49,95	619,0	569,0
55	0,16051	1,0145	9,584	0,1043	0,1833	1,9085	54,94	621,0	566,1
60	0,2031	1,0171	7,682	0,1302	0,1984	1,8891	59,94	623,2	563,3
65	0,2565	1,0199	6,208	0,1611	0,2133	1,8702	64,93	625,2	560,3
70	0,3177	1,0228	5,049	0,1981	0,2280	1,8522	69,93	627,3	557,4
75	0,3931	1,0258	4,130	0,2418	0,2425	1,8349	74,94	629,3	554,4
80	0,4829	1,0290	3,410	0,2933	0,2567	1,8178	79,95	631,3	551,3
85	0,5894	1,0323	2,830	0,3534	0,2708	1,8016	84,96	633,2	548,2
90	0,7149	1,0359	2,361	0,4235	0,2848	1,7858	89,98	635,1	545,1
95	0,8619	1,0396	1,981	0,5046	0,2985	1,7708	95,01	637,0	542,0
100	1,03323	1,0435	1,673	0,5977	0,3121	1,7561	100,04	638,9	538,9
105	1,2318	1,0474	1,419	0,7045	0,3255	1,7419	105,08	640,7	535,6
110	1,4609	1,0515	1,210	0,8265	0,3387	1,7282	110,12	642,5	532,4
115	1,7239	1,0558	1,036	0,9650	0,3519	1,7150	115,18	644,3	529,1
120	2,0246	1,0603	0,8914	1,122	0,3647	1,7018	120,3	646,0	525,7
125	2,3666	1,0650	0,7701	1,299	0,3775	1,6895	125,3	647,7	522,4
130	2,7544	1,0697	0,6680	1,496	0,3901	1,6772	130,4	649,8	518,9
135	3,192	1,0746	0,5817	1,719	0,4028	1,6652	135,5	650,8	515,3
140	3,685	1,0798	0,5084	1,967	0,4150	1,6539	140,6	652,6	511,9
145	4,237	1,0850	0,4459	2,243	0,4272	1,6428	145,8	654,0	508,2
150	4,854	1,0908	0,3924	2,548	0,4395	1,6320	150,9	655,5	504,6
155	5,540	1,0963	0,3464	2,887	0,4516	1,6214	156,1	656,9	500,8
160	6,302	1,1021	0,3068	3,260	0,4637	1,6112	161,3	658,3	497,0
165	7,146	1,1082	0,2724	3,671	0,4756	1,6012	166,5	659,6	493,1
170	8,076	1,1144	0,2426	4,122	0,4874	1,5914	171,7	660,9	489,2
175	9,101	1,1210	0,2166	4,617	0,4991	1,5818	176,9	662,1	485,2
180	10,225	1,1276	0,1939	5,157	0,5107	1,5721	182,2	663,2	481,0
185	11,456	1,1346	0,1730	5,740	0,5222	1,5629	187,6	664,1	476,8
190	12,800	1,1418	0,1544	6,362	0,5336	1,5538	192,8	665,3	472,5
195	14,265	1,1490	0,1410	7,094	0,5449	1,5448	198,1	666,2	468,1
200	15,857	1,1565	0,1273	7,857	0,5562	1,5358	203,5	667,0	463,5
210	19,466	1,1726	0,1043	9,585	0,5788	1,5184	214,3	668,3	454,0
220	23,659	1,1900	0,08614	11,61	0,6010	1,5012	225,3	669,3	443,9
230	28,531	1,2088	0,07163	13,98	0,6229	1,4840	236,4	669,7	433,3
240	34,140	1,2291	0,05970	16,75	0,6448	1,4669	247,7	669,6	421,9
250	40,56	1,2512	0,05006	19,98	0,6667	1,4499	259,2	669,0	409,8
260	47,87	1,2755	0,04213	23,74	0,6880	1,4327	271,0	667,8	396,8
270	56,14	1,3023	0,03557	28,11	0,7103	1,4153	283,0	665,9	382,0
280	65,46	1,3321	0,03010	33,22	0,7321	1,3978	295,3	663,5	368,2
290	75,92	1,3655	0,02552	39,18	0,7542	1,3797	308,0	660,2	352,2
300	87,61	1,4036	0,02163	46,24	0,7767	1,3613	321,0	656,1	335,1
310	100,64	1,4448	0,01830	54,64	0,7994	1,3415	334,6	650,8	316,2
320	115,13	1,499	0,01544	64,79	0,8229	1,3206	349,0	644,2	295,2
330	131,18	1,562	0,01295	77,20	0,8478	1,2982	364,2	636,0	271,8
340	148,96	1,641	0,01076	92,90	0,8734	1,2728	380,7	625,6	244,9
350	168,83	1,747	0,008803	113,6	0,9015	1,2433	398,9	611,9	213,0
360	190,42	1,907	0,006963	143,6	0,9353	1,2072	420,9	592,8	171,9
370	214,68	2,23	0,00500	200	0,9842	1,1506	452,3	559,3	107,0
371	217,3	2,30	0,00476	218	0,992	1,142	457	554	97
372	219,9	2,38	0,00450	222	1,002	1,132	463	547	84
373	222,5	2,50	0,00418	239	1,011	1,116	471	539	68
374	225,2	2,79	0,00365	274	1,04	1,09	488	523	35
374,2	225,6	3,04	0,00304	329	1,06	1,06	505	505	0



ارزش حرارتی منابع و مواد مختلف انرژی زا



Energy source	Btu*	Per unit
Electricity†	3,412	kWh
Coal		
Anthracite (Pa.)	25,400,000	ton
Bituminous	26,200,000	ton
Blast furnace gas	100	ft ³
Briquettes and package fuels	28,000,000	ton
Coke	24,800,000	ton
Coke-breeze	20,000,000	ton
Coke-oven gas	550	ft ³
Coal tar	150,000	gal
Coke-oven and manufactured gas products, light oils	5,460,000	bbl
Natural gas (dry)	1,035	ft ³
Natural gas liquids (average)	4,011,000	bbl
Butane	4,284,000	bbl
Propane	3,843,000	bbl
Petroleum		
Asphalt	6,640,000	bbl
Coke	6,024,000	bbl
Crude oil	5,800,000	bbl
Diesel	5,806,000	bbl
Distillate fuel oil	5,825,000	bbl
Gasoline, aviation	5,048,000	bbl
Gasoline, motor fuel	5,253,000	bbl
Jet fuel		
Commercial	5,670,000	bbl
Military	5,355,000	bbl
Kerosene	5,670,000	bbl
Lubricants	6,060,000	bbl
Miscellaneous oils	5,588,000	bbl
Refinery still gas	5,600,000	bbl
Heavy fuel oil	6,287,000	bbl
Road oils	6,640,000	bbl
Wax	5,570,000	bbl
Shale oil	5,800,000	bbl
Uranium		
Total contained energy	60,000,000,000,000	Short ton U ₃ O ₈
Energy available with present technology	500,000,000,000	Short ton U ₃ O ₈

*Btu is the amount of heat required to raise the temperature of 1 lb of water 1° F.

†Because of conversion losses in generation of electric power from heat, about 10,000 to 11,000 Btu is required to produce 1 kilowatthour (kWh).



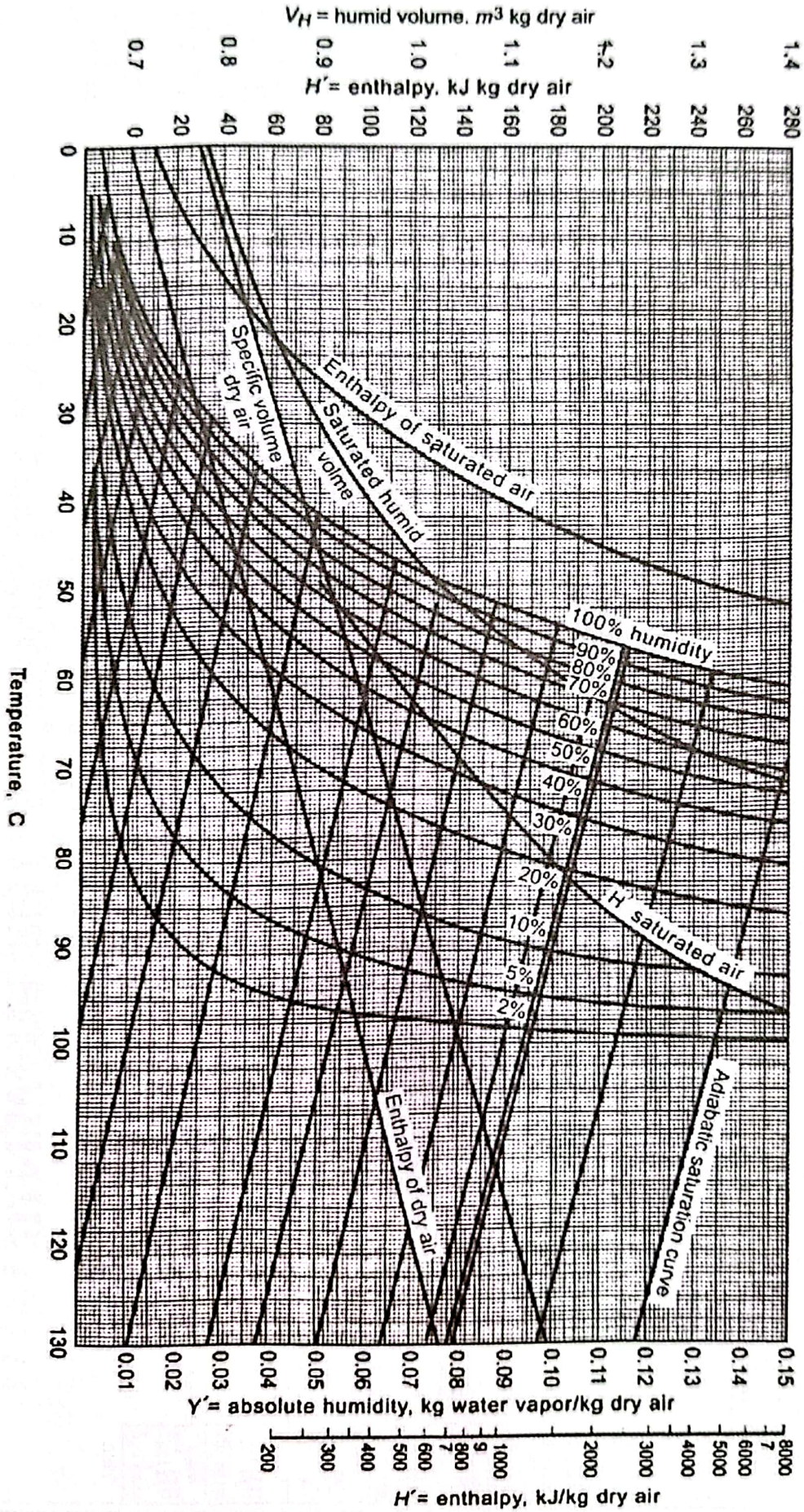
وزن مخصوص برخی از مواد



وزن مخصوص برخی از مواد		شرح	
		کیلوگرم بر متر مکعب	فلزات :
	گازهای مختلف (در صفر درجه سانتیگراد و فشار یک اتمسفر)		
۷۰۰	سنگ آهک پخته	۱/۱۷۷	آلومینیوم
۷۰۰	خاکستر کک	۱/۲۵۰	آلیاژهای ساختمانی
۱۳۰۰	پودر سیمان نوده شده و بطور آزاد	۱/۹۶۴	آلومینیوم
۱۸۰۰	پودر سیمان در کیسه و جابجا شده	۰/۵۶۰	آهن خام خاکستری
	مصالح و اجزاء ساختمانی:	۱/۲۹۳	آهن خام سفید
۲۱۵۰ تا ۲۱۰۰	ملات ماسه سیمان	۱/۳۰۰	چدن
۱۹۰۰	ملات ماسه آهک	۱/۴۲۹	فولاد نرم
۲۰۰۰	ملات ماسه و سیمان و آهک (باتارد)	۱/۲۵۴	سرب
۱۳۰۰	ملات گچ	۰/۰۸۹۵	مس
۱۶۰۰	ملات گچ و خاک		برنز
۲۰۰۰	ملات گل		روی
	چوبهای مختلف در حالت خشک:		قلع
	بلوط	۹۰۰	نیکل
	کاج	۶۰۰	آنتیموان
	داغداغان	۶۵۰	آرسنیک
	توسکا	۵۰۰	کرم
	زبان گنجشک	۷۰۰	برنج ریخته گری شده
	صنوبر	۶۰۰	منیزیم
	نارون	۷۰۰	مانگاز
	شربین یا سپاه کاج	۵۰۰	بیسوف
	مرز	۷۰۰	چوبه
	تبریزی	۲۵۰	پلاتین
	گردو	۶۵۰	طلا
	چنار	۷۵۰	
	ششاد	۹۰۰	مایعات:
	چوب آزاد	۷۰۰	آب
	سپیدار	۵۰۰	لجن
	لرک	۴۳۰	اتر
	ملح	۶۵۰	الکل
	در مورد چوبهای تازه بریده شده مقادیر فوق باید ۱/۸ برابر منظور شود.		نفت
	مصالح طبیعی نوده شده:		بنزین
	خاک - ماسه - گل رس خیس	۲۱۰۰	کلپسین
	خاک - ماسه - گل رس (مرطوب)	۱۸۰۰	روغن
	۵ درصد رطوبت)	۱۸۰۰	روغن موتور
	خاک - ماسه - گل رس (خشک)	۱۶۰۰	نفت چراغ
	لاشه سنگ	۱۴۰۰	اسید سولفوریک
	شن خیس	۲۰۰۰	اسید نیتریک
	شن خشک	۱۷۰۰	اسید کلریدریک
	پوکک کک	۷۰۰	قبر ذغال سنگ
	جوش ذغال	۱۰۰۰	
	جوش کوره (در قطعات شبه لاشه با بالاست)	۱۵۰۰	
	جرکاری با آجر فشاری و ملات ماسه سیمان	۱۸۵۰	
	جرکاری با آجر فشاری و ملات ماسه آهک	۱۸۰۰	
	جرکاری با آجر فشاری و ملات گچ و خاک	۱۷۵۰	
	جرکاری با آجر سفال و ملات ماسه سیمان (سوراخها با ملات پر می شود)	۲۱۰۰	
	جرکاری با آجر سفال و ملات ماسه آهک (سوراخها با ملات پر می شود)	۲۰۰۰	
	جرکاری با آجر مجوف (مانند اینتالوان) و ملات ماسه سیمان	۸۵۰	
	سنگ چینی با سنگهای تراش آذرین (مانند گرانیت) و ملات ماسه سیمان	۲۸۰۰	
	جوش کوره خرد شده و دانه دانه	۱۰۰۰	
	ذغال سنگ	۸۰۰	
	ذغال چوب از چوب نرم و سبک	۱۵۰	
	ذغال چوب از چوب سفت و سنگین	۲۲۰	
	خرد آجر (با رطوبت کم)	۱۵۰۰	
	ماسه بادی	۱۶۰۰	
	خاک تسول	۹۰۰	
	پوکک معدنی	۶۰۰	



نمودار رطوبت سنجی هوا





جدول خوردگی مواد



Code designations for corrosion resistance

A = acceptable, and be used successfully

C = caution, resistance varies widely depending on conditions: used when some corrosion is permissible

X = unsuitable

Blank = information lacking

Code designations for gasket material

a = asbestos, white (compressed or woven)

b = asbestos, blue (compressed or woven)

c = asbestos (compressed and rubber bonded)

d = asbestos (woven and rubber-fractionated)

e = GR-S or natural rubber

f = Teflon

Chemical	Metals										Nonmetals				Acceptable nonmetallic gasket materials
	Iron and Steel	Cast iron (Ni-resist)	Stainless steel		Nickel	Monel	Red Brass	Aluminum	Industrial glass	Carbon (Karbate)	Phenolic resins (Havag)	Acrylic resins (Lucite)	Vinylidene chloride (Saran)		
			18-8	Mo											
Acetic acid, crude	C	C	C	C	C	C	A	A	A	A	A	A	C	b,c,d,f	
Acetic acid, pure	Z	X	C	A	C	A	A	A	A	A	A	X	X	b,c,d,f	
Acetic anhydride	C	C	A	A	A	A	A	A	A	A	A	X	C	b,c,d,f	
Acetone	A	A	A	A	A	A	A	A	A	A	C	X	C	a,e,f	
Aluminum chloride	X	X	X	X	C	A	A	A	A	A	A	-	A	a,c,e,f	
Aluminum sulfate	X	X	C	A	C	C	A	A	A	A	A	A	A	a,c,d,e,f	
Alums	X	X	C	A	C	A	A	A	A	A	A	A	A	a,c,d,e,f	
Ammonia(gas)	A	A	C	A	A	A	X	C	C	-	A	-	A	a,f	
Ammonium chloride	A	A	C	A	A	A	X	C	C	A	A	A	A	b,c,d,e,f	
Ammonium hydroxide	A	A	A	A	C	A	C	C	C	A	A	A	C	a,c,d,f	
Ammonium phosphate (monobasic)	X	X	A	A	-	C	X	X	A	A	A	-	-	b,c,d,e,f	
Ammonium phosphate (dibasic)	C	A	A	A	-	A	C	C	A	A	A	-	-	a,c,d,e,f	
Ammonium phosphate (tribasic)	A	A	A	A	A	A	X	C	A	A	A	-	A	a,c,d,e,f	
Ammonium sulfate	A	A	A	A	A	A	X	C	A	A	A	-	A	b,c,d,e,f	
Aniline	A	A	A	A	A	A	X	A	A	A	A	-	C	a,f	
Benzene, benzol	A	A	A	A	A	A	A	A	A	A	A	-	C	a,f	
Boric acid	X	X	A	A	A	A	A	A	A	A	A	-	C	a,c,d,e,f	
Bromine	X	X	C	A	C	A	C	C	C	A	A	-	A	b,f	
Calcium chloride	C	A	A	A	A	A	A	A	A	A	A	-	A	b,c,d,e,f	
Calcium hydroxide	A	A	A	A	A	A	A	A	A	A	A	-	C	a,c,d,e,f	
Calcium hypochlorite	X	X	C	A	C	A	C	C	C	A	A	-	C	b,c,d,f	
Carbon tetrachloride	C	C	A	A	A	A	A	A	A	A	A	-	C	a,f	
Carbonic acid	C	C	A	A	A	A	A	A	A	A	A	-	A	a,e,f	
Chloroacetic acid	X	-	X	X	A	C	A	C	A	A	A	-	A	b,f	
Chlorine, dry	A	X	C	X	A	X	X	X	X	A	A	-	X	b,e,f	
Chlorine, wet	X	X	C	X	C	X	X	X	X	A	A	-	X	b,e,f	
Chloric acid	C	C	C	A	C	C	A	C	A	A	A	-	A	b,f	
Citric acid	X	C	C	A	A	C	C	A	A	A	A	-	X	b,c,d,e,f	
Copper sulfate	X	C	C	A	A	C	C	A	A	A	A	-	A	b,c,d,e,f	
Ethanol	A	A	A	A	A	A	A	A	A	A	A	-	A	a,c,e,f	
Ethylene glycol	A	A	A	A	A	A	A	A	A	A	A	-	A	a,e,f	
Fatty acid	C	C	A	A	A	A	A	A	A	A	A	-	A	a,e,f	
Ferric chloride	X	X	X	C	A	X	X	X	X	C	A	-	-	b,e,f	
Ferric sulfate	X	X	C	A	A	X	X	X	X	C	A	-	-	b,c,e,f	
Ferrous sulfate	C	C	A	A	A	A	C	C	A	A	A	-	A	a,c,e,f	
Formaldehyde	C	C	A	A	A	A	A	A	A	A	A	-	A	a,c,e,f	
Formic acid	X	-	A	C	A	C	A	C	A	A	A	-	A	b,c,e,f	
Glycerol	A	A	A	A	A	A	A	A	A	A	A	-	A	b,c,e,f	
Hydrocarbon (aliphatic)	A	A	A	A	A	A	A	A	A	A	A	-	A	a,c,e,f	
Hydrochloric acid	X	X	X	X	C	C	C	X	X	A	A	-	A	b,c,d,f	
Hydrofluoric acid	C	X	X	X	C	C	C	X	X	A	A	-	A	b,f	
Hydrogen peroxide	C	-	C	C	C	C	C	A	A	A	A	-	A	a,e,f	
Lactic acid	X	C	C	C	C	C	C	C	A	A	A	-	A	a,b,c,d,e,f	
Magnesium chloride	C	C	C	A	A	A	A	A	A	A	A	-	A	b,c,e,f	
Magnesium sulfate	A	A	A	A	A	A	A	A	A	A	A	-	A	b,c,e,f	
Methanol	A	A	A	A	A	A	A	A	A	A	A	-	A	a,c,e,f	
Nitric acid	X	C	C	A	C	X	X	X	X	A	A	-	A	a,c,e,f	
Oleic acid	C	C	C	A	C	A	A	A	A	A	A	-	A	b,f	
Oxalic acid	C	C	C	A	C	A	A	A	A	A	A	-	A	a,e,f	
Phenol (carbolic acid)	C	A	C	C	A	A	A	C	A	A	A	-	C	b,c,d,e,f	
Phosphoric acid	C	C	C	A	A	A	A	X	X	A	A	-	A	a,f	
Potassium hydroxide	C	C	C	A	A	A	A	X	X	A	A	-	A	b,f	
Sodium bisulfate	X	C	C	A	A	A	A	C	C	A	A	-	A	a,e,f	
Sodium carbonate	A	A	A	A	A	A	A	C	C	A	A	-	A	b,c,d,e,f	
Sodium chloride	A	A	A	A	A	A	A	C	C	A	A	-	A	a,c,d,e,f	
Sodium hydroxide	A	A	A	A	A	A	A	C	X	A	A	-	C	a,c,e,f	
Sodium hypochlorite	X	C	C	A	C	A	C	C	X	A	A	-	A	b,c,d,f	
Sodium nitrate	A	A	A	A	A	A	A	C	A	A	A	-	A	b,c,d,e,f	
Sodium sulfate	A	A	A	A	A	A	A	A	A	A	A	-	A	a,c,d,e,f	
Sodium sulfide	A	A	A	A	A	A	A	X	C	A	A	-	-	a,e,f	
Sodium sulfite	A	A	A	A	A	A	A	C	C	A	A	-	-	a,e,f	
Sodium thiosulfate	A	A	A	A	A	A	A	C	C	A	A	-	A	a,c,d,e,f	
Stearic acid	C	A	A	A	A	A	A	C	C	A	A	-	A	a,e,f	
Sulfur	A	C	C	C	C	C	C	C	C	A	A	-	A	a,e,f	
Sulfur dioxide	C	C	C	C	C	C	C	C	C	A	A	-	A	a,f	
Sulfuric acid (98% to fuming)	A	C	X	A	X	X	X	A	A	X	X	-	C	b,f	
Sulfuric acid (76%-65%)	A	C	X	X	X	X	X	A	A	A	X	-	C	b,f	
Sulfuric acid (10%-75%)	X	C	X	C	C	C	C	A	A	A	C	-	A	a,b,c,e,f	
Sulfuric acid (<10%)	X	C	X	C	C	C	C	A	A	A	C	-	A	b,c,d,e,f	
Sulfurous acid	X	-	C	A	X	X	A	C	C	A	A	-	A	a,f	
Trichloroethylene	C	A	C	C	A	A	A	C	C	A	A	-	A	a,f	
Zinc chloride	C	C	C	X	A	A	A	X	C	-	-	-	-	b,c,d,e,f	
Zinc sulfate	C	A	A	A	A	A	A	C	C	-	-	-	-	b,c,d,e,f	



جدول تبدیل واحا

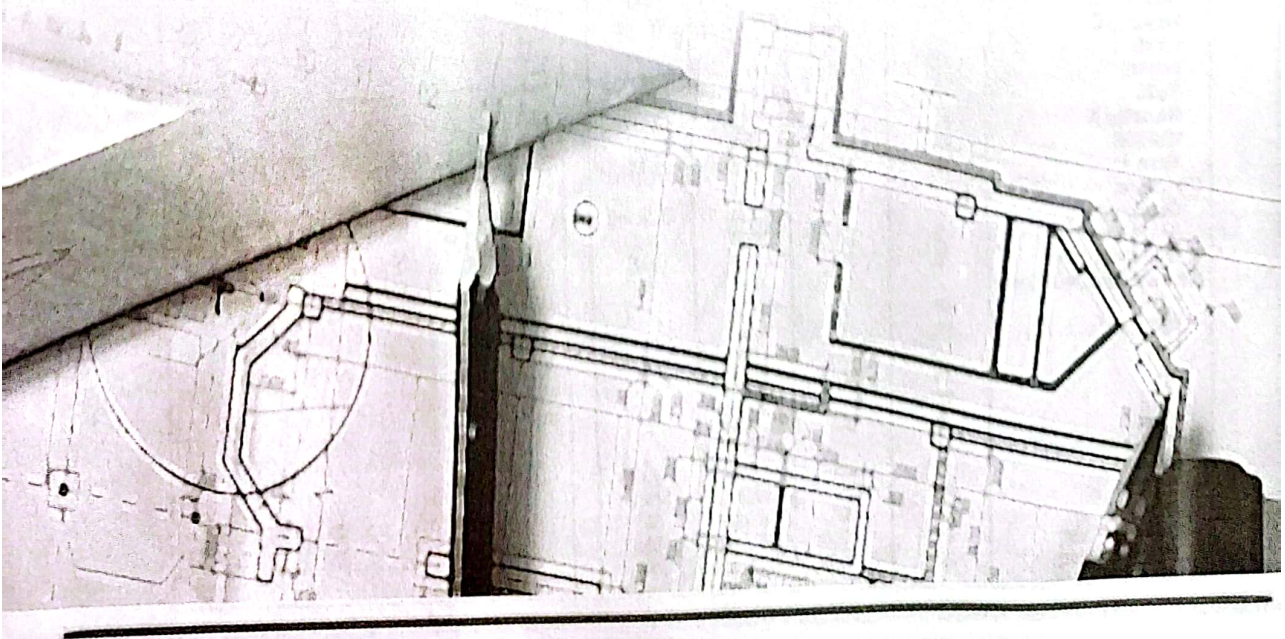


The first two digits of each numerical entry represent a power of 10. For example, the entry "-02 2.54" expresses the fact that 1 in = 2.54 × 10⁻² m.

To convert from	To	Multiply by	To convert from	To	Multiply by
abampere	ampere	+01 1.00	fluid ounce (U.S.)	meter ³	-05 2.957 352
ab coulomb	coulomb	+01 1.00	foot	meter	-01 3.048
abfarad	farad	+09 1.00	foot (U.S. survey)	meter	-01 3.048 006
abhenry	henry	-09 1.00	foot of water (39.2°F)	newton/meter ²	+03 2.988 98
abhmho	mho	+09 1.00	footcandle	lumen/meter ²	+01 1.076 391
abohm	ohm	-09 1.00	footlambert	candela/meter ²	+00 3.426 259
abvolt	volt	-08 1.00	furlong	meter	+02 2.011 68
acre	meter ²	+03 4.046 856	gal (galileo)	meter/second ²	-02 1.00
ampere (international of 1948)	ampere	-01 9.998 35	gallon (U.K. liquid)	meter ³	-03 4.546 087
angstrom	meter	-10 1.00	gallon (U.S. dry)	meter ³	-03 4.404 883
are	meter ²	+02 1.00	gallon (U.S. liquid)	meter ³	-03 3.785 411
astronomical unit	meter	+11 1.495 978	gamma	tesla	-09 1.00
atmosphere	newton/meter ²	+05 1.013 25	gauss	tesla	-04 1.00
bar	newton/meter ²	+05 1.00	gilbert	ampere turn	-01 7.957 747
barn	meter ²	-28 1.00	gill (U.K.)	meter ³	-04 1.420 652
barrel (petroleum 42 gal)	meter ³	-01 1.589 873	gill (U.S.)	meter ³	-04 1.182 941
barye	newton/meter ²	-01 1.00	grad	degree (angular)	-01 9.00
British thermal unit (ISO/TC 12)	joule	+03 1.055 06	grad	radian	-02 1.570 795
British thermal unit (International Steam Table)	joule	+03 1.055 04	grain	kilogram	-05 6.479 591
British thermal unit (mean)	joule	+03 1.055 87	gram	kilogram	-03 1.00
British thermal unit (thermochemical)	joule	+03 1.054 350	hand	meter	-01 1.016
British thermal unit (39°F)	joule	+03 1.059 67	hectare	meter ²	+04 1.00
British thermal unit (60°F)	joule	+03 1.054 65	henry (international of 1948)	henry	+00 1.000 495
bushel (U.S.)	meter ³	-02 3.523 907	hogshead (U.S.)	meter ³	-01 2.384 809
cable	meter	+02 2.194 56	horsepower (550 ft lb/s)	watt	+02 7.456 998
caliber	meter	-04 2.54	horsepower (boiler)	watt	+03 9.809 50
calorie (International Steam Table)	joule	+00 4.1868	horsepower (electric)	watt	+02 7.46
calorie (mean)	joule	+00 4.190 02	horsepower (metric)	watt	+02 7.354 99
calorie (thermochemical)	joule	+00 4.184	horsepower (U.K.)	watt	+02 7.457
calorie (15°C)	joule	+00 4.185 80	horsepower (water)	watt	+02 7.460 43
calorie (20°C)	joule	+00 4.181 90	hour (mean solar)	second (mean solar)	+03 3.60
calorie (kilogram, International Steam Table)	joule	+03 4.186 8	hour (sidereal)	second (mean solar)	+03 3.590 170
calorie (kilogram, mean)	joule	+03 4.190 02	hundredweight (long)	kilogram	+01 5.080 234
calorie (kilogram, thermochemical)	joule	+03 4.184	hundredweight (short)	kilogram	+01 4.535 923
carat (metric)	kilogram	-04 2.00	inch	meter	-02 2.54
Celsius (temperature)	kelvin	$t_K = t_C + 273.15$	inch of mercury (32°F)	newton/meter ²	+03 3.386 389
centimeter of mercury (0°C)	newton/meter ²	+03 1.333 22	inch of mercury (60°F)	newton/meter ²	+03 3.376 85
centimeter of water (4°C)	newton/meter ²	+01 9.806 38	inch of water (39.2°F)	newton/meter ²	+02 2.490 82
chain (engineer's)	meter	+01 3.048	inch of water (60°F)	newton/meter ²	+02 2.485 4
chain (surveyor's or Gunter's)	meter	+01 2.011 68	joule (international of 1948)	joule	+00 1.000 165
circular mil	meter ²	-10 5.067 074	kayser	l/meter	+02 1.00
cord	meter ³	+00 3.624 556	kilocalorie (International Steam Table)	joule	+03 4.186 74
coulomb (international of 1948)	coulomb	-01 9.998 35	kilocalorie (mean)	joule	+03 4.190 02
cubit	meter	-01 4.572	kilocalorie (thermochemical)	joule	+03 4.184
cup	meter ³	-04 2.365 882	kilogram mass	kilogram	+00 1.00
curie	disintegration/second	+10 3.70	kilogram-force (kgf)	newton	+00 9.806 65
day (mean solar)	second (mean solar)	+04 8.64	kilopond-force	newton	+00 9.806 65
day (sidereal)	second (mean solar)	+04 8.616 400	kip	newton	+03 4.448 221
degree (angle)	radian	-02 1.745 329	knot (international)	meter/second	-01 5.144 444
denier (international)	kilogram/meter	-07 1.111 111	lambert	candela/meter ²	+04 17
dram (avoirdupois)	kilogram	-03 1.771 845	lambert	candela/meter ²	+03 3.183 088
dram (troy or apothecary)	kilogram	-03 3.887 934	langley	joule/meter ²	+04 4.184
dram (U.S. fluid)	kilogram	-06 3.696 691	lbf (pound-force, avoirdupois)	newton	+00 4.448 221
dyne	newton	-05 1.00	lbf (pound-mass, avoirdupois)	kilogram	-01 4.535 923
electron volt	joule	-19 1.602 10	league (British nautical)	meter	+03 5.559 552
erg	joule	-07 1.00	league (international nautical)	meter	+03 5.556
Fahrenheit (temperature)	kelvin	$t_K = (5/9)(t_F + 459.67)$	league (statute)	meter	+03 4.825 032
Fahrenheit (temperature)	Celsius	$t_C = (5/9)(t_F - 32)$	light-year	meter	+15 9.460 35
farad (international of 1948)	farad	-01 9.995 05	link (engineer's)	meter	-01 3.048
faraday (based on carbon 12)	coulomb	+04 9.648 70	link (surveyor's or Gunter's)	meter	-01 2.011 68
faraday (chemical)	coulomb	+04 9.649 57	liter	meter ³	-03 1.00
faraday (physical)	coulomb	+04 9.652 19	lux	lumen/meter ²	+00 1.00
fathom	meter	+00 1.828 8	marwell	weber	-06 1.00
fcrmi (ferromicron)	meter	-15 1.00	meter	wavelengths Kr 86	+06 1.650 763
			micrometer	meter	-06 1.00
			mil	meter	-06 2.54
			mile (U.S. statute)	meter	+03 1.609 344
			mile (U.K. nautical)	meter	+03 1.853 184
			mile (international nautical)	meter	+03 1.852
			mile (U.S. nautical)	meter	+03 1.852
			millibar	newton/meter ²	+02 1.00
			millimeter of mercury (0°C)	newton/meter ²	+02 1.333 224

جدول تبدیل واحا

To convert from	To	Multiply by	To convert from	To	Multiply by
minute (angle)	radian	-04 2.908 882	second (ephemeris)	second (ephemeris)	+00 1.000 000
minute (mean solar)	second (mean solar)	+01 6.00	second (mean solar)	second (ephemeris)	Consult American Ephemeris and Nautical Almanac
minute (sidereal)	second (mean solar)	+01 5.983 617			
month (mean calendar)	second (mean solar)	+06 2.628	second (sidereal)	second (mean solar)	-01 9.973 695
nautical mile (international)	meter	+03 1.852	section	meter ²	+06 2.599 988
nautical mile (U.S.)	meter	+03 1.852	scruple (apothecary)	kilogram	-03 1.255 973
nautical mile (U.K.)	meter	+03 1.853 184	shake	second	-08 1.00
oersted	ampere/meter	+01 7.957 747	skein	meter	+02 1.097 28
ohm (international of 1948)	ohm	+00 1.000 496	slug	kilogram	+01 1.459 390
ounce-force (avoirdupois)	newton	-01 2.780 138	span	meter	-01 2.296
ounce-mass (avoirdupois)	kilogram	-02 2.834 952	statampere	ampere	-10 3.335 640
ounce-mass (troy or apothecary)	kilogram	-02 3.110 347	statcoulomb	coulomb	-10 3.335 640
ounce (U.S. fluid)	meter	-01 7.62	statfarad	farad	-12 1.112 650
pace	meter	+16 3.083 74	statHenry	henry	+11 8.987 554
parsec	newton/meter ²	+00 1.00	statmho	mho	-12 1.112 650
pascal	meter ²	-03 8.909 767	statohm	ohm	+11 8.987 554
peck (U.S.)	kilogram	-03 1.555 173	statute mile (U.S.)	meter	+03 1.609 344
pennyweight	meter	+00 5.0292	statvolt	volt	+02 2.997 925
perch	humen/meter ²	+04 1.00	stere	meter ³	+00 1.00
phot	meter	-03 4.217 517	stilb	candela/meter ²	+04 1.00
pica (printer's)	meter ²	-04 5.506 104	stoke	meter ² /second	-04 1.00
pint (U.S. dry)	meter ³	-04 4.731 764	tablespoon	meter ³	-05 1.478 676
pint (U.S. liquid)	meter ³	-04 4.731 764	teaspoon	meter ³	-06 4.928 921
point (printer's)	meter	-04 3.514 598	ton (assay)	kilogram	-02 2.916 666
poise	(newton-second)/meter ²	-01 1.00	ton (long)	kilogram	+03 1.016 046
pole	meter	+00 5.0292	ton (metric)	kilogram	+03 1.00
pound-force (lbf avoirdupois)	newton	+00 4.448 221	ton (nuclear equivalent of TNT)	joule	+09 4.20
pound-mass (lbm avoirdupois)	kilogram	-01 4.535 923	ton (register)	meter ³	+00 2.531 654
pound-mass (troy or apothecary)	kilogram	-01 3.732 417	ton (short, 2000 lb)	kilogram	+02 9.071 847
poundal	newton	-01 1.382 549	tonne	kilogram	+03 1.00
quart (U.S. dry)	meter ³	-03 1.101 220	torr (0°C)	newton/meter ²	+02 1.333 22
quart (U.S. liquid)	meter ³	-04 9.463 529	township	meter ²	+07 9.323 957
rad (radiation dose absorbed)	joule/kilogram	-02 1.00	unit pole	wbcr	-07 1.256 637
Rankine (temperature)	kelvin	$t_r = (5/9)t_K$	volt (international of 1948)	volt	+00 1.000 330
rayleigh (rate of photon emission)	1/second-meter ²	+10 1.00	watt (international of 1948)	watt	+00 1.000 165
rhe	meter ² /(newton- second)	+01 1.00	yard	meter	-01 9.144
rod	meter	+00 5.0292	year (calendar)	second (mean solar)	+07 3.1536
roentgen	coulomb/kilogram	-04 2.579 76	year (sidereal)	second (mean solar)	+07 3.155 815
rutherford	disintegration/second	+06 1.00	year (tropical)	second (mean solar)	+07 3.155 692
second (angle)	radian	-06 4.848 136	year 1900, tropical, Jan., day 0, hour 12	second (ephemeris)	+07 3.155 692
			year 1900, tropical, Jan., day 0, hour 12	second	+07 3.155 692





مقاومت شیمیایی انواع پلاستیک در حلال ها



S = good to 25° C
 S₁ = good to 60° C F = fair
 S₂ = good above 60° C U = unsatisfactory

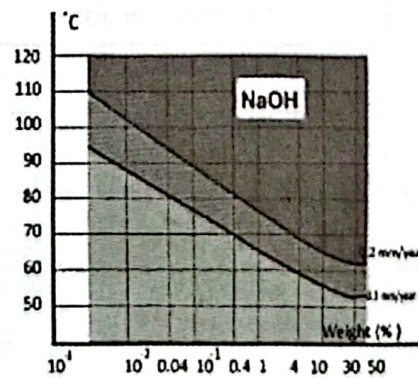
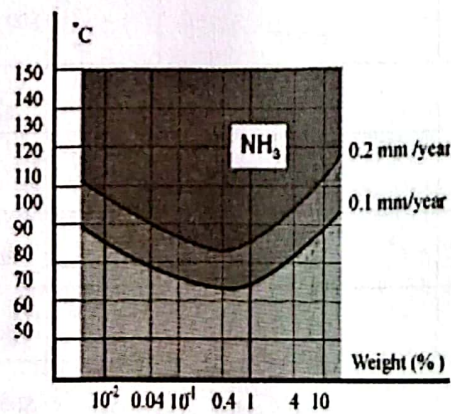
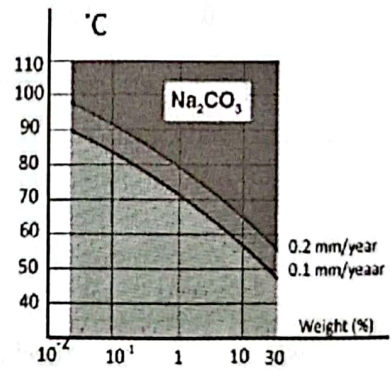
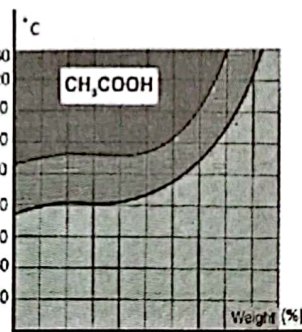
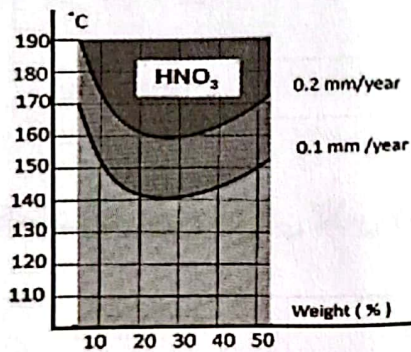
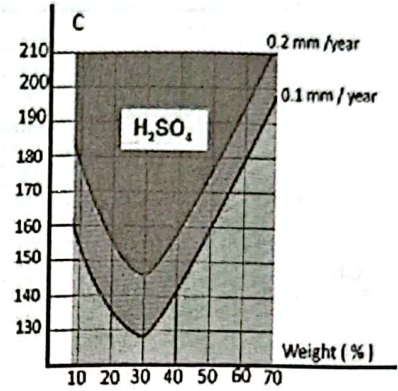
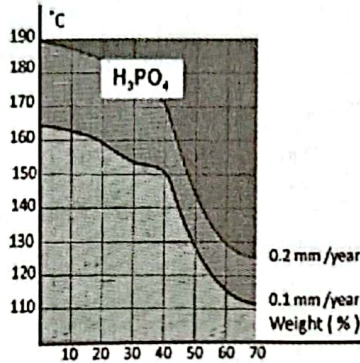
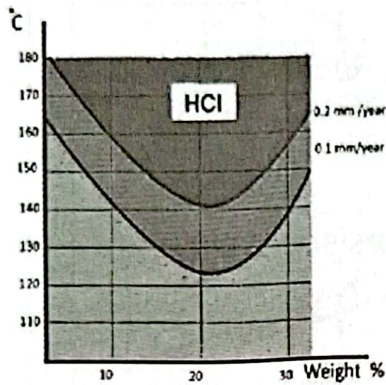
	PVC rigid	PVC plastized	Polyethylene	Polypropylene	Methacrylates	Polyesters	Epoxy	Fluorocarbons	Polystyrene	ABS polymers	Acetal Polymers	Phenol formaldehyde	Poly-carbonate	Cl-Poly-ether	Furan	Sorran
Acetone	U	U	S	S	U	U	F	S ₂	U	U	S ₁	U	S	S	F	S
Alcohols, methyl	S	S ₁	S ₁	S ₁	S	S ₁	S	S ₂	S	S ₁	S ₁	F	S ₁	S ₁	S	S ₁
ethyl	S	S ₁	S ₁	S ₁	S	S ₁	S	S ₂	S	S ₁	S ₁	F	S ₁	S ₁	S	S ₁
butyl	S	S ₁	S ₁	S ₁	S	S ₁	S	S ₂	S	S ₁	S ₁	F	S ₁	S ₁	S	S ₁
Aniline	U	U	S	S	...	...	S	S ₂	S	S	...	U	...	F	U	S ₁
Benzene	U	U	U	U	U	S ₁	S	S ₂	U	U	S	S	U	S	S	U
Carbon tetrachloride	U	U	U	U	U	S ₁	S	S ₂	U	U	S ₁	S	U	S	S	S
Cyclohexanone	U	U	...	...	...	...	...	S ₂	...	U	...	...	...	...	...	U
Ethyl acetate	U	U	U	U	U	U	F	S ₂	U	U	...	U	U	S	S	U
Ethylene dichloride	U	U	U	U	U	U	F	S ₂	U	U	S	S	U	S	S	S
Ethyl ether	U	U	S	S	U	...	S	S ₂	U	U	S ₁	S	S	S	S	U
Hexane	S	U	F	F	S	S	S	S ₂	U	F	S	S	S	S	S	S ₁
Kerosene	S	S ₁	S	S	S	S	S	S ₂	U	S	S	S	S	S	S	S ₁
Lubricating oils	S ₁	S	S	S	S	S	S ₂	S ₂	F	S	S	S	S	S	S	S ₁
Naphthalene	U	U	S	S	U	S	S	S ₂	U	U	S	S	F	S	S	S ₁
Triethanolamine	S ₁	S	S	S	...	...	...	S ₂	...	U	...	...	...	S	...	...
Xylene	U	U	U	U	U	S ₂	S	S ₂	U	U	S ₁	S	U	S	S	F

Alloys for high - temperature process use				
	Nominal Composition, %			
	Cr	Ni	Fe	Other
Ferritic steels				
Carbon steel	...	...	bal.	
2 1/2 chrome	2 1/2	...	bal.	Mo
Type 502	5	...	bal.	Mo
Type 410	12	...	bal.	
Type 430	16	...	bal.	
Type 446	27	...	bal.	
Austenitic steels:				
Type 304	18	8	bal.	
Type 321	18	10	bal.	Ti
Type 347	18	11	bal.	Cb
Type 316	18	12	bal.	Mo
Type 309	24	12	bal.	
Type 310	25	20	bal.	
Type 330	15	35	bal.	
Nickel - base alloys:				
Nickel	...	bal.		
Incoloy	21	32	bal.	
Hastelloy B	...	bal.	6	Mo
Hastelloy C	16	bal.	6	W, Mo
80/15	15	bal.	25	
Inconel	15	bal.	7	
80/20	20	bal.		
Hastelloy X	22	bal.	19	Co, Mo
Multimet	21	20	bal.	Co
Rene 41	19	bal.	5	Co, Mo, Ti
Cast irons:				
Ductile iron	...	...	bal.	C, Si, Mg
NI - Resist, D-2	2	20	bal.	Si, C
NI - Resist, D-4	5	30	bal.	Si, C
Cast stainless (AISI types):				
HC	28	4	bal.	
HF	21	11	bal.	
HH	28	12	bal.	
HK	28	20	bal.	
HT	15	35	bal.	
HW	12	bal.	28	
Super alloys:				
Inconel X	15	bal.	7	Ti, Al, Co
A 286	15	25	bal.	Mo, Ti
Stellite 25	20	10	Co-base	W
Stellite 21(cast)	27.3	2.8	Co-base	Mo
Stellite 31(cast)	25.2	10.5	Co-base	W

Resistance of stainless steels to oxidation in air	
Maximum temperature, °C	Stainless steel type
650	416
700	403, 405, 410, 414
800	430F
850	430, 431
900	302, 303, 304, 316, 317, 321, 347, 348, 17-14 CuMo
1000	302B, 308, 442
1100	309, 310, 314, 329, 446



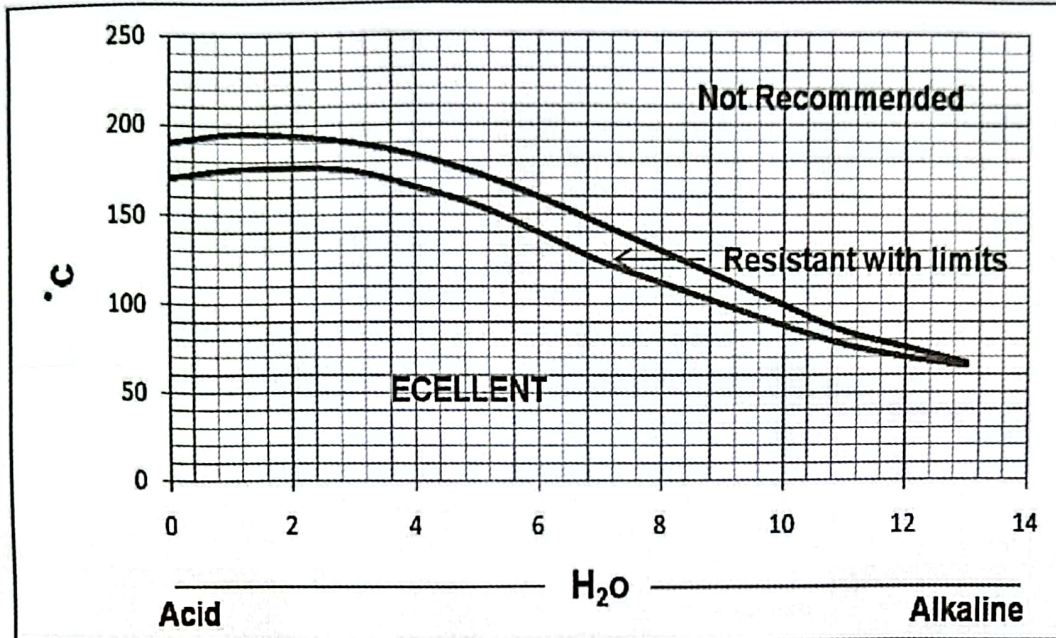
نمودارهای مقاوت در برابر خوردگی



(■ : استفاده از گلاس توصیه نمی شود ■ : خوردگی گلاس شروع می شود ■ : گلاس بدون مشکل کار می کند)



مقاومت گلاس در محدوده دما و PH های مختلف



مشخصات شیمیایی و فیزیکی گلاس لایند

Row	Specifications	Unit	Amount
1	Compressive Strength	N/mm ²	800 - 1000
2	Density	gr/cm ³	2.5
3	Resistivity	kv/mm	20
4	Percentage elongation	Percent	0.1%
5	Hardness	Vickers	600
6	coefficient of linear expansion	C ⁻¹	800 * 10 ⁻⁷
7	Modulus of elasticity	N/mm ²	75.000
8	Clearance Surface	Micrometers	0.08
9	Heat transfer coefficient	w/m.k	1.2
10	Adhesion strength glass to metal	N/mm ²	1000