CDOT Construction Manual

APPENDIX D
MISCELLANEOUS DATA

July 2002

[Page Intentionally Blank]

APPENDIX D
MISCELLANEOUS DATA

Appendix D presents common tables, figures, and miscellaneous data that Project Engineers and Project Inspectors will use on a day-to-day basis. These include such items as legal dimensions and weights for trucks, procedures for measuring and documenting vertical and lateral clearances at structures, grade stamps used by accredited lumber inspection agencies, and miscellaneous mathematical formulas.

[Page Intentionally Blank]

1 STOP SHOP Gets Truckers Moving

FYI

FOR YOUR INFORMATION

Colorado Motor Carrier Services
One Stop Shopping Center
1881 Pierce Street
Lakewood, Colorado 80214

Phone: Denver (303) 205-5691 FAX (303) 205-5764 [redacted]

LEGAL VEHICLE DIMENSIONS (CDOT FYI 1)

The figures below reflect legal size limitations, any dimensions exceeding these limitations will require an oversize permit **C.R.S. 42-4-510(11)** The metric equivalents are not part of the statutory references, but are displayed only for informational purposes.

Single unit maximum length is **45' (13.72 meters)** as measured from extreme front bumper to extreme rear bumper. **C.R.S. 42-4-504(2)**

No overall length limit for a combination with a single trailer length of **57' 4" (14.47 meters)** or less in length. **C.R.S. 42-4-404(4)**

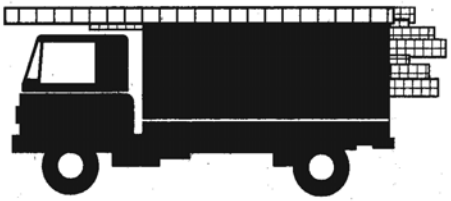
No overall length limit for a combination of units with trailers **28'6" (8.68 meters)** or less in length. The common name for this combination is "Western Double".
C.R.S. 42-4-504(4)

Saddlemounts are allowed **75' (22.86 meters)** in length for no more than **4** total units. A fullmount also may be transported as part of this combination. A fullmount is a smaller vehicle that is mounted completely on the frame of either the first or last vehicle in a saddlemount combination.
C.R.S. 42-4-504(4.5)

15' (4.57 meters) Drawbar

When one vehicle is towing another the drawbar or other connection shall be of sufficient strength to pull all weight towed, and the drawbar or other connection shall not exceed **15** feet **(4.57 meters)** from one vehicle to the other **C.R.S. 42-4-506(1)**

Load may not project more than **4** feet **(1.22 meters)** from the front most part of the grill. **C.R.S. 42-4-504(5)**



Load may not project more than **10** feet **(3.05 meters)** to the rear of the vehicle bumper. Overhangs for automobile and boat transporters are restricted to **6** feet **(1.83 meters)**. **C.R.S. 42-4-504(6)**

DAYLIGHT TRAVEL - Red flags are required at the end of the load projections greater than **4** feet **(1.22 meters)**.**C.R.S. 42-4-209**

NIGHT TRAVEL - A red light or lantern is required at the end of the load projections greater than **4** feet **(1.22 meters)**. **C.R.S. 42-4-209**

The total outside width of any vehicle or load shall not exceed **102" (2.59 meters)**, excluding mirrors or safety devices. **C.R.S. 42-4-502 (1),(5)**

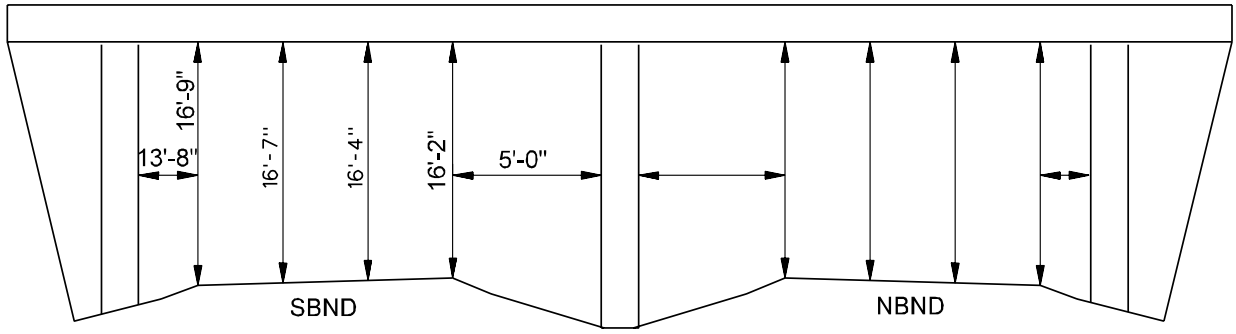
No vehicle unladen or with load shall exceed a height of **13' (3.96 meters)**; except that vehicles with a height of **14' 6" (4.42 meters)** shall be operated only on highways designated by the State Department of Transportation. **C.R.S. 42-4-504(1)**

PERMIT FEES FOR VEHICLES THAT EXCEED LEGAL VEHICLE LIMITATIONS
C.R.S. 42-4-510 (11)

Single Trip Permit	(Oversize)	$15.00
	(Special)	$125.00 required when a load exceeds maximum extra-legal dimensions.
Annual Permit	(Oversize)	$250.00 per permitted power unit.
Annual Fleet Permit	(Overlength)	This fleet permit only applies to public utility vehicles and loads. $1,500.00 plus $15.00 per fleet vehicle.

For detailed information and requirements concerning oversize/overweight permits, please refer to the Department of Transportation's Rules and Regulations titled "Pertaining to Transport Permits for the Movement of Extra-Legal Vehicles or Loads" (2 CCR 601-4). For more information contact CDOT at (303) 757-9539 or 1-800-350-3765.

PROCEDURE FOR MEASURING AND DOCUMENTING VERTICAL AND LATERAL CLEARANCES FOR BRIDGES AND SIGNS
(Applicable to New Construction, Reconstruction, Overlay, and Rehabilitation Projects)



LOOKING N

I-25

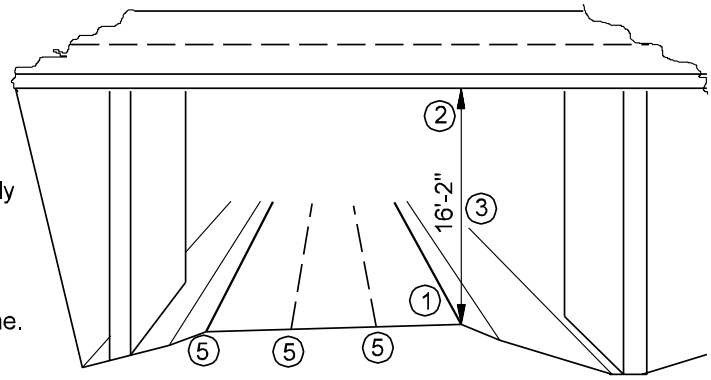
EXAMPLE SHOWING 16th ST BRIDGE OVER I-25

Recording Vertical and Lateral Clearances

1. Make an accurate sketch of bridge or sign structure.
2. Take measurements of vertical clearances as shown below. Be sure to measure the clearances under all the girders to determine the minimum along each lane line. Also meaure and record lateral clearances.
3. On sign structures, the minimum may not be the sign support. It may be a cat walk or an appurtenance hanging lower.
4. Record the measurements on a sketch of the bridge or sign as shown above.
5. Note which direction you are looking on the sketch. On a divided highway, record measurements for both structures while looking in one direction only. Do not look in the direction of traffic for each of the bridges.
6. Send the information to Bridge Records, c/o Staff Bridge Branch. If less than 16'-6", notify Staff Maintenance - Oversize/Overweight Permits (See Section 630.2.4 and Construction Bulletin, January 20, 2001).

Where to Measure Vertical Clearances

1. Locate the edge of roadway, excluding shoulder. Typically, a solid white line represents the edge of roadway.
2. Locate the lowest point of the structure directly above that line.
3. Measure the clearance.
4. Record the measurement.
5. Repeat steps 2, 3, and 4 for each roadway line.



[Page Intentionally Blank]

AMERICAN LUMBER STANDARD COMMITTEE, INCORPORATED
H.R. Friesen, Chairman
S.R. Ingram, Vice Chairman
R.K. Caron, Treasurer
T. D. Searles, President

American Lumber
Standard Committee, Incorporated
P. O. Box 210
Germantown, Maryland 20875-0210
301-972-1700
Fax: 301-540-8004
e-mail: alsc@alsc.org

July, 2001
(this list supercedes all previous lists)

The following rules have been certified as conforming to the American Softwood Lumber Standard, PS20, by the Board of Review of the American Lumber Standard Committee:

1. **Standard Grading Rules for Northeastern Lumber;** published by the Northeastern Lumber Manufacturers Association (NeLMA), 272 Tuttle Road, P.O. Box 87A, Cumberland Center, ME 04021; phone 207-829-6901; fax 207-829-4293.
2. **Standard Grading Rules;** published by Northern Softwood Lumber Bureau (NSLB), 272 Tuttle Road, P.O. Box 87A, Cumberland Center, ME 04021; phone 207-829-6901; fax 207-829-4293.
3. **Standard Specifications for Grades of California Redwood Lumber;** published by the Redwood Inspection Service (RIS), 405 Enfrente Drive, Suite 200, Novato, CA 94949; phone 415-382-0662; fax 415-382-8531.
4. **Standard Grading Rules for Southern Pine Lumber;** published by the Southern Pine Inspection Bureau (SPIB), 4709 Scenic Highway, Pensacola, FL 32504; phone 850-434-2611; fax 850-433-5594.
5. **Standard Grading Rules for West Coast Lumber;** published by the West Coast Lumber Inspection Bureau (WCLIB), Box 23145, Portland, OR 97281-3145; phone 503-639-0651; fax 503-684-8928.
6. **Western Lumber Grading Rules;** published by Western Wood Products Association (WWPA), Yeon Building, 522 SW Fifth Avenue, Portland, OR 97204-2122; phone 503-224-3930; fax 503-224-3934.
7. **Standard Grading Rules for Canadian Lumber;** published by the National Lumber Grades Authority (NLGA), 406-First Capital Place, 960 Quayside Drive, New Westminster, B.C. V3M 6G2; phone 604-524-2393; fax 604-524-2893

Agencies Accredited By the Board of Review of the American Lumber Standard Committee, Incorporated and Typical Grade Stamps.

TYPICAL GRADE STAMP — AGENCY NAMES AND ADDRESSES

California Lumber Inspection Service (CLIS)
420 West Pine Street
Suite #10
Lodi, CA 95240
209-334-6956
Fax: 209-334-6970

1. Approval as an inspection agency including mill supervisory service under:
   a. WCLIB rules
   b. RIS rules
   c. WWPA rules
   d. NGR, Decking and Western Red Cedar portions of NLGA rules
   e. NGR, Boards and Scaffold Plank portions of SPIB rules
2. Approved to supervise glued lumber.

Northeastern Lumber Manufacturers Association (NeLMA)
272 Tuttle Road, P.O. Box 87A
Cumberland Center, Maine 04021
207-829-6901
Fax: 207-829-4293
e-mail: nelma@javanet.com

1. NeLMA is a rules writing agency.
2. Approval of rules they publish and as an inspection agency including mill supervisory services under:
   a. NeLMA rules
   b. NSLB rules
   c. NGR, Posts and Timbers, and Beams and Stringers portions of WCLIB rules
   d. NGR, Selects and Common Boards, 4/4 Shop, Heavy Shop, Posts and Timbers, and Beams and Stringers under the WWPA rules
   e. NGR portion of the SPIB rules
3. Approved to supervise glued and machine graded lumber.

110 STUD
NSLB
S-DRY
BALSAM
FIR

Northern Softwood Lumber Bureau (NSLB)
272 Tuttle Road, P.O. Box 87A
Cumberland Center, Maine 04021
207-829-6901
Fax: 207-829-4293
e-mail: nelma@javanet.com

1. NSLB is a rules writing agency.
2. Approval of rules they publish and as an inspection agency including mill supervisory service under:
   a. NSLB rules
   b. NGR portions of the WCLIB rules
   c. NGR portions of the WWPA rules
   d. NGR portions of the NLGA rules
3. Approved to supervise glued and machine graded lumber.

PLIB W-10 CONST S-GRN ® HEM-FIR WCLB RULES

Pacific Lumber Inspection Bureau (PLIB)
33442 First Way South
Suite 300
Federal Way, WA 98003
253-835-3344
Fax: 253-835-3371
e-mail: plib@foxinternet.com

1. Approval as an inspection agency including mill supervisory service under:
   a. WCLIB rules
   b. WWPA rules
   c. RIS rules
   d. NLGA rules
2. Approved to supervise glued and machine graded lumber.

50 FDTN S-GRN REDWOOD RIS®

Redwood Inspection Service (RIS)
405 Enfrente Drive, Suite 200
Novato, California 94949
415-382-0662
Fax: 415-382-8531
e-mail: cjjourdain@worldnet.att.net

1. RIS is a rules writing agency.
2. Approval of rules they publish and as an inspection agency including mill supervisory service under:
   a. RIS rules
   b. WCLIB rules
   c. WWPA rules
3. Approved to supervise machine graded lumber.

RRA® No 1
028 SYP KD19

Renewable Resource Associates, Inc. (RRA)
3091 Chaparral Place
Lithonia, Georgia 30038
770-482-9385
Fax: 770-484-2541
e-mail: rra.inc@mindspring.com

1. Approval as an inspection agency including mill supervisory service under:
   a. SPIB rules
   b. NGR, Posts and Timbers, and Beams and Stringers portions of the NLGA rules
   c. NGR, Selects and Finish, Boards, Posts and Timbers and Beams and Stringers portions of the WWPA rules
   d. NGR, Posts and Timbers, and Beams and Stringers portions of the WCLIB rules
   e. NGR, Selects and Finish, Boards, Posts and Timbers, and Beams and Stringers portions of the NeLMA rules
   f. NGR, Selects and Finish, Boards, Mouldings, Posts and Timbers, and Beams and Stringers portions of the NSLB rules
2. Approved to supervise glued and machine graded lumber.

SPIB® No. 2
KD19 7

Southern Pine Inspection Bureau (SPIB)
4709 Scenic Highway
Pensacola, Florida 32504
850-434-2611
Fax: 850-433-5594
e-mail: spib@spib.org

1. SPIB is a rules writing agency.
2. Approval of rules they publish and as an inspection agency including mill supervisory service under:
   a. SPIB rules
   b. Southern pine graded under WWPA Moulding Stock and Shop Lumber rules
   c. NGR, Posts and Timbers, and Beams and Stringers portions of NeLMA rules
   d. NGR, Posts and Timbers, and Beams and Stringers portions of NSLB rules
   e. NGR, Posts and Timbers, and Beams and Stringers portions of WCLIB rules
   f. NGR, Posts and Timbers, and Beams and Stringers portions of WWPA rules
   g. NGR, Posts and Timbers, and Beams and Stringers portions of NLGA rules
3. Approved to supervise glued and machine graded lumber.

AUDITED BY
TP® NO.2 S-DRY
000 SYP

AUDITED BY
TP® NO.1 S-DRY
000 D.FIR-L

Timber Products Inspection (TP)
P.O. Box 919
Conyers, Georgia 30012
770-922-8000
Fax: 770-922-1290
e-mail: jmoore@tpinspection.com

1. Approval as an inspection agency including mill supervisory service under:
   a. SPIB rules
   b. RIS rules
   c. WCLIB rules
   d. WWPA rules
   e. NGR, Posts and Timbers, and Beams and Stringers, and Section 6-Eastern White Pine Board Grades portions of the NeLMA rules
   f. NGR, paragraph 112-Selects and paragraph 113-Commons portions of the NLGA rules
   g. NGR portion of the NSLB rules
2. Approved to supervise glued and machine graded lumber.

MILL 10
WCLB® NO. 2
DOUG FIR S-DRY

West Coast Lumber Inspection Bureau (WCLIB)
Box 23145
Portland, OR 97281-3145
503-639-0651
Fax: 503-684-8928
e-mail: bshelley@wclib.org
e-mail: info@wclib.org

1. WCLIB is a rules writing agency.
2. Approval of rules they publish and as an inspection agency including mill supervisory service under:
   a. WCLIB rules
   b. RIS rules
   c. WWPA rules
   d. NLGA rules
   e. NGR, Scaffold Plank, Radius Edge Decking, Finish and Boards portions of the SPIB rules
3. Approved to supervise glued and machine graded lumber.

12
WWP® 2 S-DRY
D. FIR

Western Wood Products Association (WWPA)
522 SW Fifth Avenue, Suite 500
Portland, Oregon 97204-2122
503-224-3930
Fax: 503-224-3934
e-mail: info@wwpa.org

1. WWPA is a rules writing agency.
2. Approval of rules they publish and as an inspection agency including mill supervisory service under:
   a. WWPA rules
   b. WCLIB rules
   c. NLGA rules
   d. RIS rules
   e. NGR and Scaffold Plank portions of the SPIB rules
3. Approved to supervise glued and machine graded lumber.

National Lumber Grades Authority (NLGA)
406-First Capital Place
960 Quayside Drive
New Westminster, British Columbia V3M 6G2
604-524-2393
Fax: 604-524-2893
e-mail: nlga@axionet.com

The NLGA is the rules writing agency for Canada. The following Canadian agencies have been accredited by the Board of Review of the American Lumber Standard Committee as inspection agencies including mill supervisory service as indicated below.

A.F.P.A.® 00
S—P—F
S-DRY STAND

Alberta Forest Products Association (AFPA)
11738 Kingsway Avenue # 200
Edmonton, Alberta T5G OX5
780-452-2841
Fax: 780-455-0505
e-mail:ndupuis@compusmart.ab.ca

1. Approved as an inspection agency including mill supervisory service under:
   a. NLGA rules
2. Approved to supervise glued and machine graded lumber.

CL® A S-P-F 100 No. 2 S-GRN.
CL® A 100 SPRUCE-PINE-FIR NO. 1 S-DRY

Canadian Lumbermen's Association (CLA)
27 Goulburn Avenue
Ottawa, Ontario K1N 8C7
613-233-6205
Fax: 613-233-1929
e-mail: info@cla-ca.ca

1. Approved as an inspection agency including mill supervisory service under:
   a. NLGA rules
   b. NGR portion of NeLMA rules
2. Approved to supervise glued and machine graded lumber.

COFI 100 ®
No 1 S-DRY HEM-FIR(N)

Canadian Mill Services Association (CMSA)
Suite 1115, Two Bentall Centre
555 Burrard Street
Box 226
Vancouver, British Columbia V7X 1M8
604-891-1200
Fax: 604-891-1217
e-mail: beatty@canserve.org

1. Approved as an inspection agency including mill supervisory service under:
   a. NLGA rules
   b. NGR portion of WWPA rules for Douglas fir, larch and SPF(S).
2. Approved to supervise glued and machine graded lumber.

CSI 000 ®
No 1 S-DRY HEM-FIR(N)

Canadian Softwood Inspection Agency, Inc. (CSI)
22089 28th Avenue
Langley, British Columbia V2Z 1P1
604-532-7624
Fax: 604-532-7625
e-mail: thomasr@uniserve.com

1. Approved as an inspection agency including mill supervisory service under:
   a. NLGA rules
   b. NGR portion of WWPA rules
   c. NGR portion of WCLIB rules
2. Approved to supervise glued and machine graded lumber.

CLMA 00 ®
S-DRY 1
S—P—F

Cariboo Lumber Manufacturers Association (CLMA)
205-197 N. 2nd Avenue
Williams Lake, British Columbia V2G 1Z6
250-392-7778
Fax: 250-392-4692
e-mail: clma@wlake.com

1. Approved as an inspection agency including mill supervisory service under:
   a. NLGA rules
2. Approved to supervise glued and machine graded lumber.

CFPA® 00
S-P-F S-DRY
CONST

Central Forest Products Association (CFPA)
Suite #309, 35-2855 Pembina Hwy.
Winnipeg, Manitoba R3T 2N5
204-487-7403
Fax: 204-487-3769

1. Approved as an inspection agency including mill supervisory service under:
   a. NLGA rules
   b. NGR portion of the NeLMA rules
2. Approved to supervise glued and machine graded lumber.

GLIB® 100
1 S-DRY
SPRUCE-PINE-FIR

Gateway Lumber Inspection Bureau (GLIB)
992 Burns Street
North Bay, Ontario P1B 3V4
705-474-9148
Fax: 705-474-3644
e-mail: maurice.bosselle@sympatico.ca

1. Approved as an inspection agency including mill supervisory service under:
   a. NGR, paragraph 114, Posts and Timbers, and Beams and Stringers portions of the NLGA rules
2. Approved to supervise glued lumber

ILMA® S-DRY 1
00 S—P—F

Interior Lumber Manufacturers Association (ILMA)
360-1855 Kirschner Road 250-860-9663
Kelowna, British Columbia V1Y 4N7 Fax: 250-860-0009
e-mail: ilma@ilma.com

1. Approved as an inspection agency including mill supervisory service under:
   a. NLGA rules
   b. NGR portion of the WWPA rules
2. Approved to supervise glued and machine graded lumber.

0 No 1
0 S-DRY
D FIR (N)

Macdonald Inspection (MI)
110-1720 14th Avenue 250-287-4422
Campbell River, British Columbia V9W 8B9 Fax: 250-287-4622
e-mail: macinsp@island.net

1. Approved as an inspection agency including mill supervisory service under:
   a. NLGA rules
   b. NGR portion of the WWPA rules
   c. NGR portion of the WCLIB rules
2. Approved to supervise glued and machine graded lumber.

MLB® S-P-F NO. 1 S-GRN 99

Maritime Lumber Bureau (MLB)
P.O. Box 459 902-667-3889
Amherst, Nova Scotia B4H 4A1 Fax: 902-667-0401
e-mail: mlb@ns.sympatico.ca

1. Approved as an inspection agency including mill supervisory service under:
   a. NLGA rules
   b. NGR and Section 6-Eastern White Pine Board Grades portions of the NeLMA rules
2. Approved to supervise glued lumber.

NFLD.LUMBER
NLPA® S-P-F NO. 1 K.D. 000

Newfoundland and Labrador Lumber Producers Association (NLPA)
P.O. Box 8 709-533-2206
Glovertown, Newfoundland A0G 2L0 Fax: 709-533-2611

1. Approved as an inspection agency including mill supervisory service under:
   a. NLGA rules

NFPA® S-P-F S-DRY
100 No 1

Northern Forest Products Association (NFPA)
400-1488 Fourth Avenue 250-564-5136
Prince George, British Columbia V2L 4Y2 Fax: 250-564-3588
e-mail: nfpa@pgweb.com

1. Approved as an inspection agency including mill supervisory service under:
   a. NLGA rules
2. Approved to supervise glued and machine graded lumber.

O.L.M.A.® 01-1
CONST. S-DRY
SPRUCE - PINE - FIR

Ontario Lumber Manufacturers Association (OLMA)
65 Queen Street West, Suite 210 416-367-9717
Toronto, Ontario M5H 2M5 Fax: 416-367-3415
e-mail: olmassoc@aol.com

1 Approved as an inspection agency including mill supervisory service under:
   a. NLGA rules
   b. NGR and Section 6-Eastern White Pine Board Grades portions of the NeLMA rules
2. Approved to supervise glued and machine graded lumber.

PLIB® NLGA RULE
No 1
S-DRY
00 S—P—F

Pacific Lumber Inspection Bureau (PLIB)
33442 First Way South
Suite 300
Federal Way, WA 98003

British Columbia Division:
P.O. Box 19118
Fourth Avenue Postal Outlet 253-835-3344
Vancouver, British Columbia V6K 4R8 Fax: 604-732-1782
e-mail: plib@foxinternet.com

1. Approved as an inspection agency including mill supervisory service under:
   a. NLGA rules
   b WCLIB rules
   c WWPA rules
2. Approved to supervise glued and machine graded lumber.

® S-P-F
1
000 S-DRY

Quebec Lumber Manufacturers Association (QLMA)
1175 Lavigerie Avenue, Suite 200 418-657-7916
Ste-Foy, QB G1V 4P1 Fax: 418-657-3365
e-mail: gilles.jeanrie@sciage-lumber.qc.ca

1. Approved as an inspection agency including mill supervisory service under:
   a. NLGA rules
   b. NGR and paragraph 6.5 Commons portions of the NeLMA rules
2. Approved to supervise glued and machine graded lumber.

INTERPRETING GRADE STAMPS

With few exceptions (see note), all approved grade stamps include the following five elements.

Visually Graded Lumber [1]:

(a) TRADEMARK®	*(c)* Grade Designation
(b) Mill Identification	*(d)* Species *(e)* Seasoning

a. *Trademark* – indicates identity of agency quality supervision
b. *Mill Identification* – product manufacturer name, brand or assigned mill number
c. *Grade Designation* – grade name (number or abbreviation)
d. *Species Identification* – name or abbreviation of individual species or species combination
e. *Condition of Seasoning* – moisture content classification at time of surfacing:
   1. *S-Dry* – 19% maximum moisture content
   2. *MC 15* – 15% maximum moisture content
   3. *KD* – kiln dried to moisture content indicated in grading rules
   4. *S-GRN* –over 19% moisture content (unseasoned)

Machine Graded Lumber [1]:

Grade stamps on machine graded lumber include the five elements listed above for visually graded lumber. Grade designations for the two types of machine graded lumber, machine stress rated (MSR) lumber and machine evaluated lumber (MEL), are distinctive from those used for visually graded lumber grades.

Machine Stress Rated Lumber (MSR) Stamp:

(b) Mill Identification	*(d)* Species *(e)* Seasoning
(a) TRADEMARK®	*(c)* #### Fb - #.#E
Machine Rated	

- MSR grade designations are composed of the assigned extreme fiber in bending (Fb or f) in psi and the assigned modulus of elasticity (E) in millions of pound per square inch. Examples include 1650f-1.5E, 2100f-1.8E and 2400f-2.0E.
- The phrase "Machine Rated" or "MSR" is also required on machine stress rated lumber stamps.

Machine Evaluated Lumber (MEL) Stamp:

(a) TRADEMARK®	*(b)* Mill Identification
(d) Species	*(e)* Seasoning
(c) M – xx	
#### Fb #.# E	#### Ft

- MEL grade designations use the format, M-xx; where xx indicates a one or two digit number. Examples include M-12, M-15 and M-19.
- In addition, the assigned extreme fiber in bending (Fb or f) in psi, the assigned modulus of elasticity (E) in millions of pound per square inch, and the assigned tension parallel to grain (Ft) in psi are required elements on machine evaluated lumber stamps.

Glued Lumber [1]:

(a) TRADEMARK®	*(b)* Mill Identification
(d) Species	*(e)* Seasoning
(c) Grade Identification (Type Glue/Appropriate Use)	

Grade stamps on glued lumber include all the information indicated for visually graded lumber. In addition, the grade stamp includes a designation or abbreviation indicating the type of glue joint and appropriate use. Examples include "Stud Use Only", "Vertical Use Only", "Certified End Joint" and "Certified Exterior Joints".

[1] Grade Stamp Layout – The placement of the required elements within a grade stamp may vary, depending on the preferences of the specific supervising agency. The sample grade stamp facsimiles that accompany the agency listing herein provide a good example of the typical placement of elements preferred by that particular agency. Contact the agency, whose trademark appears on the lumber, for specific information related to the agency's grade stamping policies.

Note: Grade stamps for timbers are not required to include the condition of seasoning.
Grade stamps are permitted to include information that is not required, so long as the additional information is not confusing, misleading or deceptive. Contact the agency, whose trademark appears on the lumber, for specific information related to the agency's grade stamping policy.

AMERICAN LUMBER STANDARD COMMITTEE, INCORPORATED
P.O. Box 210
Germantown, Maryland 20875-0210
301-972-1700 fax 301-540-8004 e-mail: alsc@alsc.org

American Lumber Standard Committee, Incorporated

H.R. Friesen, Chairman
S.R. Ingram, Vice Chairman
R.K. Caron, Treasurer
T.D. Searles, President

P.O. Box 210
Germantown, Maryland 20875-0210
Telephone: (301) 972-1700
Fax: (301) 540-8004
E-Mail: alsc@alsc.org

ACCREDITED AGENCIES FOR SUPERVISORY AND LOT INSPECTION OF PRESSURE TREATED WOOD PRODUCTS JULY, 2001

(this list supercedes all previous lists)

Agencies accredited by the Board of Review of the American Lumber Standard Committee, Incorporated and typical quality marks.

Interpreting a Quality Mark

ABC [1]
19__-19__ [3]
GROUND CONTACT [6]
.40 [5]
Use Category and/or AWPA ____ STDS [2]
XXX [7]
PRESERVATIVE [4]
KDAT [8]
X-XX [9]

1 - The identifying symbol, logo or name of the accredited agency.
2 - The applicable American Wood–Preservers' Association (AWPA) commodity standard and/or Use Category.
3 - The year of treatment if required by AWPA standard/use category.
4 - The preservative used, which may be abbreviated.
5 - The preservative retention.
6 - The exposure category (e.g. Above Ground, Ground Contact, etc.).
7 - The company name and location of home office; or company name and number; or company number.
8 - If applicable, moisture content after treatment.
9 - If applicable, length, and/or class.

As specified below for particular agencies, some or all of the following American Wood–Preservers' Association commodity standards are used by American Lumber Standard Committee, Incorporated accredited agencies which supervise facilities which pressure treat wood products:

- C1 All Timber Products--Preservative Treatment by Pressure Processes
- C2 Lumber, Timbers, Bridge Ties and Mine Ties--Preservative Treatment by Pressure Processes
- C3 Piles--Preservative Treatment by Pressure Processes
- C4 Poles--Preservative Treatment by Pressure Processes
- C5 Fence Posts--Preservative Treatment by Pressure Processes
- C6 Crossties and Switch Ties-Preservative Treatment by Pressure Process
- C9 Plywood--Preservative Treatment by Pressure Processes
- C15 Wood for Commercial-Residential Construction--Preservative Treatment by Pressure Processes
- C17 Playground Equipment Treated with Inorganic Preservatives--Preservative Treatment by Pressure Processes
- C18 Standard for Pressure Treated Material in Marine Construction
- C22 Lumber and Plywood for Permanent Wood Foundations--Preservative Treatment by Pressure Processes
- C23 Round Poles and Posts used in Building Construction--Preservative Treatment by Pressure Processes
- C24 Sawn Timber Used to Support Residential and Commercial Structures
- C25 Sawn Crossarms-Preservative Treatment by Pressure Process
- C28 Standard for Preservative Treatment by Pressure Process of Structural Glued Laminated Members and Laminations Before Gluing.
- C31 Lumber Used Out of Contact With the Ground and Continuously Protected from Liquid Water--Treatment by Pressure Processes
- C33 Standard for Preservative Treatment of Structural Composite Lumber by Pressure Processes
- C34 Shakes and Shingles-Preservative Treatment by Pressure Processes

AWPA Use Categories and Corresponding AWPA Commodity Standards ***		
AWPA Use Category (UC)	Use Category Service Conditions	Corresponding AWPA Commodity Standard (C)
UC1	Interior construction, dry, above ground	C1, C2, C15, C28, C31
UC2	Interior construction, damp above ground	C1, C2, C9, C15, C28, C31
UC3A	Exterior construction, coated, above ground	C1, C2, C15, C34
UC3B	Exterior construction, above ground	C1, C2, C9, C15, C25, C28, C33, C34
UC4A	Ground contact or fresh water	C1, C2, C4, C5, C6, C9, C15, C17, C28, C33
UC4B	Ground contact or fresh water or important construction components	C1, C2, C3, C4, C5, C6, C15, C22, C23, C24, C28, C33
UC4C	Ground contact or fresh water or critical construction components	C1, C2, C3, C4, C6, C24, C28, C33
UC5A, UC5B, UC5C	Salt or brackish water and adjacent mud zone	C1, C2, C3, C9, C18

*** For additional information concerning the AWPA Use Category and Commodity Standard treatment requirements contact the American Wood-Preservers' Association, P.O. Box 5690, Granbury, Texas 76049 (Telephone: 817-326-6300, Fax: 817-326-6306, E-Mail: awpa@itexas.net; Web Site: www.awpa.com.)

As specified in the following tables, some or all of the following preservatives are used:

CCA	- chromated copper arsenate
ACA	- ammoniacal copper arsenate
ACZA	- ammoniacal copper zinc arsenate
ACC	- acid copper chromate
ACQ	- ammoniacal copper quat.
COPPER NAP	- copper naphthenate
PENTA	- pentachlorophenol
CREOSOTE	- creosote and/or solutions
BORATE	- borates
CBA-A	- copper azole - A
CC	- ammoniacal copper citrate
CDDC	- copper bis (dimethyldithiocarbamate)

KEY TO THE FOLLOWING TABLES

1 - sawn material and plywood
2 - plywood only
3 - sawn material only
R - round commodities

SP	- southern pine
RP	- red pine
PP	- ponderosa pine
HF	- hem-fir
DF	- coastal Douglas fir
LP	- lodgepole pine
WH	- western hemlock
RDP	- radiata pine
CP	- caribbean pine
EWP	- eastern white pine
JP	- jack pine

ACCREDITED AGENCY AND ADDRESSES

TYPICAL QUALITY MARK

TABLE OF COMMODITIES, BY SPECIES & PRESERVATIVE
(See Key

Bode Inspection
P.O. Box 307
Beaverton, Oregon 97075-0307
503-590-3555
Fax: 503-590-2802
e-mail: bodeins@aol.com

LP-22 AWPA
.40 RETENTION C2/C9
GROUND CONTACT
CCA-C
DRY
B .40 XYZ TREATING
BEAVERTON, OR

	HF	DF	WH
CCA	1	2,R	R
ACA	1	1,R	R
ACZA	1	1,R	R
ACC	1	2,R	R
ACQ	1	1	
COPPER NAP	1	1,R	R
PENTA	1	1,R	R
CREOSOTE	1	1,R	R

California Lumber Inspection Service
420 West Pine Street
Suite #10
Lodi, CA 95240
209-334-6956
Fax: 209-334-6970

CLIS®
CCA-C
GROUND CONTACT
LP-22 RET. .40
AWPA C2 & C9
CDE WOOD TREATING INC.
INDUSTRY, CA.

	SP	RP	PP	HF	DF	LP	WH
CCA	1,R	1,R	1,R	1	2,R	R	R
ACA	1,R	1,R	1,R	1	1,R	1,R	1,R
ACZA	1,R	1,R	1,R	1	1,R	1,R	1,R
ACC	1,R	1,R	1,R	1	2,R	1,R	1,R
COPPER NAP	1,R	1,R	1,R	1	1,R	1,R	1,R
PENTA	1,R	1,R	1,R	1	1,R	1,R	1,R
CREOSOTE	1,R	1,R	1,R	1	1,R	1,R	1,R

California Lumber Inspection Service maintains a laboratory accredited for the analysis of wood samples pressure treated with the following preservative(s): CCA, ACA, ACZA, ACC and COPPER NAP.

Canadian Softwood Inspection Agency, Inc.
22089 28th Avenue
Langley, BC V2Z 1P1 Canada
604-532-7624
Fax: 604-532-7625
e-mail: thomasr@uniserve.com

CSI®
CCA-C
AWPA C2 / C9
.40 RET
LP - 22
GROUND CONTACT
NAME OF TREATMENT FACILITY
LOCATION

	SP	RP	PP	HF	DF	LP	WH	JP
CCA	1,R	1,R	1,R	1	1,R	1,R	1,R	1,R
BORATE	1-All AWPA Applicable Species							

Florida Lumber Inspection Service
P. O. Box 898
Conyers, GA 30012
770-922-8000
Fax: 770-922-1290
flis@perry.gulfnet.com

AWPA
C2/C9
STDS
CCA-C
FLIS®
.25
ABOVE
GROUND
PLANT NAME / LOCATION (S)
OR PLANT NO.

	SP	RP	PP	RDP	CP
CCA	1,R	1,R	1,R	1,R	1,R
COPPER NAP	1,R	1,R	1,R	1,R	1,R
PENTA	1,R	1,R	1,R	1,R	1,R
CREOSOTE	1,R	1,R	1,R	1,R	1,R

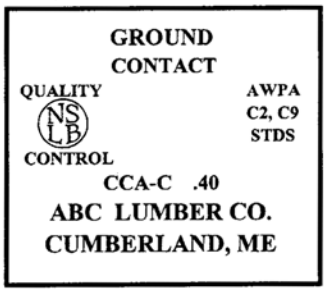
McCutchan Inspection, Inc.
P.O.Box 397
Banks, OR 97106
503-324-5210
Fax: 503-324-7912
e-mail: sasu1@msn.com

AWPA C-2 CCA-C .25
LP-2 ABOVE GROUND McC →
ABC TREATING
PORTLAND, OREGON

	SP	RP	PP	HF	DF
CCA	1,R	1,R	1	1	1,R
ACA	1,R	1,R	1	1	1,R
ACZA	1,R	1,R	1	1	1,R
ACC	1,R	1,R	1	1	1,R
COPPER NAP	1,R	1,R	1	1	1,R
PENTA	1,R	1,R	1	1	1,R
CREOSOTE	1,R	1,R	1	1	1,R

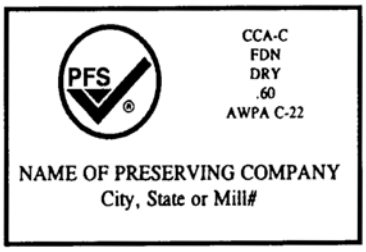
ACCREDITED AGENCY AND ADDRESSES	TYPICAL QUALITY MARK	TABLE OF COMMODITIES, BY SPECIES & PRESERVATIVE (See Key)

Northern Softwood Lumber Bureau
272 Tuttle Road
P.O. Box 87A
Cumberland Center, Maine 04021
207-829-6901
Fax: 207-829-4293
e-mail: nelma@javanet.com



	SP	RP	PP	EWP
CCA	1	1	1	1
ACZA	1	1	1	1

PFS Corporation
2402 Daniels Street
Madison, Wisconsin 53718
608-221-3361
Fax: 608-221-0180
e-mail: pfsteco@pfs-teco.com



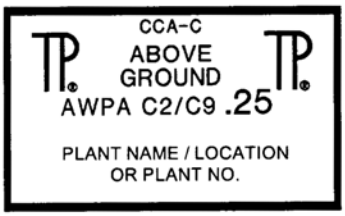
	SP	RP	PP	HF	DF	LP	WH
CCA	1,R	1,R	1,R	1	2,R	R	R
ACA	1,R	1,R	1,R	1	1,R	R	R
ACZA	1,R	1,R	1,R	1	1,R	R	R
ACC	1,R	1,R	1,R	1	2,R	R	R
CREOSOTE	1,R	1,R	1,R	1	1,R	R	R

Southern Pine Inspection Bureau
4555 Spanish Trail
Pensacola, Florida 32504
850-434-5011
Fax: 850-434-5388
e-mail: spib@spib.org

ALL AWPA APPLICABLE SPECIES	
CCA	1,R
PENTA	R
CREOSOTE	R
ACQ	1
ACZA	1
BORATE	1

Southern Pine Inspection Bureau maintains a laboratory accredited for the analysis of wood samples pressure treated with the following preservative(s): CCA, ACZA, BORATE, PENTA, CRESOTE, and ACQ.

Timber Products Inspection
P. O. Box 919
Conyers, Georgia 30012
770-922-8000
Fax: 770-922-1290
e-mail: tpinsp@mindspring.com

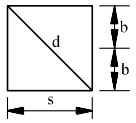


	ALL AWPA APPLICABLE SPECIES
CCA	1,R
ACA	1,R
ACZA	1,R
ACC	1,R
ACQ	1,R
COPPER NAP	1,R
PENTA	1,R
CREOSOTE	1,R
BORATE	1
CBA-A	3
CC	1, R
CDDC	3

Timber Products Inspection maintains a laboratory accredited for the analysis of wood samples pressure treated with the following preservative(s): CCA, ACA, ACZA, ACC, ACQ, COPPER NAP, PENTA, CREOSOTE, BORATE, CBA-A, CC and CDDC.

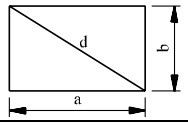
AREAS OF PLANE FIGURES

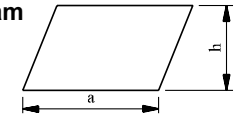
Square



Diagonal = d = $s\sqrt{2}$
Area = $s^2 = 4b^2 = 0.5d^2$
Example: s = 6; b = 3; Area = $(6)^2$ = 36 Ans.
d = 6 x 1.414 = 8.484 Ans.

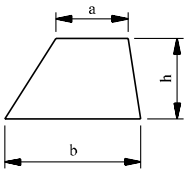
Rectangle and Parallelogram





Area = ab or $b\sqrt{d^2 - b^2}$
Example. a = 6; b = 3.
Area = 3 x 6 = 18 Ans.

Trapezoid

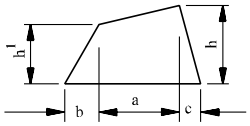


Area = $\frac{1}{2}h(a+b)$

Example: a = 2; b = 4; h = 3

Area = $\frac{1}{2} \times 3(2+4) = 9$ Ans.

Trapezium



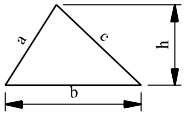
Area = $\frac{1}{2}\left[a\left(h+h^1\right)+bh^1+ch\right]$

Example: a = 4; b = 2; c = 2; h = 3; h^1 = 2.

Area = $\frac{1}{2}\left[4(3+2)+(2\times 2)+(2\times 3)\right] = 15$ Ans.

Triangles

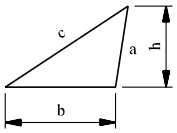
Both formulas apply to both figures.



Area = $\frac{1}{2}$ bh

Example: h =3; b = 5

Area = $\frac{1}{2}(3\times 5) = 7\frac{1}{2}$ Ans.

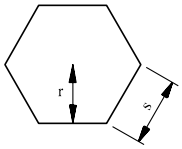


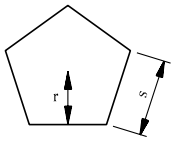
Area = $\sqrt{S(S-a)(S-b)(S-c)}$ where S = $\frac{a+b+c}{2}$

Example: a = 2; b = 3; c = 4

S = $\frac{2+3+4}{2}$ = 4.5; Area = $\sqrt{4.5(4.5-2)(4.5-3)(4.5-4)}$ = 2.9 Ans.

Regular Polygons





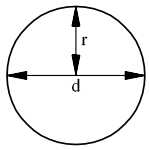
$$\text{Area} \begin{cases} 5\text{ sides} = 1.720477\,S^2 = 3.63271\,r^2 \\ 6\text{ sides} = 2.598150\,S^2 = 3.46410\,r^2 \\ 7\text{ sides} = 3.633875\,S^2 = 3.37101\,r^2 \\ 8\text{ sides} = 4.828427\,S^2 = 3.31368\,r^2 \\ 9\text{ sides} = 6.181875\,S^2 = 3.27573\,r^2 \\ 10\text{ sides} = 7.694250\,S^2 = 3.24920\,r^2 \\ 11\text{ sides} = 9.365675\,S^2 = 3.22993\,r^2 \\ 12\text{ sides} = 11.196300\,S^2 = 3.21539\,r^2 \end{cases}$$

n = number of sides; r = short radius; S = length of side; R = long radius.

Area = $\frac{n}{4}S^2\cot.\frac{180°}{n} = \frac{n}{2}R^2\sin.\frac{360°}{n}$ = $nr^2\tan\frac{180°}{n}$

AREAS OF PLANE FIGURES

Circle



π = 3.1416; A = area; d = diameter

p = circumference or periphery; r = radius

$p = \pi d = 3.1416d$ $\qquad$ $p = 2\sqrt{\pi A} = 3.54\sqrt{A}$

$p = 2\pi r = 6.2832r$ $\qquad$ $p = \frac{2A}{r} = \frac{4A}{d}$

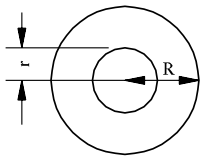
$d = \frac{p}{\pi} = \frac{p}{3.1416}$ $\qquad$ $d = 2\sqrt{\frac{A}{\pi}} = 1.128\sqrt{A}$

$r = \frac{p}{2\pi} = \frac{p}{6.2832}$ $\qquad$ $r = \sqrt{\frac{A}{\pi}} = 0.564\sqrt{A}$

$A = \frac{\pi d^2}{4} = 0.7854d^2$ $\qquad$ $A = \frac{p^2}{4\pi} = \frac{p^2}{12.57}$

$A = \pi r^2 = 3.1416r^2$ $\qquad$ $A = \frac{pr}{2} = \frac{pd}{4}$

Circular Ring



Area = $\pi\left(R^2 - r^2\right) = 3.1416\left(R^2 - r^2\right)$

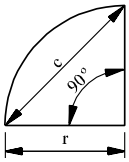
Area = $0.7854(D^2-d^2) = 0.7854(D-d)(D+d)$

Area = difference in areas between the inner and outer circles.

Example: R = 4; r = 2.

Area = $3.1416(4^2-2^2) = 37.6992$ Ans.

Quadrant

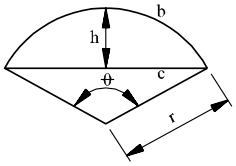


Area = $\frac{\pi r^2}{4} = 0.7854r^2 = 0.3927c^2$

Example. r = 3; c = chord.

Area = $0.7851 \times 3^2 = 7.0686$ Ans.

Segment



b = length of arc; θ = angle in degrees; c = chord = $\sqrt{4\left(2hr - h^2\right)}$

Area = $\frac{1}{2}\left[br - c\left(r - h\right)\right] = \pi r^2 \frac{\theta}{360} - \frac{c\left(r - h\right)}{2}$

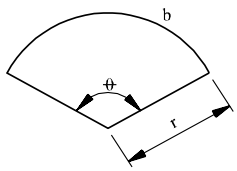
When θ is greater than 180° then $\frac{c}{2} \times$ difference between r and h is added to the fraction $\frac{\pi r^2 \theta}{360}$.

Example: r = 3; θ = 120°; h = 1.5

Area = $3.1416 \times 3^2 \times \frac{120}{360} - \frac{5.196\left(3 - 1.5\right)}{2} = 5.5278$ Ans.

AREAS OF PLANE FIGURES

Sector



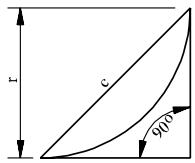
Area = $\frac{br}{2} = \pi r^2 \frac{\theta}{360°}$

θ = angle in degrees; b = length of arc

Example: r = 3; θ = 120°

Area = 3.1416 $\times 3^2 \times \frac{120}{360} = 9.4248$ Ans.

Spandrel



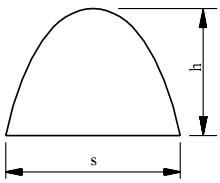
Area = $0.2146r^2 = 0.1073c^2$

Example: r = 3

Area = 0.2146 x 3^2 = 1.9314 Ans.

Parabola

l = length of curved line = periphery – s



$$l = \frac{s^2}{8h}\left[\sqrt{c(1+c)} + 2.0326 \times \log\left(\sqrt{c} + \sqrt{1+c}\right)\right] \text{ where } c = \left(\frac{4h}{s}\right)^2$$

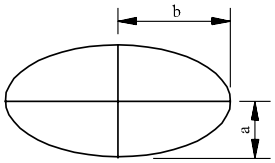
Area = $\frac{2}{3}sh$

Example: s = 3; h = 4

Area = $\frac{2}{3} \times 3 \times 4 = 8$ Ans.

Ellipse

Area = $\pi ab = 3.1416ab$



Circum. = $2\pi\sqrt{\frac{a^2 + b^2}{2}}$ (close approximation)

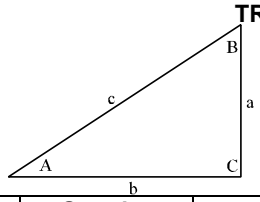
Example. a = 3; b = 4.

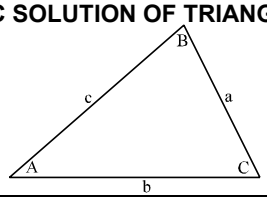
Area = 3.1416 x 3 x 4 = 37.6992 Ans.

Circum. = 2 x 3.1416 $\sqrt{\frac{(3)^2 + (4)^2}{2}} = 6.2832 \times 3.5355$ = 22.21 Ans.

[Page Intentionally Blank]

TRIGONOMETRIC SOLUTION OF TRIANGLES





$$S = \frac{a + b + c}{2}$$

Given:	Sought:	Formulae:
RIGHT-ANGLED TRIANGLES		
a,c	A,B,b	$\sin A = \frac{a}{c}$, $\cos B = \frac{a}{c}$, $b = \sqrt{c^2 - a^2}$
	Area	Area = $\frac{a}{2}\sqrt{c^2 - a^2}$
a,b	A,B,c	$\tan A = \frac{a}{b}$, $\tan B = \frac{b}{a}$, $c = \sqrt{a^2 + b^2}$
	Area	Area = $\frac{ab}{2}$
A,a	B,b,c	B = 90° - A, b = a cot A, $c = \frac{a}{\sin A}$
	Area	Area = $\frac{a^2 \cot A}{2}$
A,b	B,a,c	B = 90° - A, a = b tan A, $c = \frac{b}{\cos A}$
	Area	Area = $\frac{b^2 \tan A}{2}$
A,c	B,a,b	B = 90° - A, a = c sin A, b = c cos A
	Area	Area = $\frac{c^2 \sin A \cos A}{2}$ or $\frac{c^2 \sin 2A}{4}$
OBLIQUE-ANGLED TRIANGLES		
a,b,c	A	$\sin \frac{1}{2} A = \sqrt{\frac{(s-b)(s-c)}{bc}}$, $\cos \frac{1}{2} A = \sqrt{\frac{s(s-2)}{bc}}$, $\tan \frac{1}{2} A = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$
	B	$\sin \frac{1}{2} B = \sqrt{\frac{(s-a)(s-c)}{ac}}$, $\cos \frac{1}{2} B = \sqrt{\frac{s(s-b)}{ac}}$, $\tan \frac{1}{2} B = \sqrt{\frac{(s-a)(s-c)}{s(s-b)}}$
	C	$\sin \frac{1}{2} C = \sqrt{\frac{(s-a)(s-b)}{ab}}$, $\cos \frac{1}{2} C = \sqrt{\frac{s(s-c)}{ab}}$, $\tan \frac{1}{2} C = \sqrt{\frac{(s-a)(s-b)}{s(s-c)}}$
	Area	Area = $\sqrt{s(s-a)(s-b)(s-c)}$
a,A,B	b,c	$b = \frac{a \sin B}{\sin A}$ $c = \frac{a \sin C}{\sin A} = \frac{a \sin(A+B)}{\sin A}$
	Area	Area = $\frac{1}{2} a b \sin C = \frac{a^2 \sin B \sin C}{2 \sin A}$

TRIGONOMETRIC SOLUTION OF TRIANGLES

a,b,A	B	$\sin B = \frac{b \sin A}{a}$
	c	$c = \frac{a \sin C}{\sin A} = \frac{b \sin C}{\sin B} = \sqrt{a^2 + b^2 - 2ab\cos C}$
	Area	Area = $\frac{1}{2}$ ab sin C
a,b,C	A	$\tan A = \frac{a \sin C}{b - a\cos C}$, $\tan \frac{1}{2}(A - B) = \frac{a - b}{a + b} \cot \frac{1}{2} C$
	c	$c = \sqrt{a^2 \div b^2 - 2ab\cos C} = \frac{a \sin C}{\sin A}$
	Area	Area = $\frac{1}{2}$ ab sin C
$a^2 = b^2 + c^2 - 2bc \cos A$, $b^2 = a^2 + c^2 - 2ac \cos B$, $c^2 = a^2 + b^2 - 2ab \cos C$		

PROBABLE COMPRESSIVE STRENGTH OF CONCRETE CYLINDERS

$S^{28} = S^7 + 30\sqrt{S^7}$

where: S^{28} = approximate 28 day strength.

S^7 = known 7 day strength.

For approximating strengths at other ages from known strengths at various ages the following table may be used.

AGE (days)	PROBABLE COMPRESSIVE STRENGTH (pounds per square inch)								
100	1550	2250	2900	4150	4720	5400	5970	6560	
90	1500	2180	2830	3440	4050	4620	5280	5840	6430
80	1460	2110	2740	3350	3950	4510	5150	5710	6290
70	1390	2030	2640	3250	3830	4380	5000	5550	6110
60	1330	1940	2540	3120	3690	4220	4840	5370	5930
55	1290	1890	2470	3050	3610	4140	4750	5270	5820
50	1250	1840	2410	2970	3520	4050	4640	5170	5700
45	1200	1780	2330	2890	3420	3950	4520	5040	5570
40	1150	1700	2250	2790	3310	3830	4400	4910	5430
38	1130	1670	2220	2760	3280	3790	4350	4860	5380
36	1110	1640	2190	2720	3230	3740	4300	4800	5310
34	1080	1610	2140	2670	3180	3680	4220	4720	5240
32	1050	1580	2100	2620	3120	3620	4160	4650	5170
30	1030	1540	2050	2560	3060	3560	4090	4570	5090
28	1000	1500	2000	2500	3000	3500	4000	4500	5000
26	960	1450	1950	2450	2930	3410	3930	4400	4900
24	920	1400	1890	2380	2850	3340	3840	4300	4800
22	890	1350	1830	2310	2780	3250	3750	4200	4700
20	850	1300	1770	2240	2700	3160	3640	4100	4590
19	830	1270	1730	2200	2650	3110	3590	4040	4510
18	800	1240	1690	2150	2600	3050	3520	3980	4450
17	780	1200	1650	2100	2550	3000	3460	3910	4380
16	750	1170	1600	2050	2490	2940	3400	3830	4300
15	720	1130	1550	2000	2430	2870	3310	3770	4210
14	690	1090	1500	1950	2360	2800	3250	3690	4130
13	660	1050	1450	1890	2300	2740	3180	3600	4050
12	630	1000	1400	1820	2230	2660	3090	3500	3960
11	590	950	1350	1750	2150	2570	3000	3400	3850
10	550	900	1280	1680	2070	2490	2900	3300	3730
9	510	840	1200	1590	1980	2380	2780	3170	3600
8	460	780	1130	1500	1880	2280	2650	3050	3460
7	400	700	1040	1380	1750	2120	2500	2890	3280
6	340	600	920	1260	1610	1980	2340	2700	3100

CONVERSION TABLES

MULTIPLY	BY	TO OBTAIN
ACRES	43560	SQUARE FEET
BARRELS OF CEMENT	376	POUNDS OF CEMENT
BAGS OF CEMENT	94	POUNDS OF CEMENT (1 CU FT)
CUBIC FEET	7.48052	U.S. GALLONS
CUBIC FEET	1728	CUBIC INCHES
CUBIC FEET	62.4	POUNDS OF WATER
CUBIC INCHES	0.0005787	CUBIC FEET
CUBIC INCHES	0.004329	U.S. GALLONS
CUBIC YARDS	27	CUBIC FEET
CUBIC YARDS	46656	CUBIC INCHES
CUBIC YARDS	201.97	U.S. GALLONS
FATHOMS	6	FEET
FEET	0.3048	METERS
FEET PER SECOND	0.68182	MILES PER HOUR
METERS	3.281	FEET
METERS	39.37	INCHES
METERS	1.094	YARDS
MILES	5280	FEET
MILES PER HOUR	88	FEET PER MINUTE
MILES PER HOUR	1.46667	FEET PER SECOND
POUNDS OF WATER	0.01602	CUBIC FEET
POUNDS OF WATER	27.68	CUBIC INCHES
POUNDS OF WATER	0.12	U.S. GALLONS
SQUARE FEET	144	SQUARE INCHES
SQUARE MILES	640	ACRES
SQUARE YARDS	9	SQUARE FEET
SQUARE FEET	0.0002066	ACRES
TONS (SHORT)	2000	POUNDS
TONS (LONG)	2240	POUNDS

CONVERSION FACTORS
LENGTH MEASUREMENTS

UNITS	INCHES	FEET	YARDS	RODS	MILES	METERS
1 Inch	1	0.08333	0.027778	0.005051	0.0000157828	0.0254
1 Foot	12	1	0.3333	0.060606	0.00018939	0.304801
1 Yard	36	3	1	0.181818	0.000568182	0.914402
1 Rod	198	16.5	5.5	1	0.003125	5.029216
1 Mile (Stat)	63360	5280	1760	320	1	1609.347
1 Meter	39.37	3.280833	1.093611	0.198838	0.00062137	1
1 Link	7.92	0.66	0.22	0.04	0.000125	0.201168
1 Chain	792	66	22	4	0.0125	20.177
1 Station	1200	100	33.33	6.060606	0.0189394	30.4801
1 Furlong	7920	660	220	40	0.125	201.168
1 Mile (Naut)	72913	6076.103	2025.366	368.248	1.15078	1852
1 Millimeter	0.03937	0.003281	0.001094	0.000199	--	0.001
1 Centimeter	0.3937	0.032808	0.010936	0.001988	--	0.01
1 Kilometer	--	3280.833	1093.611	198.836	0.621370	1000

CONVERSION MEASUREMENTS
WEIGHT MEASUREMENTS

UNITS	OUNCES	POUNDS	TONS (SHORT)	TONS (LONG)	KILOGRAMS	TONS (METRIC)
1 OUNCE	1	0.0625	---	---	0.028349	---
1 POUND	16	1	0.0005	0.0004464	0.4535924	0.00045359
1 TON (SHORT)	32000	2000	1	0.892857	907.18486	0.907185
1 TON (LONG)	35840	2240	1.12	1	1016.047	1.016047
1 KILOGRAM	35.27396	2.204622	0.0011023	0.0009842	1	0.001
1 TON (METRIC)	35273.96	2204.62	1.10231	0.98421	1000	1
1 HNDRDWEIGHT (SHORT)	1600	100	0.05	0.044643	45.3592	0.045359
1 HNDRDWEIGHT (LONG)	1792	112	0.056	0.05	50.8023	0.050802
1 GRAIN	0.0022857	---	---	---	---	---
1 GRAM	0.0352739	0.002204	---	---	0.001	---
1 MILLIGRAM	---	---	---	---	0.000001	---

CONVERSION FACTORS
AREA MEASUREMENTS

UNITS	SQUARE INCHES	SQUARE FEET	SQUARE YARDS	SQUARE RODS	ACRES	SQUARE MILES	SQUARE METERS
1 SQUARE INCH	1	0.006944	0.0007716	---	---	---	0.00064516
1 SQUARE FOOT	144	1	0.11111	0.0036731	---	---	0.09290341
1 SQUARE YARD	1296	9	1	0.033058	0.0002066	---	0.8361307
1 SQUARE ROD	39204	272.25	30.25	1	0.00625	---	25.29295
1 ACRE	---	43560	4840	160	1	0.0015625	4046.873
1 SQUARE MILE	---	---	3097600	102400	640	1	2589998
1 SQUARE METER	1550	10.76387	1.195985	0.0395367	0.0002471	---	1
1 SQUARE LINK	62.7264	0.4356	0.0484	0.0016	0.00001	---	0.040468
1 SQUARE CHAIN	627264	4356	484	16	0.1	---	404.689
1 SQUARE	14400	100	11.1111	0.367309	0.0022956	---	9.29034
1 SECTION	---	---	3097600	102400	640	1	2589998
1 SQUARE CENTIMETER	0.1549997	0.0010764	0.0001196	---	---	---	0.0001
1 HECTARE	---	107638.7	11959.85	395.367	2.471044	0.003861	10000
1 SQUARE KILOMETER	---	---	1195985	39536.7	247.1044	0.3861006	1000000

CONVERSION FACTORS
VOLUME MEASUREMENTS

UNITS	CUBIC INCHES	CUBIC FEET	CUBIC YARDS	PINTS (LIQUID)	QUARTS (LIQUID)	GALLONS (U.S.)	LITERS (1000 cc)
1 CUBIC INCH	1	0.000579	0.0000214	0.034632	0.017316	0.004329	0.016387
1 CUBIC FOOT	1728	1	0.037037	59.844	29.922	7.4805	28.31625
1 CUBIC YARD	46656	27	1	1615.8	807.9	201.975	764.54
1 PINT (LIQUID)	28.875	0.016710	0.000619	1	0.5	0.125	0.473168
1 QUART (LIQUID)	57.75	0.033420	0.001238	2	1	0.25	0.946333
1 GALLON (U.S.)	231	0.1336805	0.004951	8	4	1	3.78533
1 LITER (1000 cc)	61.025	0.035316	0.001308	2.11336	1.056682	0.264178	1
1 GILL	7.21876	0.004177	0.000155	0.25	0.125	0.03125	0.118292
1 PINT (DRY)	33.6003	0.019445	0.000720	1.163647	0.581823	0.145456	0.550599
1 QUART (DRY)	67.200625	0.038889	0.001440	2.32730	1.163646	0.290912	1.10120
1 QUART (IMPERIAL)	69.35503	0.040135	0.001486	2.4019	1.200953	0.300238	1.13650
1 GALLON (IMPERIAL)	277.4201	0.16054	0.0059457	9.60762	4.80381	1.20095	4.54609
1 PECK	537.605	0.311114	0.011523	18.61835	9.309177	2.327294	8.809586
1 BUSHEL (U.S.)	2150.42	1.2444	0.046089	74.47341	37.23670	9.3092	35.238329
1 BOARD FOOT	144	0.08333	0.003086	4.987012	2.493506	0.623376	2.3597
1 CORD	221184	128	4.74074	7660.051	3830.025	957.506	3624.48
1 PERTROLEUM BARREL	9701.975	5.614569	0.207947	336	168	42	158.9839
1 BARREL (U.S. LIQUID)	7276.370	4.21086	0.15596	252	126	31.5	119.237895
1 CUBIC METER	61023.38	35.314445	1.307943	2113.4	1056.7	264.178	999.973
1 CUBIC CENTIMETER	0.061024	0.0000353	---	0.002113	0.001057	0.0002642	0.000999

EQUIVALENT WEIGHTS OF AGGREGATES

POUNDS PER CUBIC FOOT	POUNDS PER CUBIC YARD	TONS PER CUBIC YARD	CUBIC YARDS PER TON	POUNDS PER CUBIC FOOT	POUNDS PER CUBIC YARD	TONS PER CUBIC YARD	CUBIC YARDS PER TON
60	1620	0.81	1.23	94.4	2550	1.28	0.78
65	1755	0.88	1.14	96.3	2600	1.30	0.77
70	1890	0.95	1.06	98.1	2650	1.33	0.75
75	2025	1.01	0.99	100.0	2700	1.35	0.74
80	2160	1.08	0.93	101.9	2750	1.38	0.73
85	2295	1.15	0.87	103.7	2800	1.40	0.71
90	2430	1.22	0.82	105.6	2850	1.43	0.70
95	2565	1.28	0.78	107.4	2900	1.45	0.69
100	2700	1.35	0.74	109.3	2950	1.48	0.68
105	2835	1.42	0.71	111.1	3000	1.50	0.67
110	2970	1.49	0.67	113.0	3050	1.53	0.66
115	3105	1.55	0.64	114.8	3100	1.55	0.65
120	3240	1.62	0.62	116.7	3150	1.58	0.63
125	3375	1.69	0.59	118.5	3200	1.60	0.63
130	3510	1.76	0.57	120.4	3250	1.63	0.62
135	3645	1.82	0.55	122.2	3300	1.65	0.61
140	3780	1.89	0.53	124.1	3350	1.68	0.60
66.7	1800	0.90	1.11	125.9	3400	1.70	0.59
68.5	1850	0.93	1.08	127.8	3450	1.73	0.58
70.4	1900	0.95	1.05	129.6	3500	1.75	0.57
72.2	1950	0.97	1.03	131.5	3550	1.78	0.56
74.1	2000	1.00	1.00	133.3	3600	1.80	0.56
75.9	2050	1.03	0.98	135.2	3650	1.83	0.55
77.8	2100	1.05	0.85	137.0	3700	1.85	0.54
79.6	2150	1.08	0.93	138.0	3750	1.88	0.53
81.5	2200	1.10	0.91	140.7	3800	1.90	0.52
83.3	2250	1.13	0.89	142.6	3850	1.93	0.52
85.2	2300	1.15	0.87	144.4	3900	1.95	0.51
87.0	2350	1.18	0.85	146.3	3950	1.98	0.51
88.9	2400	1.20	0.83	148.1	4000	2.0	0.50
90.7	2450	1.23	0.82	150.0	4050	2.03	0.49
92.6	2500	1.25	0.80				

TEMPERATURE-VOLUME CORRECTIONS FOR EMULSIFIED ASPHALTS

Legend: t = observed temperature in degrees Celsius (Fahrenheit)
M = multiplier for correcting volumes to the basis of 15.6°C (60°F)

t °C	°F	M*	t °C	°F	M*	t °C	°F	M*
10.0	50	1.00250	35.0	95	.99125	57.8	136	.98100
10.6	51	1.00225	35.6	96	.99100	58.3	137	.98075
11.1	52	1.00200	36.1	97	.99075	58.9	138	.98050
11.7	53	1.00175	36.7	98	.99050	59.4	139	.98025
12.2	54	1.00150	37.2	99	.99025	60.0	140	.98000
12.8	55	1.00125	37.8	100	.99000	60.6	141	.97975
13.3	56	1.00100	38.3	101	.98975	61.1	142	.97950
13.9	57	1.00075	38.9	102	.98950	61.7	143	.97925
14.4	58	1.00050	39.4	103	.98925	62.2	144	.97900
15.0	59	1.00025	40.0	104	.98900	62.8	145	.97875
15.6	60	1.00000	40.6	105	.98875	63.3	146	.97850
16.1	61	.99975	41.1	106	.98850	63.9	147	.97825
16.7	62	.99950	41.7	107	.98825	64.4	148	.97800
17.2	63	.99925	42.2	108	.98800	65.0	149	.97775
17.8	64	.99900	42.8	109	.98775	65.6	150	.97750
18.3	65	.99875	43.3	110	.98750	66.1	151	.97725
18.9	66	.99850	43.9	111	.98725	66.7	152	.97700
19.4	67	.99825	44.4	112	.98700	67.2	153	.97675
20.0	68	.99800	45.0	113	.98675	67.8	154	.97650
20.6	69	.99775	45.6	114	.98650	68.3	155	.97625
21.1	70	.99750	46.1	115	.98625	68.9	156	.97600
21.7	71	.99725	46.7	116	.98600	69.4	157	.97575
22.2	72	.99700	47.2	117	.98575	70.0	158	.97550
22.8	73	.99675	47.8	118	.98550	70.6	159	.97525
23.3	74	.99650	48.3	119	.98525	71.1	160	.97500
23.9	75	.99625	48.9	120	.98500	71.7	161	.97475
24.4	76	.99600	49.4	121	.98475	72.2	162	.97450
25.0	77	.99575	50.0	122	.98450	72.8	163	.97425
25.6	78	.99550	50.6	123	.98425	73.3	164	.97400
26.1	79	.99525	51.1	124	.98400	73.9	165	.97375
26.7	80	.99500	51.7	125	.98375	74.4	166	.97350
27.2	81	.99475	52.2	126	.98350	75.0	167	.97325
27.8	82	.99450	52.8	127	.98325	75.6	168	.97300
28.3	83	.99425	53.3	128	.98300	76.1	169	.97275
28.9	84	.99400	53.9	129	.98275	76.7	170	.97250
29.4	85	.99375	54.4	130	.98250	77.2	171	.97225
30.0	86	.99350	55.0	131	.98225	77.8	172	.97200
30.6	87	.99325	55.6	132	.98200	78.3	173	.97175
31.1	88	.99300	56.1	133	.98175	78.9	174	.97150
31.7	89	.99275	56.7	134	.98150	79.4	175	.97125
32.2	90	.99250	57.2	135	.98125			
32.8	91	.99225						
33.3	92	.99200						
33.9	93	.99175						
34.4	94	.99150						

*Multiplier (M) for °C is a close approximation.