Chapter IX - TECHNICAL TABLES AND RELATED DATA

On the following pages will be found additional tables and data that may be used as reference for problems relating to materials and construction, and to other subjects herein.

Technical and Related Abbreviations

A

A - ampere

A.A.S.H.T.O. - American Association of State Highway & Transportation Officials

Abs. - absolute (temperature)

a. c., ac - alternating current

AEC - Atomic Energy Commission

alt. - alternate, - ing

a.m. - before noon (L. ante meridiem)

amp - ampere

amt. - amount

anal. - analysis; analytic

ans. - answer

app. - appendix; applied; apparatus

appl. - application; appliance

approx. - approximate, - ly

aq. - water (L. aqua); aqueous

Ar. - Arabic

are - 100 m^2

art. - article (pl. arts.)

Assn. - Association (pl. Assns.)

Asst. - Assistant

A.S.T.M. - American Society for Testing Materials

atm. - atmosphere(s); atmospheric

att. - attached

Attn. - Attention

at. wt. - atomic weight

av., avdp. - avoirdupois

avg., av. - average

A.W.G., AWG - American Wire Gauge

B

bal. - balance

bar. - barometer; barometric

bbl. - barrel (pl. bbl. or bbls.)

bd. ft. - board foot or feet (see f.b.m.)

bg. - bag (pl. bgs.)

Bldg. - Building

blk. - block (pl. blks.); bulk

b.m. - board measure (See f.b.m.)

b.p. - boiling point

Bq. - becquerel

B.t.u., Btu - British thermal unit (pl. B.t.u., Btu, B.t.u.'s, or Btu's)

Bur., Bu. - Bureau

C

c - carat (metric); cycle (electric)

c - centi (10^{-2})

C.- Celsius

C - coulomb

cap. - capacity

cd - candela

Cel. - Celsius

cem. - cement

cen. - center; central

cert. - certificate, - tion; certified

cfm - cubic feet per minute

cfs - cubic feet per second

c.g. - center of gravity

CGS, cgs - centimeter-gram-second (system)

chem., ch. - chemical; chemistry

chron. - chronological

cht., ch. - chart

cir. - circle; circular; circumference

cir. mils, c.m. - circular mils (wire measure)

cl., CL, ℄ - center line

cm - centimeter (metric)

cm^2 - square centimeter

cm^3 - cubic centimeter

cm., cum. - cumulative

c.m., cir. mils - circular mils (wire measure)

coef. - coefficient (math.)

col. - column

cpm - cycles per minute

cps - cycles per second

c. to c., c-c - center-to-center

cu. - cubic

cu. ft., ft^3 - cubic foot or feet

cu. in., in^3 - cubic inch or inches

cum., cm. - cumulative

cu. yd. - cubic yard or yards

cy. - cycle

cyl. - cylinder

D

d - deci (10^{-1})

d. - density; distance

D., dia., diam. - diameter

da - deka (10)

db - decibel (unit of sound)

d.c., dc - direct current

dec. - decrease; decimal

deg., ° - degree(s)

Dept. - Department (pl. Depts.)

dev. - deviation

dia., diam., D. - diameter

diag. - diagram; diagonal

Dir. - Director

dist. - district; distance; distribution

div. - division (pl. divs.)

dm - decimeter (metric); dm^2 ; dm^3

doz. - dozen

dr. - dram; drum (pl. drs.)

E

E. - East

ea. - each

EBL - Eastbound Lane

eff. - efficiency; effective

el. - elevation

Engr. - Engineer

eq. - equal; equivalent; equalize; equipment; equation

etc. - and so forth (L. et cetera)

ex. - example (pl. exx.); exception; extra

exam. - examined; examination

ext. - exterior; extension; external; extract

exx. - examples

F

f - force

F., Fahr. - Fahrenheit

F - Farad

f.b.m. - feet board measure

fig. - figure (pl. figs.)

fl. - fluid

fl. dr. - fluid dram, apothecaries'

fl. oz. - fluid ounce, apothecaries'

fm. - from; form

f.o.b. - free on board

fol. - follow, -ing

f.p., fp - freezing point

f.p.m., fpm, f/m - feet per minute

f.p.s., fps, f/s - feet per second

F.P.S., f.p.s., f-p-s, fps - foot-pound-second (system)

fr., fm. - from

ft. - foot or feet; ft^2; ft^3 (see sq. ft., etc.)

ft-lb. - foot-pound(s)

ft/sec., fs - feet per second (see fps)

G

g - gram (metric)

G - giga (10^9)

g. - gauge; gravity

gal. - gallon (pl. gals.)

geol. - geology, -ic, -ical, -ist

g.p.m., gpm, g/m - gallons per minute, or mile

gr. - gross; grade; gravity; graph

grain - spelled out (for weight)

gr. wt. - gross weight

Gy - gray

H

H - henry

h - hecto (10^2); hour

ha - hectare

HB - Brinell Hardness

hdw. - hardware

hf. - half

hp., hp, HP - horsepower

h.p. - high pressure

hp-hr. - horsepower-hour

hr. - hour (pl. hrs.)

ht. - height; heat

Hwy., Hy. - Highway

Hz - Hertz

I

i.d., ID - inside diameter

in. - inch(es); in^2; in^3 (See sq.in., etc.)

incl. - inclusive; including

info. - information

init. - initial

in-lb. - inch-pound

inst. - instrument

int. - interstate; internal; intermediate

i.p.s., ips - inches per second

J

J - joule (elec.)

K

k - kilo (10^3)

K. - Kelvin (absolute scale of temperature)

kg - kilogram (metric)

kg/m^3 - kilograms per cubic meter

kgps, kg/s - kilograms per second

kip - thousand (kilo) pounds (structural)

km - kilometer (metric); km^2; km^3

kmps, km/s - kilometers per second

kW - kilowatt(s)

kWh, kW-hr., kWhr - kilowatt-hour

L

L - liter (metric)

l. - left; length

lab. - laboratory

lb. - pound (L. Libra) (pl. lbs.)

lb-ft. - pound-foot

lb/ft^2- pounds per square foot (See p.s.f., psf)

lb-in. - pound-inch

lb/in^2 - pounds per square inch (See p.s.i., psi)

L.C.L., LCL - less than carload lots

lin. ft. - linear foot

liq. - liquid

lm - lumen

loc. - location

lx - lnx

M

m - meter (metric); milli (10^{-3})

m^2 - square meter

m^3 - cubic meter

m. - mass

M - Mega (10^6)

mach. - machine; machinery

mag. - magnitude

math. - mathematics, -cian, -ical

max. - maximum

Mbm, M.B.M., MBM - thousand (feet) board measure (lumber)

meas. - measure, -ment

mech. - mechanic, -ics, -al

med. - medium

memo - memorandum

met. - metal

mfg. - manufacturing

mfr. - manufacture, -r (pl. mfrs.)

mg - milligram (metric)

m.g.d., mgd - million gallons per day

mi. - mill; mile(s); mi^2; sq.mi.

mil. - mileage; million

min. - minute(s); minimum

mo. - month(s) (pl. mos.)

mol. - molecule; mole

misc. - miscellaneous

mks, MKS - meter-kilogram-second (system)

ml - milliliter (metric)

mm - millimeter (metric); mm^2; mm^3

Mg - Megagram (metric ton)

mol. wt. - molecular weight

MPa - MegaPascal

m.p.g., mpg, m/g - miles per gallon

m.p.h., mph, m/h - miles per hour

m/s - meters per second

m/s^2 - meters per second per second

msg. - message

m.s.l. - mean sea level

Mt. - mountain (pl. Mts.); material

N

n - Nano (10^{-9})

N. - noon; North; Newton

N.A.S. - National Academy of Sciences

NBL - Northbound Lane

NBS - National Bureau of Standards

neg. - negative, -ly

Nm - Newton meter

no. - number (L. numero) (pl. nos.)

nth - indefinite, as “nth degree”

nt. wt. - net weight

O

oa., OA - overall

obs. - obsolete, observatory

o.d. - outside diameter

ofc., off. - office; official; officer

opp. - opposite

orig. - original, -ly

oz. - ounce(s)

oz-ft. - ounce-foot

oz-in. - ounce-inch

P

p. - page (pl. pp.); per; pressure; power

Pa - pascal

par. - paragraph; parallel

pat. - patent, -ed

pc. - piece (pl. pcs.)

pc., pct., % - percent

pk. - pack, -ing

pkg. - package (pl. pkgs.)

Pkwy. - parkway

pl. - place; plural; plate (pl. pls.)

p.m. - after noon (L. post meridiem)

P.O. - post office

pop. - population

pos. - positive; positon

pp. - pages; prepaid, postpaid

p.p. - parcel post

ppd. - postpaid; prepaid

p.p.m., ppm - parts per million

prep. - preparation

prim. - primary

prin. - principal

prob. - problem

prod. - product; produce; produced

prop. - property

PS. - postscript (pl. PSs.)

p.s.f., psf - pounds per square foot

p.s.i., psi - pounds per square inch

pt. - part; pint; point

pub. - public, -ation; published, -ing, -er

pur. - purchaser; purchasing

pwr., pow. - power

Q

Q. - question; query (pl. QQ.)

qly. - quality

qt. - quart (pl. qts.)

qty. - quantity

R

r. - right

R. - river; radius

rad. - radiant; radian

rct., rec. - receipt (pl. rcts., rec.)

rd. - road; round

re - in regard to

rec. - record, -ed, -er; receipt

recd., rcd. - received

R

ref. - reference

refr. - refrigerate, -ed, -ing, -tor

rep. - repeat; report; repair

rept., rep. - report

req. - requisition; required

res. - reserve; residence

ret. - return; retired

retd. - returned

rev. - review; reverse; revise, -ed, -ion; revolve, -ing, -ution

r.p.m., rpm, r/m - revolutions per minute

r.p.s., rps, r/s - revolutions per second

rpt. - report

Rte., Rt. - Route

R/W - right of way

S

S - siemens

s, sec. - second(s)

/S/ - signed (before a copied signature)

S. - South

SASHTO - Southeastern Associaton of State Highway and Transportation Officials

SBL - Southbound Lane

sec. - section; second(s)

sel. - selected, -tion

sep. - separate

shpt. - shipment

shtg. - shortage

sh. tn. - short ton

SI - System International (metric system)

sig. - signature

sk. - sack (pl. sx)

sol. - solution; soluble

spec. - specification(s); specimen(s)

sp. gr. - specific gravity

sp. ht. - specific heat

sq. - square, as sq. yd., sq. mi.

sq. ft., ft^2 - square foot or feet

sq. in., in^2 - square inch or inches

sq. yd., yd^2 - square yard or yards

sr - steradian

St. - Street; State

Sta. - Station

stat. - statistics

std. - standard

stg. - storage

stk. - stock

sub. - substitute

subj. - subject

sup. - supply

supp. - supplement (pl. supps.)

Supt. - Superintendent

sx - sacks

syst., sys. - system

T

t - metric ton (ordinary ton is tn. or T.)

t. - temperature; time

T., tn. - ton (ordinary)

T - tesla

tbsp. - tablespoon(s) (measure)

tech. - technical

tel. - telephone; telegraph; telegram

temp. - temperature; temporary

tonn. - tonnage

tr. - transit; transfer

t.s., ts - tensile strength

tsp. - teaspoon(s) (measure)

U

UL - Underwriters' Laboratories (elec. std.)

ult. - ultimate

ut. - utilities

V

v - volt (elec.)

V. - valve; velocity

vac. - vacuum

val. - value; valuation

var. - variation

vel. - velocity

vol. - volume

vs., v. - against (L. versus)

v.v. - vice versa

W

W - watt (elec.)

W. - West

Wb - weber

WBL - Westbound Lane

w.g. - wire guage

Wh, W-hr., Whr. - watt-hour (elec.)

wt. - weight (pl. wts.)

X

x - by, as 2x4; cross, as x-roads

Y

yd. - yard (pl. yds.)

yd^2, sq.yd. - square yard(s)

yd^3, cu.yd. - cubic yard(s)

yr. - year (pl. yrs.)

Z

z., Z - zone; zero

Signs and Symbols

Ω - ohm

+ - plus, or more than

- - minus, or less than

— - over last figure of decimal indicates that it is approximate

± - plus or minus, more or less

X - by in dimensions, as 2X4

: - is to; compared with

∴ - therefore; hence

∵ - since; because

... - and so on

∥ - parallel to

⊥ - perpendicular to

∞ - infinity; indefinitely great

‘ - feet, as 10’; minutes of an arc

“ - inches, as 10”; seconds of an arc; ditto

> - 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 bbls/day; of; after; to; upon; proportion, as a/b=c/d

- square; square miles

$\sqrt{\ }$ - root or radical sign; square root

$\sqrt[3]{\ }$ - cube root

´ ´´ ´´´ - accents used to distinguish several things of the same general designation, as A´, A´´, A´´´ - read A prime, A second, A third, etc.

12345 - superior figures (exponents) indicate the power to which a given number is to be raised, as 12^2 (squared), 10^3 (cubed)

° - degrees

° ´ ´´ - degrees, minutes, seconds of an arc

°F - degrees Fahrenheit

°C - degrees Celsius

% - percent

μ - micro (10^{-6})

Σ - sum of

σ - sigma; standard deviation

Temperature Conversion Table

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

$$F = \frac{9}{5}C + 32$$

$$C = \frac{5}{9}(F - 32)$$

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 temperature in either degrees Celsius or Fahrenheit. In the center, find the known temperature, and the corresponding Celsius or Fahrenheit temperature 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	1112
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
Standard	Alternative	Opening, in.
50 mm	2 in.	2
37.5 mm	1 1/2 in.	1.5
31.5 mm	1 1/4 in.	1.25
25.0 mm	1 in.	1
19.0 mm	3/4 in.	0.750
16.0 mm	5/8 in.	0.625
12.5 mm	1/2 in.	0.500
9.5 mm	3/8 in.	0.375
8.0 mm	5/16 in.	0.312
6.3 mm	1/4 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 = giga = G
Mass = kilogram kg	10^{6} = 1,000,000 = mega = M
Time = second s	10^{3} = 1,000 = kilo = k
Electric Current = ampere A	10^{-1} = 0.1= deci = d
Thermodynamic Temperature = kelvin K	10^{-2} = 0.01 = centi = c
Amount of Substance = mole mol	10^{-3} = 0.001 = milli = m
Luminous Intensity = candela cd	10^{-6} = 0.000,001 = micro = μ

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 ft.	1 ft. = 0.3048 meters
1 km = 0.67137 mile	1 mile = 1.60934 kilometers
Surface Measure	
(1 hectare = 10,000 square meters)	
1 mm² = 0.00155 in²	1 in² = 645.16 mm²
1 cm² = 0.1550 in²	1 in² = 6.4516 cm²
1 dm² = 0.1076 ft²	1 ft² = 9.2903 dm²
1 m² = 10.7639 ft²	1 ft² = 0.092903 m²
1 m² = 1.19599 yd²	1 yd² = 0.83617 m²
1 hectare = 2.47105 acres	1acre = 0.404686 hectares
1 hectare = 0.00386 mi²	1 mi² = 258.99 hectares
Volume Measure	
1 cm³ = 0.061024 in³	1 in³ = 16.3871 cm³
1 dm³ = 0.035315 ft³	1 ft³ = 28.3168 dm³
1 m³ = 1.30795 yd³	1 yd³ = 0.764555 m³

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.	1lb. = 0.453592 kg
1 metric ton = 1.1023 net ton (2000 lb ton)	1 net ton = 0.9072 metric ton

Liquid Measure

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^3 = 264.`72 gal	1 gal = 0.003785 m^3

Force & Stress Measure

1 N (newton) = 0.224809 lb(f)	1 lb(f) = 4.44822 N
1 N/m = 0.06852 lb/ft	1lb/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^3 = 0.062428 lb/ft^3	1 lb/ft^3 = 16.01846 kg/m^3
1 kg/m^3 = 1.685555 lb/yd^3	1 lb/yd^3 = 0.5932764 kg/m^3

Lineal Feet Covered by One Ton at Various Application Rates

RATE OF APPLICATION (Lb. per Sq. Yd.)	Width of Application (Feet) 8	9	10	11	12
50	44.9	40.0	36.0	32.8	30.1
55	40.8	36.4	32.8	29.8	27.3
60	37.4	33.3	30.0	27.3	25.1
65	34.6	30.8	27.7	25.2	23.1
70	32.1	28.6	25.7	23.4	21.5
75	30.0	26.7	24.0	21.8	20.0
80	28.1	25.0	22.5	20.5	18.8
85	26.4	23.5	21.1	19.3	17.7
90	25.0	22.2	20.0	18.2	16.7
95	23.6	21.0	19.0	17.3	15.8
100	22.5	20.0	18.0	16.4	15.0

Note: For rates of application over 100 pounds, divide lineal feet per ton for 100 lb./sq. yd. by one hundredth of rate4 of application.

Example: Rate of application = 125 lb. per sq. yd. Width of application = 11 feet

$$\frac{16.4}{1.25} = 13.1 \text{ feet per ton}$$

Lineal Meters Covered by One Meteric Ton at Various Application Rates

RATE OF APPLICATION (kg/m²)	Width of Application (Meters) 2.5	3.0	3.5	3.6	3.7
25	16.10	13.33	11.43	11.11	10.81
30	13.33	11.11	10.50	9.26	9.01
35	11.43	9.52	8.16	7.94	7.72
40	10.00	8.33	7.14	6.94	6.76
45	8.89	7.41	6.35	6.17	6.01
50	8.00	6.67	5.71	5.56	5.41
55	7.27	6.06	5.19	5.05	4.91
60	6.67	5.56	4.76	4.63	4.50
65	6.15	5.13	4.40	4.27	4.16
70	5.71	4.76	4.08	3.97	3.86
75	5.33	4.44	3.81	3.70	3.60
100	4.00	3.33	2.86	2.78	2.70

Note: For rates of application other than 100 kg/m², divide lineal meters per metric ton for 100 kg/m² by one hundredth of rate of application.

Example: Rate of application = 125 kg/m². Width of application = 3.6 meters

$$\frac{2.78}{1.25} = 2.22 \text{ meters per metric ton}$$

Distance in Lineal Feet Covered by 1000 Gallons

APPLICATION RATE (Gallons per Square Yard)	Width of Spread (Feet)									
	2	3	4	5	6	7	8	9	10	11
0.10	45000	30000	22500	18000	15000	12857	11250	10000	9000	8182
0.15	30000	20000	15000	12000	10000	8571	7500	6667	6000	5455
0.20	22500	15000	11250	9000	7500	6429	5625	5000	4500	4091
0.25	18000	12000	9000	7200	6000	5143	4500	4000	3600	3273
0.30	15000	10000	7500	6000	5000	4286	3750	3333	3000	2727
0.333	13500	9000	6750	5400	4500	3857	3375	3000	2700	2455
0.35	12857	8571	6429	5143	4286	3673	3214	2857	2571	2338
0.40	11250	7500	5625	4500	3750	3214	2813	2500	2250	2045
0.45	10000	6667	5000	4000	3333	2857	2500	2222	2000	1818
0.50	9000	6000	4500	3600	3000	2571	2250	2000	1800	1636
0.60	7500	5000	3750	3000	2500	2143	1875	1667	1500	1364
0.667	6750	4500	3375	2700	2250	1929	1688	1500	1350	1227
0.70	6429	4286	3214	2571	2143	1837	1607	1429	1286	1169
0.75	6000	4000	3000	2400	2000	1714	1500	1333	1200	1091
0.80	5625	3750	2813	2250	1875	1607	1406	1250	1125	1023
0.90	5000	3333	2500	2000	1667	1429	1250	1111	1000	909
1.00	4500	3000	2250	1800	1500	1286	1125	1000	900	818
1.25	3600	2400	1800	1440	1200	1029	900	800	720	655
1.50	3000	2000	1500	1200	1000	857	750	667	600	545
2.00	2250	1500	1125	900	750	643	563	500	450	409
2.25	2000	1333	1000	800	667	571	500	444	400	364
2.50	1800	1200	900	720	600	514	150	400	360	327

Distance in Meters Covered by 1000-Liters

APPLICATION RATE (Liters per Square Meter)	Width of Spread (Meters)									
	0.6	0.8	1.0	1.5	2.0	2.5	3.0	3.5	3.6	3.7
0.50	3333	2500	2000	1333	1000	800	667	571	555	541
0.60	2778	2083	1667	1111	833	667	556	476	462	450
0.667	2480	1875	1500	1000	750	600	500	429	417	405
0.70	2381	1785	1428	952	714	571	476	408	397	386
0.75	2222	1667	1333	889	667	533	444	380	370	360
0.80	2083	1562	1250	833	625	500	417	357	347	338
0.90	1852	1388	1111	741	555	444	367	317	308	300
1.00	1667	1250	1000	667	500	400	333	286	278	270
1.10	1515	1136	909	606	455	364	303	260	253	246
1.20	1389	1041	833	555	417	333	278	238	231	225
1.25	1333	1000	800	533	400	320	267	229	222	216
1.30	1282	962	769	513	385	308	256	220	214	208
1.333	1240	938	750	500	375	300	250	215	208	202
1.40	1190	893	714	476	357	285	238	204	199	193
1.50	1111	833	667	444	333	267	222	190	185	180
1.66	1000	750	600	400	300	240	200	171	167	162
1.75	952	714	571	381	285	229	190	163	159	154
2.00	833	625	500	333	250	200	167	143	139	135
2.25	741	555	444	296	222	178	148	126	123	120
2.50	667	500	400	267	200	160	133	115	111	108
2.75	606	455	364	242	182	145	121	104	101	98
3.00	555	417	333	222	167	133	111	95	92	90

Dry Weight per Square Yard of Aggregate Base Materials

DRY DENSITY COMPACTED BASE	THICKNESS (Inches)											DRY WEIGHT PER CUBIC YARD	
(Lb. / Cu. Ft.)	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**Lbs.**	**Tons**
120	180	270	360	450	540	630	720	810	900	990	1080	3240	1.620
125	188	281	375	469	563	656	750	844	938	1031	1125	3375	1.688
130	195	293	390	488	585	683	780	878	975	1073	1170	3510	1755
135	203	304	405	507	608	709	810	911	1013	1114	1215	3645	1823
140	210	315	420	525	630	735	840	945	1050	1155	1260	3780	1.890
145	218	326	435	544	653	761	870	979	1088	1196	1305	3915	1.958
150	225	338	450	563	675	788	900	1013	1125	1238	1350	4050	2.025
155	233	349	465	582	698	813	930	1046	1162	1279	1395	4185	2.093
160	240	360	480	600	720	840	960	1080	1200	1320	1440	4320	2.160
Cubic Yards of Material Per Square Yard of Surface	0.056	0.083	0.111	0.139	0.167	0.194	0.222	0.250	0.287	0.306	0.333		

Dry Weight per Square Meter of Aggregate Base Materials

DRY DENSITY COMPACTED BASE	THICKNESS (millimeters)											DRY WEIGHT PER CUBIC METER	
(kg / m³)	**50**	**75**	**100**	**125**	**150**	**175**	**200**	**225**	**250**	**275**	**300**	**kg**	**Tons**
1900	95	142	190	237	285	333	380	427	475	522	570	1900	1.9
2000	100	150	200	250	300	350	400	450	500	550	600	2000	2.0
2100	105	157	210	262	315	367	420	472	525	577	630	2100	2.1
2200	110	165	220	275	330	385	440	495	550	605	660	2200	2.2
2300	115	172	230	287	345	402	460	517	575	632	690	2300	2.3
2400	120	180	240	300	360	420	480	540	600	660	720	2400	2.4
2500	125	187	250	312	375	437	500	562	625	687	750	2500	2.5
2600	130	195	260	325	390	455	520	585	650	715	780	2600	2.6
Cubic Meters of Material Per Square Meter of Surface	0.050	0.075	0.100	0.125	0.150	0.175	0.200	0.225	0.250	0.275	0.300		

Volume Correction Table for Liquid Asphalt

(Volume at 60°F (16°C). Occupied by Unit Volume at Indicated Temperature; t = Observed Temperature °F.; M = Multiplier to Reduce Volume to 60°F (16°C).)

Group 1 Cutback Asphalts
Specific Gravity at 60°F., 0.850 to 0.966

t	M	t	M	t	M	t	M
60	1.0000	145	0.9666	230	0.9343	315	0.9029
65	0.9980	150	0.9647	235	0.9324	320	0.9010
70	0.9960	155	0.9628	240	0.9305	325	0.8992
75	0.9940	160	0.9609	245	0.9286	330	0.8974
80	0.9921	165	0.9589	250	0.9268	335	0.8956
85	0.9901	170	0.9570	255	0.9249	340	0.8938
90	0.9881	175	0.9551	260	0.9231	345	0.8920
95	0.9861	180	0.9532	265	0.9212	350	0.8902
100	0.9842	185	0.9513	270	0.9194	355	0.8884
105	0.9822	190	0.9494	275	0.9175	360	0.8866
110	0.9803	195	0.9475	280	0.9157	365	0.8848
115	0.9783	200	0.9456	285	0.9138	370	0.8831
120	0.9763	205	0.9437	290	0.9120	375	0.8813
125	0.9744	210	0.9428	295	0.9102	380	0.8795
130	0.9725	215	0.9399	300	0.9083	385	0.8777
135	0.9705	220	0.9380	305	0.9065	390	0.8760
140	0.9686	225	0.9361	310	0.9047	395	0.8742
						400	0.8724

Group 0 Asphalt Cements
Specific Gravity at 60°F (16°**C)**., above 0.966

t	M	t	M	t	M	t	M
60	1.0000	145	0.9706	230	0.9419	315	0.9138
65	0.9983	150	0.9689	235	0.9402	320	0.9122
70	0.9965	155	0.9672	240	0.9385	325	0.9105
75	0.9948	160	0.9655	245	0.9369	330	0.9089
80	0.9930	165	0.9648	250	0.9352	335	0.9073
85	0.9913	170	0.9621	255	0.9336	340	0.9057
90	0.9896	175	0.9604	260	0.9319	345	0.9040
95	0.9878	180	0.9587	265	0.9302	350	0.9024
100	0.9861	185	0.9570	270	0.9286	355	0.9008
105	0.9844	190	0.9553	275	0.9269	360	0.8992
110	0.9826	195	0.9536	280	0.9253	365	0.8976
115	0.9809	200	0.9520	285	0.9236	370	0.8960
120	0.9792	205	0.9503	290	0.9220	375	0.8944
125	0.9775	210	0.9486	295	0.9204	380	0.8928
130	0.9758	215	0.9469	300	0.9187	385	0.8912
135	0.9740	220	0.9452	305	0.9171	390	0.8896
140	0.9723	225	0.9436	310	0.9154	395	0.8880
						400	0.8864

Asphalt Emulsions (.00025 Per °F.)							
t	M	t	M	t	M	t	M
60	1.0000	105	.98875	121	.98475	137	.98075
90	.99250	106	.98850	122	.98450	138	.98050
91	.99225	107	.98825	123	.98425	139	.98025
92	.99200	108	.98800	124	.98400	140	.98000
93	.99175	109	.98775	125	.98375	141	.97975
94	.99150	110	.98750	126	.98350	142	.97950
95	.99125	111	.98725	127	.98325	143	.97925
96	.99100	112	.98700	128	.98300	144	.97900
97	.99075	113	.98675	129	.98275	145	.97875
98	.99050	114	.98650	130	.98250	146	.97850
99	.99025	115	.98625	131	.98225	147	.97825
100	.99000	116	.98600	132	.98200	148	.97800
101	.98975	117	.98575	133	.98175	149	.97775
102	.98950	118	.98550	134	.98150	150	.97750
103	.98925	119	.98525	135	.98125		
104	.98900	120	.98500	136	.98100		

Weight/Volume Relations of Asphaltic Materials at 60ºF (16ºC)

Specific Gravity	Pounds per Gallon	Gallons per Ton	Specific Gravity	Pounds per Gallon	Gallons per Ton	Specific Gravity	Pounds per Gallon	Gallons per Ton
0.930	7.745	258.2	0.980	8.162	245.0	1.030	8.578	233.2
0.935	7.786	256.8	0.985	8.203	243.8	1.035	8.620	232.0
0.940	7.828	255.6	0.990	8.245	242.6	1.040	8.662	230.8
0.945	7.870	254.2	0.995	8.287	241.4	1.045	8.704	229.8
0.950	7.911	252.8	1.000	8.328	240.2	1.050	8.745	228.5
0.955	7.953	251.4	1.005	8.370	239.0	1.055	8.787	227.6
0.960	7.995	250.2	1.010	8.412	237.8	1.10	9.161	218.3
0.965	8.036	248.8	1.015	8.453	236.6	1.20	9.994	200.1
0.970	8.078	247.6	1.020	8.495	235.4	1.30	10.826	184.8
0.975	8.120	246.4	1.025	8.537	234.2	1.40	11.659	171.6

Lineal Feet Covered by One Ton of Aggregate at Various Rates of Application

Rate of Application (Lb. per Sq. Yd.)	Width of Application (Feet)				
	9	12	15	16	20
10	200	150	120	113	90
15	133	100	80	75	60
20	100	75	69	56	45
25	80	60	48	45	36
30	67	50	40	38	30
35	57	43	34	32	26
40	50	38	30	28	23
45	44	33	27	25	20
50	40	30	24	23	18

Lineal Meters Covered by One Metric Ton of Aggregate at Various Rates of Application

Rate of Application (kg/m^2)	Width of Application (Meters)				
	1	1.5	2	3	3.5
4	250	167	125	83	71
6	167	111	83	56	48
8	125	83	63	42	35
10	100	67	50	33	29
12	83	56	42	28	24
14	71	48	36	24	20
16	63	42	32	21	18
18	56	37	28	19	16
20	50	33	25	17	14

Specific Gravity Ranges of Some Common Virginia Aggregates

Material	Specific Gravity Range
Diabase	2.85 -3.00
Dolomite	2.80 - 2.85
Granite	2.65 - 2.70
Granite Gneiss	2.70 - 2.85
Gravel (Quartz)	2.60 - 2.65
Greenstone	2.95 - 3.10
Limestone	2.70 - 2.79
Sand (Quartz)	2.60 - 2.65
Sandstone	2.55 - 2.65

Reinforcing Steel

ASTM STANDARD REINFORCING BARS				
BAR SIZE Designation	WEIGHT Pounds per foot	NOMINAL DIMENSIONS - ROUND SECTIONS		
		Diameter Inches	Cross Sectional Area - Sq. In.	Perimeter Inches
#3	0.376	0.375	0.11	1.178
#4	0.668	0.500	0.20	1.571
#5	1.043	0.625	0.31	1.963
#6	1.502	0.750	0.44	2.356
#7	2.044	0.875	0.60	2.749
#8	2.670	1.000	0.79	3.142
#9	3.400	1.128	1.00	3.544
#10	4.303	1.270	1.27	3.990
#11	5.313	1.410	1.56	4.430
#14	7.65	1.693	2.25	5.32
#18	13.60	2.257	4.00	7.09

ASTM STANDARD REINFORCING BARS				
BAR SIZE Designation	WEIGHT (kg/m)	NOMINAL DIMENSIONS - ROUND SECTIONS		
		Diameter (mm)	Cross Sectional Area – (mm^2)	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	287.10	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

AASHTO Classification of Soil and Soil Aggregates

(With Suggested Subgroups)

GERNERAL CLASSIFICATION	GRANULAR MATERIALS (35% or Less Passing No. 200)							SILT-CLAY MATERIALS (More than 35% Passing No. 200)			
Group Classification	A-1		A-3	A-2				A-4	A-5	A-6	A-7
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6
Sieve Analysis, Percent Passing											
No. 10	50 Max.										
No. 40	30 Max.	50 Max.	51 Min.								
No. 200	15 Max.	25 Max.	10 Max.	35 Max.	35 Max.	35 Max.	35 Max.	36 Min.	36 Min.	36 Min.	36 Min.
Characteristics of Fraction Passing No. 40:											
Liquid Limit				40 Max.	41 Min.	40 Max.	41 Min.	40 Max.	41 Min.	40 Max.	41 Min.
Plasticity Index	6 Max.		N.P.	10 Max.	10 Max.	11 Min.	11 Min.	10 Max.	10 Max.	11 Min.	11 Min.[a]
Usual Types of Significant Constituent Materials	Stone Fragments Gravel and Sand		Fine Sand	Silty and Clayey Gravel and Sand				Silty Soils		Clayey Soils	
Geneeral Rating as Subgrade	Excellent to Good							Fair to Poor			

Classification Procedure: With required test data available, proceed from left to right on above chart and correct group will be found by process of elimination. The first group from the left into which the test data will fit is the correct classification.

[a]Plasticity Index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30.

[b]Group index should be shown in parentheses after group symbol as: A-1-3(3), A-4(5), A-6(12), A-7-5(17), etc.