
Chapter 16

Special Use Tables, Charts, and Conversions

Contents:	652.1600	General	16-1
	652.1601	English conversion units	16-1
	652.1602	Metric conversion units	16-3

Exhibits	Exhibit 16-1	Irrigation related units conversion factors	16-1
	Exhibit 16-2	Units of area, length, weight, volume, pressure, flow, velocity, temperature, yields, and rates	16-3

Chapter 16

Special Use Tables, Charts, and Conversions

652.1600 General

This chapter contains commonly used tables, charts, and conversions that were not included in the major parts of the guide, but do provide a definite use. Tables and charts can be added as needed. This chapter will vary in size and scope.

652.1601 English conversion units

Throughout this guide, English units generally are used followed with metric units in parenthesis. Exhibit 16-1 displays commonly used conversion factors relating to irrigation.

Exhibit 16-1 Irrigation related units conversion factors

Volume, weight, and flow units

1 gallon (gal)	= 231 cubic inches (in ³) = 0.13368 cubic feet (ft ³)
1 gallon of water weighs	= 8.345 pounds (lb)
1 million gallons (mg)	= 3.0689 acre-feet (ac-ft) = 133,700 cubic feet (ft ³)
cubic foot water	= 1728 cubic inches (in ³) = 7.48 gallons
1 cubic foot of water weighs	= 62.4 pounds (lb)
1 acre-foot (ac-ft)	= amount of water to cover 1 acre 1 foot deep = 43,560 cubic foot (ft ³) = 325,850 gallons = 12 acre-inches (ac-in)
1 acre-inch per day (ac-in/da)	= 18.7 gallons per minute (gpm)
1 million gallons (mg)	= 3.0689 acre-feet (ac-ft)
1 million gallons per day (mgd)	= 1.547 cubic feet per second (ft ³ /s), = 695 gallon per minute (gpm)
1 cubic foot per second	= 448.83 (typically rounded to 450) gallons per minute (gpm) = 7.48 gallons per second = 0.646 million gallons per day (mgd) = 0.992 (typically rounded to 1) acre-inch per hour (ac-in/hr) = 1.983 (typically rounded to 2) acre-feet per day (ac-ft/d) = 40 miners inches (11.25 gpm)—AZ, CA, MT, NV, OR = 50 miners inches (9 gpm)—ID, KA, NE, NM, ND, UT = 38.4 miners inches—CO

Exhibit 16-1 Irrigation related units conversion factors—Continued**Pressure units**

1 atmosphere (1 bar)	= 14.697 pounds per square inch (lb/in ²) = 2116.3 pounds per square foot (lb/ft ²) = 33.93 feet of water = 29.92 inches of mercury
1 pound per square inch	= 144 pounds per square foot = 2.31 feet of head of water
1 pound per square foot	= 48 Pa = .0048 kPa
1 foot head of water (ft)	= 0.433 pounds per square inch = 0.0295 atmospheres (bars)

Energy units

1 hp	= 0.746 kw
1 kw	= 1.3405 hp

Soil and water chemistry units

1 meq/liter = 1 mg/liter/equiv. weight	1 mg/L = 1 ppm
	1 ml water = 1 cc water
	1 ml water = 1 mg

Element	Equivalent weight	Element	Equivalent weight
Ca	2.0	CO ₃	30
Mg	12.2	HCO ₃	61
Na	23	SO ₄	48
Cl	35.4	NO ₃ -N	14

Common conversion units pertaining to water quality

10 ppm Nitrate – Nitrogen	= 27 lb/ac-ft of water = 2.25 lb/ac-in of water
---------------------------	--

652.1602 Metric conversion units

Where metric units are used in this guide, they generally are presented in SI Units (International System of Units); however, other more common units may be used for ease of use, display, or conversion. Exhibit 16-2 displays commonly used conversion factors relating to irrigation.

Basic SI units are:

unit	metric unit	SI unit designation
length	meter	m
mass	kilogram	kg
time	second	s
time	hour	hr
time	day	d
temperature	degree Celsius	°C
pressure	Pascals	Pa

Exhibit 16-2 Units of area, length, weight, volume, pressure, flow, velocity, temperature, yields, and rates

Area							
Units	m ²	ha	km ²	in ²	ft ²	acre	
1 square meter	= 1	.0001	—	1550	10.764	—	
1 hectare	= 10,000	1	.01	—	1.1 x 10 ⁵	2.4711	
1 square kilometer	= 1.0 x 10 ⁶	100	1	—	1.1 x 10 ⁷	247.1	
1 square foot	= .0929	9.3 x 10 ⁻⁶	—	144	1	—	
1 acre	= 2.6 x 10 ⁶	.4047	.0040	—	43,560	1	
1 square mile	= —	—	2.6	—	—	—	

Length							
Units	mm	cm	m	km	in	ft	mi
1 millimeter	= 1	.1	.001	—	.0394	.033	—
1 centimeter	= 10	1	.01	—	.3937	.0328	—
1 meter	= 1000	10	1	.001	39.37	3.2808	—
1 kilometer	= —	—	1000	1	—	3280.8	.6214
1 inch	= 25.40	2.54	.0254	—	1	—	—
1 foot	= 304.8	30.48	.3048	—	12	1	—
1 mile	= —	—	1609.3	1.6093	—	5280	1
1 yard	= —	—	.9	—	—	—	—

Exhibit 16-2 Units of area, length, weight, volume, pressure, flow, velocity, temperature, yields, and rates—Continued**Weight**

Units		mg	g	kg	met ton	lb	ton
1 milligram	=	1	.001	—	—	—	—
1 gram	=	1000	1	.001	—	—	—
1 kilogram	=	—	1,000	1	.001	2.2046	—
1 metric ton	=	—	—	1,000	1	2,204.6	1.102
1 pound	=	—	453.6	.4536	—	1	.0005
1 ton	=	—	—	907.18	.9072	2,000	1

Volume

Units		L	m ³	qt	gal	ft ³
1 liter	=	1	.001	.9081	.2270	.0358
1 cubic meter	=	1,000	1	—	264.2	35.31
1 quart	=	1.1012	—	1	.25	.0389
1 gallon	=	3.785	—	4	1	.1337
1 cubic foot	=	28.316	.02832	25.714	7.48	1
1 acre foot	=	—	1233	—	—	43,560
1 cubic yard	=	—	.80	—	—	—

Flow

Units		L/s	m ³ /s	gpm	ft ³ /s	ac-ft/d	mg/d
1 liter per second	=	1	.001	15.85	.03531	.004419	—
1 cubic meter per second	=	1,000	1	15,850	35.31	70.04	22.82
1 gallon per minute	=	.0631	—	1	—	—	—
1 cubic foot per second	=	28.32	.02832	448.8	1	1.983	.6463
1 acre-foot per day	=	14.28	.01428	226.3	.5042	1	.3259
1 million gallons per day	=	43.81	.04381	694.4	1.547	3.069	1

Exhibit 16-2 Units of area, length, weight, volume, pressure, flow, velocity, temperature, yields, and rates—Continued**Velocity**

Units		m/s	km/h	ft/s	mph
1 meter per second	=	1	3.6	3.281	2.237
1 kilometer per hour	=	.2778	1	.9113	.6214
1 foot per second	=	.3048	1.097	1	.6818
1 mile per hour	=	.447	1.609	1.467	1

Yield and rate

Units		kg/ha	met ton/ha	lb/ac	L/ha	gal/ac
1 kilogram per hectare	=	1	—	.893	—	—
1 metric ton per hectare	=	—	1	893	—	—
1 pound per acre	=	1.12	.00112	1	—	—
1 liter per hectare	=	—	—	—	1	.107
1 gallon per acre	=	—	—	—	9.35	—

Pressure conversions

1 atmosphere (1 bar)	=	100	kilopascal (kPa)	
1 foot of water (ft)	=	2.9890	"	
1 meter of water (m)	=	9.8064	"	
1 millibar	=	0.100	"	
1 pound per square foot (lb/ft ²)	=	.04788	"	= 47.8 Pascals
1 pound per square inch (lb/in ²)	=	6.8948	"	

Exhibit 16-2 Units of area, length, weight, volume, pressure, flow, velocity, temperature, yields, and rates—Continued

Temperature			
°C	°F	°F	°C
-10	14	32	0
-5	23	34	1.1
0	32	36	2.2
		38	3.3
2	36	40	4.4
4	39		
6	43	42	5.6
8	46	44	6.7
10	50	46	7.8
		48	8.9
12	54	50	10.0
14	57		
16	61	52	11.1
18	64	54	12.2
20	68	56	13.3
		58	14.4
22	72	60	15.6
24	75		
26	79	62	16.7
28	82	64	17.8
30	86	66	18.9
		68	20.0
32	90	70	21.1
34	93		
36	97	72	22.2
37	98.6	74	23.3
38	100	76	24.4
40	104	78	25.6
		80	26.7
45	113		
50	122		
55	131	82	27.8
60	140	84	28.9
65	149	86	30.0
70	158	88	31.1
		90	32.2
75	167		
80	176		
85	185	92	33.3
90	194	94	34.4
95	203	96	35.6
100	212	98	36.7
		100	37.8