

# APPENDIX B

## ABBREVIATIONS, SYMBOLS AND CONVERSION FACTORS

### Abbreviations

A	ampere
AASHTO	American Association of State Highway & Transportation Officials
ABS (%)	Percent of Absorbed Moisture
Abs. Vol.	Absolute Volume
ACI	American Concrete Institute
AE	Air-Entrained
AEA	Air-Entrained Admixture
aggr.	Aggregate
AMP	ampere
Are	100 m <sup>2</sup>
ASTM	American Society for Testing and Materials
bbls.	Barrels (Measurement of Cement)
c	centi (10 <sup>-2</sup> )
C. A.	Coarse Aggregate
cem.	cement
C. F.	Cement Factor
conc.	Concrete
cu	cubic
cu. ft.	cubic foot
cu. ft. <sup>3</sup>	cubic feet
cu. in.	cubic inch
cu. in. <sup>3</sup>	cubic inches
c. y.	cubic yard
d	deci (10 <sup>-1</sup> )
da	deka (10)
deg., °	degree
dm	decimeter (metric) dm <sup>2</sup> ; dm <sup>3</sup>
eq	equal
ex	example
F	Fahrenheit
F. A.	Fine Aggregate
Ft.	Foot or Feet
F. M.	Fineness Modulus
g.	gram (metric)
h	hecto (10 <sup>-2</sup> )
ha	hectare
In.	inch(es); in. <sup>2</sup> in. <sup>3</sup>
k	kilo (10 <sup>3</sup> )
K.	Kelvin (absolute scale of temperature)
kg.	kilogram (metric)
kg/m <sup>3</sup>	kilograms per cubic meter

kip	thousand (kilo) pounds (structural)
km	kilometer (metric); km <sup>2</sup> ; km <sup>3</sup>
kW	Kilowatt(s)
kWh	kilowatt- hour
L	Liter (metric)
lb.	pound
lb.- ft.	pound-foot
lb./ft. <sup>2</sup>	pounds per square foot
lb.-in.	pound-inch
lb/in <sup>2</sup>	pounds per square inch
lin. foot	linear foot
m	meter (metric); milli (10 <sup>-2</sup> )
m <sup>2</sup>	square meter
m <sup>3</sup>	cubic meter
m.	mass
M	Mega (10 <sup>6</sup> )
max	maximum
mg	milligram (metric)
ml	milliliter (metric)
mm	millimeter (metric)
Mg	Megagram (metric ton)
mPa	MegaPascal
Mat'ls	Materials
min.	minimum
mod.	modified
n	Nano (10 <sup>-9</sup> )
oz	ounce(s)
Pa	Pascal
PCA	Portland Cement Association
pcf	pounds per cubic foot
psi	pounds per square inch
sp. gr.	specific gravity (density)
SI	system international (metric system)
SSD	Saturated Surface Dry
sq.	square, as in sq. yd.
sq. ft., ft <sup>2</sup>	square foot or feet
sq. in., in <sup>2</sup>	square inch or inches
t	metric ton
VDOT	Virginia Department of Transportation
VTM	Virginia Test Methods
W/C	Water/Cement ratio
wt.	weight
yd.	yard
yd <sup>2</sup> sq. yd.	square yard(s)
yd <sup>3</sup> cu. yd.	cubic yard(s)

## Signs and Symbols

+	plus, or more than
-	minus, or less than
±	plus or minus
'	Feet
"	Inches
>	is greater than
≥	is greater than or equal to
<	is less than
≤	is less than or equal to
#	number, if before a figure; pounds if after a figure
/	per, as kg/sqft; of; after; to; upon; proportion
<sup>123</sup>	superior figures (exponents) indicate the power to which a given number is to be raised, as 12 <sup>2</sup> (squared), 10 <sup>3</sup> (cubed)
°	degree; °F - degree Fahrenheit; °C - degree Celsius
%	Percent
μ	micro (10 <sup>-6</sup> )

## Temperature Conversion Table

To convert from degrees Celsius to degrees Fahrenheit or vice versa, the following formulas may be used:

$$F = 9/5 (C + 32)$$

$$C = 5/9 (F - 32)$$

The following table may be used for quick conversion of temperatures in the most common working ranges. The numbers in the center of each column refer to temperatures in either degrees Celsius or Fahrenheit. In the center, find the known temperature, and the corresponding Celsius or Fahrenheit temperatures is then found at the sides.

°C		°F		°C		°F	
-45.6	-50	-58	77	170	338		
-40	-40	-40	82	180	356		
-34.4	-30	-22	88	190	374		
-28.9	-20	-4	93	200	392		
-23.3	-10	14	99	210	410		
-17.8	0	32	100	212	413		
-12.2	10	50	104	220	428		
-6.6	20	68	110	230	446		
-1.1	30	86	116	240	464		
4.4	40	104	121	250	482		
10	50	122	127	260	500		
15.6	60	140	132	270	518		
21.1	70	158	138	280	536		
26.7	80	176	143	290	554		
32.2	90	194	149	300	572		
37.8	100	212	177	350	662		
43	110	230	204	400	752		
49	120	248	232	450	842		
54	130	266	260	500	932		
60	140	284	288	550	1022		
66	150	302	316	600	1122		
71	160	320					

Metric unit of temperature = Kelvin (K) = °C + 273.15

(The terms Celsius and Centigrade have the same meaning, but Celsius is the preferred term.)

## U. S. A. Standard Sieve Series

Sieve Designation		Nominal Sieve Opening, In.
Standard	Alternative	
50 mm	2 in.	2
37.5 mm	1 ½ in.	1.5
31.5 mm	1 ¼ in.	1.25
25.0mm	1 in.	1
19.0 mm	¾ in.	0.750
16.0 mm	5/8 in.	0.625
12.5 mm	½ in.	0.500
9.5 mm	3/8 in.	0.375
8.0 mm	5/16 in.	0.312
6.3 mm	¼ in.	0.250
4.75 mm	No. 4	0.187
4.00 mm	No. 5	0.157
3.35 mm	No. 6	0.132
2.36 mm	No. 8	0.0937
2.00 mm	No. 10	0.0787
1.70 mm	No. 12	0.0661
1.18 mm	No. 16	0.0469
850 µm	No. 20	0.0331
600 µm	No. 30	0.0234
425 µm	No. 40	0.0165
300 µm	No. 50	0.0117
250 µm	No. 60	0.0098
212 µm	No. 70	0.0083
180 µm	No. 80	0.0070
150 µm	No. 100	0.0059
106 µm	No. 140	0.0041
75 µm	No. 200	0.0029
53 µm	No. 270	0.0021
45 µm	No. 325	0.0017
38 µm	No. 400	0.0015

## Weights and Measures (English and Metric)

Metric Units	Metric Prefixes
Length = meter m	$10^9 = 1,000,000,000 = \text{giga} = G$
Mass = kilogram kg	$10^6 = 1,000,000 = \text{mega} = M$
Time = second s	$10^3 = 1,000 = \text{kilo} = k$
Electric Current = ampere A	$10^{-1} = 0.1 = \text{deci} = d$
Thermodynamic Temperature = Kelvin K	$10^{-2} = 0.01 = \text{centi} = c$
Amount of Substances = mole mol	$10^{-3} = 0.001 = \text{milli} = m$
Luminous Intensity = candela cd	$10^{-6} = 0.000,001 = \text{micro} = \mu$

### Conversion Tables

#### Metric to Inch-pound

#### Inch-pound to Metric

Linear Measure	
1 m = 39.3701 in.	1 in. = 0.0254 meters
1 m = 3.28084 in.	1 ft. = 0.3048 meters
1 km = 0.67137 mile	1 mile = 1.60934 kilometers

Surface Measure (1 hectare = 10,000 square meters)	
1 mm <sup>2</sup> = 0.00155 in <sup>2</sup>	1 in <sup>2</sup> = 645.16 mm <sup>2</sup>
1 cm <sup>2</sup> = 0.1550 in <sup>2</sup>	1 in <sup>2</sup> = 6.4516 cm <sup>2</sup>
1 dm <sup>2</sup> = 0.1076 ft <sup>2</sup>	1 ft <sup>2</sup> = 9.2903 dm <sup>2</sup>
1 m <sup>2</sup> = 10.7639 ft <sup>2</sup>	1 ft <sup>2</sup> = 0.092903 m <sup>2</sup>
1 m <sup>2</sup> = 1.19599 yd <sup>2</sup>	1 yd <sup>2</sup> = 0.83617 m <sup>2</sup>
1 hectare = 2.47105 acres	1 acre = 0.404686 hectares
1 hectare = 0.00386 mi <sup>2</sup>	1 mi <sup>2</sup> = 258.99 hectares

Volume Measure	
1 cm <sup>3</sup> = 0.061024 in <sup>3</sup>	1 in <sup>3</sup> = 16.3871 cm <sup>3</sup>
1 dm <sup>3</sup> = 0.035315 ft <sup>3</sup>	1 ft <sup>3</sup> = 28.3168 dm <sup>3</sup>
1 m <sup>3</sup> = 1.30795 yd <sup>3</sup>	1 yd <sup>3</sup> = 0.764555 m <sup>3</sup>

Mass (Weight) Measure	
1 g = 0.035274 oz.	1 oz. = 28.3495 g
1 g = 0.002205 lb.	1 lb. = 453.592 g
1 kg. = 2.20462 lb.	1 lb. = 0.453592 kg
1 metric ton = 1.1023 net ton (2000 lb. ton)	1 net ton = 0.9072 metric tons

<b>Liquid Measure</b>	
1 L = 33.81402 oz.	1 oz. = 0.02957 L
1 L = 1.05669 qt.	1 qt. = 0.946353 L
1 L = 0.264172 gal.	1 gal. = 3.78541 L
1 m <sup>3</sup> = 264.72 gal.	1 gal. = 0.003785 m <sup>3</sup>

<b>Force &amp; Stress Measure</b>	
1 N (Newton) = 0.224809 lb. (f)	1 lb. (f) = 4.44822 N
1 N/m = 0.06852 lb/ft	1 lb/ft = 14.5939 N/m
1 Pa (Pascal) = 0.000145 psi	1 psi = 6,894.76 Pa
1 kPa = 0.145 psi	1 psi = 6.89476 kPa
1 mPa = 145.038 psi	1 psi = 0.006895 mPa
1 Pa = 0.020885 psf	1 psf = 47.88026 Pa
1 kg/m <sup>3</sup> = 0.062428 lb/ft <sup>3</sup>	1 lb/ft <sup>3</sup> = 16.01846 kg/m <sup>3</sup>
1 kg/m <sup>3</sup> = 1.625555 lb/yd <sup>3</sup>	1 lb/yd <sup>3</sup> = 0.5932764 kg/m <sup>3</sup>

## Reinforcing Steel

ASTM Standard Reinforcing Bars				
Bar Size Designation	Nominal Mass (kg/m)	Nominal Dimensions - Round Sections		
		Diameter (mm)	Cross Sectional Area (mm <sup>2</sup> )	Perimeter (mm)
#10	0.560	9.53	70.97	29.92
#13	0.994	12.70	129.03	39.90
#16	1.552	15.88	200.00	49.86
#19	2.235	19.05	283.87	59.84
#22	3.042	22.23	387.10	69.83
#25	3.973	25.40	509.68	79.81
#29	5.060	28.65	645.16	90.02
#33	6.404	32.26	819.35	101.35
#36	7.907	35.81	1006.45	112.52
#43	11.384	43.00	1451.61	135.13

