Table 6.1
Species combinations
(See Clause 6.2.1.2.)

Species combinations	Stamp identification	Species included in the combination
Douglas Fir-Larch	D Fir-L (N)	Douglas fir, western larch
Hem-Fir	Hem-Fir (N)	Pacific coast hemlock, amabilis fir
Spruce-Pine-Fir	S-P-F	Spruce (all species except coast Sitka spruce and Norway spruce), Jack pine, lodgepole pine, balsam fir, alpine fir
Northern Species	North Species	Any Canadian species graded in accordance with the NLGA rules

Notes:
1) *Names of species in this Table are standard commercial names. Additional information on botanical names and other common names is given in CSA O141.*
2) *The NLGA* Standard Grading Rules for Canadian Lumber *contains other species combinations not shown in this Table. If the species can be identified, however, it can be possible to group it in one of the species combinations for the purpose of assigning specified strengths.*

6.2.1.3 US lumber

For US commercial species combinations graded in accordance with the *National Grading Rule for Dimension Lumber*, the design data may be determined using the species combination equivalents in Table 6.2.

Table 6.2
Species combination equivalents
(See Clause 6.2.1.3.)

US combination	Equivalent Canadian combination
Douglas Fir-Larch	Douglas Fir-Larch
Hem-Fir	Hem-Fir

Note: *The NLGA* Standard Grading Rules for Canadian Lumber *incorporates the* National Grading Rule for Dimension Lumber*, a uniform set of grade descriptions and other requirements for softwood dimension lumber that form a required part of all softwood lumber grading rules in the United States. Thus, all dimension lumber throughout Canada and the United States is graded to uniform requirements.*

6.2.2 Lumber grades and categories

6.2.2.1 Visually stress-graded lumber

Grade categories, limiting dimensions, and structural grades for which design data are assigned in this Standard are listed in Table 6.3. These grades are specified in the NLGA *Standard Grading Rules for Canadian Lumber.*

Table 6.3
Visual grades and their dimensions
(See Clause 6.2.2.1.)

Grade category	Smaller dimension, mm	Larger dimension, mm	Grades
Light framing	38–89	38–89	Construction, Standard
Studs	38–89	38 or more	Stud
Structural light framing	38–89	38–89	Select structural No. 1, No. 2, No. 3
Structural joists and planks	38–89	114 or more	Select structural No. 1, No. 2, No. 3
Beams and stringers	114 or more	Exceeds smaller dimension by more than 51	Select structural No. 1, No. 2
Posts and timbers	114 or more	Exceeds smaller dimension by 51 or less	Select structural No. 1, No. 2
Plank decking*	38–89	140 or more	Select, Commercial

* *"Plank decking" is defined as "decking" under NLGA rules.*

6.2.2.2 Machine stress-rated (MSR) and machine evaluated lumber (MEL)

The design data specified in this Standard apply to lumber that is graded in accordance with NLGA SPS 2 and is identified by the grade stamp of a grading agency accredited for grading by mechanical means.

Note: *A list of accredited agencies can be obtained from the Canadian Lumber Standards Accreditation Board.*

6.2.3 Finger-joined and face-glued lumber

6.2.3.1 General

Except as limited in Clause 6.2.3.2, 6.2.3.3, or 6.2.3.4, the design data specified in this Standard apply to finger-joined and face-glued lumber that has been produced in accordance with NLGA SPS 1, SPS 3, SPS 4, SPS 5, or SPS 6.

Note: *Finger-joined and face-glued lumber is produced to specifications that permit the same specified strength and stiffness to be assigned as non-finger-joined and non-face-glued lumber of the same grade, species, and size.*

6.2.3.2 NLGA SPS 3 and SPS 5 "vertical stud use only" lumber

6.2.3.2.1 Applications

Finger-joined and face-glued lumber that has been produced in accordance with NLGA SPS 3 and SPS 5, respectively, shall be used only under the following conditions:

a) applications where the primary loading is in compression, with only short-duration stresses in bending or tension, such as due to wind or earthquake loads; and
b) applications where it is protected from wet-service conditions and not in an environment where the temperature can be expected to exceed 50 °C for an extended period.

6.2.3.2.2 Fire-rated wall assemblies

For SPS 3 and SPS 5 "vertical stud use only" lumber to be used in a fire-rated wall assembly, the grade stamp shall include the Heat Resistant Adhesive (HRA) designation.

6.2.3.3 NLGA SPS 4 "dry use only" lumber

Finger-joined lumber that has been produced in accordance with NLGA SPS 4 and designated "dry use only" shall be used only where protected from wet-service conditions.

6.2.3.4 NLGA SPS 6 structural face-glued lumber

For SPS 6 structural face-glued lumber to be used in a fire-rated assembly, the grade stamp shall include the HRA designation.

6.2.4 Remanufactured lumber

Dimension lumber and timbers that are resawn or otherwise remanufactured shall be regraded in accordance with Clause 6.2.1.

6.2.5 Mixed grades

When mixed grades are used, the specified strength shall be that of the grade having the lowest value.

6.3 Specified strengths and moduli of elasticity

6.3.1 Visually stress-graded lumber

6.3.1.1 General

The specified strengths and moduli of elasticity for visually stress-graded lumber are tabulated as follows:

a) structural joists and planks, structural light framing, and studs grade categories of lumber in Table 6.4;
b) light framing grades in Table 6.5;
c) beams and stringers grade categories of lumber in Table 6.6; and
d) posts and timbers grade categories of lumber in Table 6.7.

6.3.1.2 Plank decking

The specified strengths and moduli of elasticity for plank decking shall be derived from Table 6.4 using the following grade equivalents:

Decking grade	Equivalent lumber grade
Select	Select structural
Commercial	No. 2

6.3.2 Machine stress-rated and machine evaluated lumber

The specified strengths and moduli of elasticity for machine stress-rated lumber are given in Table 6.8. The specified strengths and moduli of elasticity for machine evaluated lumber are given in Table 6.9. Specified strengths in shear are not grade dependent and shall be taken from Table 6.4 for the appropriate species.

Table 6.4
Specified strengths and moduli of elasticity for structural joists and planks, structural light framing, and studs, MPa
(See Clauses 6.3.1.1, 6.3.1.2, 6.3.2, 6.5.3.1, 6.5.5.2.4, 6.5.5.2.5, 6.5.6.2, 6.5.8, 10.5.3–10.5.5, 10.6.3.1, 10.6.3.6, 12.4.4.4, 12.4.4.5, A.6.5.5.3.6, and A.5.4.2.2 and Tables 6.8, 6.9, and 8.2.)

				Compression			Modulus of elasticity	
Species combination	Grade	Bending, f_b	Longitudinal shear, f_v	Parallel to grain, f_c	Perpendicular to grain, f_{cp}	Tension parallel to grain, f_t	E	E_{05}
Douglas Fir-Larch	SS	16.5		19.0		10.6	12 500	8500
	No. 1/No. 2	10.0	1.9	14.0	7.0	5.8	11 000	7000
	No. 3/Stud	4.6		7.3		2.1	10 000	5500
Hem-Fir	SS	16.0		17.6		9.7	12 000	8500
	No. 1/No. 2	11.0	1.6	14.8	4.6	6.2	11 000	7500
	No. 3/Stud	7.0		9.2		3.2	10 000	6000
Spruce-Pine-Fir	SS	16.5		14.5		8.6	10 500	7500
	No. 1/No. 2	11.8	1.5	11.5	5.3	5.5	9500	6500
	No. 3/Stud	7.0		9.0		3.2	9000	5500
Northern Species	SS	10.6		13.0		6.2	7500	5500
	No. 1/No. 2	7.6	1.3	10.4	3.5	4.0	7000	5000
	No. 3/Stud	4.5		5.2		2.0	6500	4000

Note: *Tabulated values are based on the following standard conditions:*
a) *286 mm larger dimension;*
b) *dry-service conditions; and*
c) *standard-term duration of load.*

Table 6.5
Specified strengths and moduli of elasticity for light framing, MPa, applicable to sizes 38 × 38 mm to 89 × 89 mm
(See Clauses 6.3.1.1, 6.5.5.2.5, 10.5.3–10.5.5, 10.6.3.1, 10.6.3.6, 12.4.4.4, and 12.4.4.5.)

				Compression			Modulus of elasticity	
Species combination	Grade	Bending, f_b	Longitudinal shear, f_v	Parallel to grain, f_c	Perpendicular to grain, f_{cp}	Tension parallel to grain, f_t	E	E_{05}
Douglas Fir-Larch	Const.	13.0	3.2	16.0	7.0	6.6	10 000	5500
	Stand.	7.3		13.1		3.7	9000	5000
Hem-Fir	Const.	14.3	2.7	16.9	4.6	7.0	10 000	6000
	Stand.	8.0		13.9		3.9	9000	5500
Spruce-Pine-Fir	Const.	15.3	2.6	13.1	5.3	6.2	9000	5500
	Stand.	8.6		10.8		3.5	8000	5000
Northern Species	Const.	9.9	2.2	11.9	3.5	4.5	6500	4000
	Stand.	5.5		9.8		2.5	6000	3500

Notes:

1) *The size factor K_Z for light framing grades shall be 1.00, except that K_{Zc} shall be calculated in accordance with Clause 6.5.5.2.4 and K_{Zcp} shall be determined in accordance with Clause 6.5.6.4.*

2) *Tabulated values are based on the following standard conditions:*
   - a) *89 mm width (except for compression properties);*
   - b) *dry-service conditions; and*
   - c) *standard-term duration of load.*

Table 6.6
Specified strengths and moduli of elasticity for beams and stringers, MPa
(See Clauses 6.3.1.1, 6.5.2.2, 6.5.5.2.5, 10.5.3–10.5.5, 10.6.3.1, 10.6.3.6, 12.4.4.4, 12.4.4.5, and 14.3.)

				Compression			Modulus of elasticity	
Species combination	Grade	Bending, f_b*	Longitudinal shear, f_v	Parallel to grain, f_c	Perpendicular to grain, f_{cp}	Tension parallel to grain, f_t	E*	E_{05}*
Douglas Fir-Larch	SS	19.5	1.5	13.2	7.0	10.0	12 000	8000
	No. 1	15.8		11.0		7.0	12 000	8000
	No. 2	9.0		7.2		3.3	9500	6000
Hem-Fir	SS	16.8	1.2	13.0	4.6	7.4	11 500	8000
	No. 1	14.4		12.4		6.3	11 000	7500
	No. 2	14.4		12.4		6.3	11 000	7500
Spruce-Pine-Fir	SS	13.6	1.2	9.5	5.3	7.0	8500	6000
	No. 1	11.0		7.9		4.9	8500	6000
	No. 2	6.3		5.2		2.3	6500	4500
Northern Species	SS	12.8	1.0	7.2	3.5	6.5	8000	5500
	No. 1	10.8		6.0		4.6	8000	5500
	No. 2	5.9		3.9		2.2	6000	4000

** Specified strengths for beams and stringers are based on loads applied to the narrow face. When beams and stringers are subject to loads applied to the wide face, the specified strength for bending at the extreme fibre and the specified modulus of elasticity shall be multiplied by the following factors:*

	f_b	E or E_{05}
Select structural	*0.88*	*1.00*
No. 1 or No. 2	*0.77*	*0.90*

Notes:

1) *Beams and stringers have a smaller dimension of at least 114 mm, with a larger dimension more than 51 mm greater than the smaller dimension.*

(Continued)

Table 6.6 (Concluded)

2) *An approximate value for modulus of rigidity may be estimated at 0.065 times the modulus of elasticity.*
3) *With sawn members thicker than 89 mm that season slowly, care should be exercised to avoid overloading in compression before appreciable seasoning of the outer fibre has taken place; otherwise, compression strengths for wet-service conditions shall be used.*
4) *Tabulated values are based on the following standard conditions:*
   a) *343 mm larger dimension for bending and shear and 292 mm larger dimension for tension and compression parallel to grain;*
   b) *dry-service conditions; and*
   c) *standard-term duration of load.*
5) *The designer is strongly advised to check availability of species, grade, and sizes before specifying. See Clause A.6.2.1.2.*

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Table 6.7
Specified strengths and modulus of elasticity for posts and timbers grades, MPa
(See Clauses 6.3.1.1, 6.5.2.2, 6.5.5.2.5, 10.5.3–10.5.5, 10.6.3.1, 10.6.3.6, 12.4.4.4, and 12.4.4.5.)

				Compression			Modulus of elasticity	
Species combination	Grade	Bending, f_b	Longitudinal shear, f_v	Parallel to grain, f_c	Perpendicular to grain, f_{cp}	Tension parallel to grain, f_t	E	E_{05}
Douglas Fir-Larch	SS	18.3	1.5	13.8	7.0	10.7	12 000	8000
	No. 1	13.8		12.2		8.1	10 500	6500
	No. 2	6.0		7.5		3.8	9500	6000
Hem-Fir	SS	13.6	1.2	11.3	4.6	7.9	10 000	7000
	No. 1	10.2		10.0		6.0	9000	6000
	No. 2	4.5		6.1		2.8	8000	5500
Spruce-Pine-Fir	SS	12.7	1.2	9.9	5.3	7.4	8500	6000
	No. 1	9.6		8.7		5.6	7500	5000
	No. 2	4.2		5.4		2.6	6500	4500
Northern Species	SS	12.0	1.0	7.5	3.5	7.0	8000	5500
	No. 1	9.0		6.7		5.3	7000	5000
	No. 2	3.9		4.1		2.5	6000	4000

Notes:

1) *Posts and timbers have a smaller dimension of at least 114 mm, with a larger dimension not more than 51 mm greater than the smaller dimension.*
2) *Posts and timbers graded to beam and stringer rules may be assigned beam and stringer strength.*
3) *An approximate value for modulus of rigidity may be estimated at 0.065 times the modulus of elasticity.*
4) *With sawn members thicker than 89 mm that season slowly, care should be exercised to avoid overloading in compression before appreciable seasoning of the outer fibre has taken place; otherwise, compression strengths for wet-service conditions shall be used.*
5) *Tabulated values are based on the following standard conditions:*
   a) *343 mm larger dimension for bending and shear and 292 mm larger dimension for tension and compression parallel to grain;*
   b) *dry-service conditions; and*
   c) *standard-term duration of load.*
6) *The designer is strongly advised to check availability of species, grade, and sizes before specifying. See Clause A.6.2.1.2.*

Table 6.8
Specified strengths and modulus of elasticity for machine stress-rated lumber, 38 mm wide by all depths, MPa
(See Clauses 6.3.2, 10.5.3–10.5.5, 10.6.3.1, 10.6.3.6, and A.6.5.6 and Table 8.2.)

Grade	Bending, f_b	Modulus of elasticity, E	Tension parallel to grain, f_t 64–184 mm	Tension parallel to grain, f_t > 184 mm*	Compression Parallel to grain, f_c	Compression Perpendicular to grain, f_{cp}†
1200F_b -1.2E	17.4	8300	6.7	—	15.1	5.3
1350F_b -1.3E	19.5	9000	8.4	—	16.9	5.3
1450F_b -1.3E	21.0	9000	9.0	—	17.3	5.3
1500F_b -1.4E	21.7	9700	10.1	—	17.5	5.3
1650F_b -1.5E	23.9	10 300	11.4	—	18.1	5.3
1800F_b -1.6E	26.1	11 000	13.2	—	18.7	5.3
1950F_b -1.7E	28.2	11 700	15.4	—	19.3	5.3
2100F_b -1.8E	30.4	12 400	17.7	—	19.9	6.5
2250F_b -1.9E	32.6	13 100	19.6	—	20.5	6.5
2400F_b -2.0E	34.7	13 800	21.6	—	21.1	6.5
2550F_b -2.1E	36.9	14 500	23.0	—	21.7	6.5
2700F_b -2.2E	39.1	15 200	24.1	—	22.3	6.5
2850F_b -2.3E	41.3	15 900	25.8	—	22.9	6.5
3000F_b -2.4E	43.4	16 500	26.9	—	23.5	6.5
The following MSR grades provide a modulus of elasticity with higher corresponding strengths. For these MSR grades, qualification and daily quality control for tensile strength are required.						
1400F_b -1.2E	20.3	8300	9.0	9.0	17.1	5.3
1600F_b -1.4E	23.2	9700	10.7	10.7	17.9	5.3
1650F_b -1.3E	23.9	9000	11.4	11.4	18.1	5.3
1800F_b -1.5E	26.1	10 300	14.6	14.6	18.7	5.3

(Continued)