Filed July 31-1957

IND 52, 53, 55, 57

I Helen E. Gill, Secretary of the Industrial Commission of Wisconsin, and custodian of the official records of said commission, do hereby certify that on July 26, 1957 the Industrial Commission voted to make the following changes in the Wisconsin State Building Code.

Amend Ind 52.001 by adding subsection (2).

Revise Ind 52.10(1).

Repeal old Ind 52.10(4) and adopt new Ind 52.10(4).

Amend Ind 53.09(4)(b).

Repeal old Ind 53.20 and adopt new Ind 53.20.

Repeal old Ind 53.28(2) and adopt new Ind 53.28(2), and adopt new Ind 53.28(10).

Amend Ind 55.02(1)(a).

Repeal old Ind 55.29(2) and adopt new Ind 55.29(2).

Amend Ind 57.53 by adding subsection (2)(g).

The amendments and the new orders will become effective the first day of the month following their publication in the Wisconsin Administrative Code, namely September 1, 1957.

Dated at the City of Madison, Wisconsin
this 29th day of July, 1 9 5 7.

Helen E. Gill

Secretary, Industrial Commission of Wisconsin

PROPOSED AMENDMENTS

to the

WISCONSIN STATE BUILDING CODE

Ind 52.001 Design and Supervision. (1) Every new building containing more than 50,000 cubic feet total volume, or addition to a building which by reason of such addition results in a building containing over 50,000 cubic feet total volume, or structural alteration to a building containing over 50,000 cubic feet total volume shall be designed by an architect or engineer in accordance with the provisions of this code; and shall be constructed under the supervision of an architect or engineer who shall be responsible for its erection in accordance with the plans and specifications of the designer. No change from the original plans and specifications shall be made except with the knowledge and consent of the designer, and as provided in section Ind 50.10 of this code.

(2) On completion of the construction, the supervising architect or engineer shall file a written statement with the Industrial Commission certifying that, to the best of his knowledge and belief, the construction has been performed in accordance with the plans and specifications approved by the commission.

(3) No owner shall construct or alter any building, or portion of a building, or permit any building to be constructed or altered, except in accordance with the provisions of this section.

Note: By the term "architect" or "engineer" above is meant "registered architect" or "registered professional engineer", as defined in the Architects and Professional Engineers Registration Act, Section 101.31 of the Wisconsin Statutes.

Ind 52.10 Chimneys. ~~(1) The walls of all chimneys shall be built of brick~~

(1) The walls of all chimneys shall be built of brick or other approved fire resistive material, except that a metal smoke stack may be provided as specified in section Ind 52.11. No chimney shall rest upon a flooring of wood nor shall any wood be built into, or in contact with any chimney. Headers, beams, joists and studs shall not be less than

2 inches from the outside face of a chimney. The foundation of every chimney, flue, or stack, shall be designed and built in conformity with the requirements for foundations for buildings. In no case shall a chimney be corbeled out more than 8 inches from the wall and in every case the corbeling shall consist of at least 5 courses of brick. Chimneys shall extend at least 3 feet above flat roofs and not less than 2 feet above the ridge of gable and hip roofs, and lime-cement or cement mortar shall be used in the laying of chimney masonry above the roof line.

(2) Every masonry chimney shall have walls at least 8 inches in solid thickness, except that in a chimney with a flue not larger than 260 square inches where a fire clay or other suitable refractory clay flue lining is used for the full height of the chimney the walls shall not be less than 4 inches in solid thickness. No smoke flue shall have a cross sectional area less than 64 square inches, except that flue linings 7 inches by 7 inches inside, or 8 inches in diameter inside, may be used.

(3) All flue linings shall be adapted to withstand reasonably high temperatures and flue gases and shall have a softening point not lower than 2,000° Fahrenheit. Flue linings shall be not less than 5/8 inch in thickness and shall be built in as the outer walls of the chimney are constructed. Flue linings shall start from a point not less than 8 inches below the bottom of the smokepipe intakes and shall be continuous to a point not less than 4 inches above the enclosing walls. Flue linings for gas or fuel oil apparatus shall be of salt glazed fire clay equipped with bell and spigot joints, or of other approved material.

(4) Flue Connections. Where there is more than one smokepipe connected to a flue, the connections shall be at different levels. Two or more heating units or appliances may be connected to a common smokepipe or breeching if joined by Y fittings as close as practicable to the flue. In all such cases, the size of the breeching and the flue shall be sufficient to accommodate the total volume of flue gases.

(a) Cleanout Opening. Every chimney shall be provided with a cleanout opening at the base. Such openings shall be equipped with metal doors and frames arranged to remain closed when not in use.

(5) Every chimney shall be designed to withstand the following wind pressure in pounds per square foot over the diametrical area:

Square Chimneys	30
Polygonal Chimneys	25
Round Chimneys	20

IND 53.09 Bearing Masonry Walls, Bearing Partitions and Piers.

(1) General Requirements. All masonry units used in the constuction of bearing walls, bearing partitions and piers shall conform in all respects to the requirements for bearing units.

(2) The unit stresses in bearing masonry walls, partitions and piers shall not exceed those specified in sections Ind 53.04 and Ind 53.07.

(3) Cement mortar shall be used for all masonry which will have one or more faces in contact with soil. Lime-cement mortar or cement mortar shall be used for all masonry in isolated piers, parapet walls, chimneys where exposed to the weather, and for all hollow masonry units. All other masonry may be laid in cement mortar, lime-cement mortar or lime mortar.

(4) Masonry Bond. In brick masonry, or in combination brick and other masonry units, the bonding of each tier of units to that adjoining shall be secured by means of a full header course of brick every sixth course of brick, or equivalent. The use of metal ties for bonding masonry is not approved.

(a) By equivalent, is meant that one-sixth of the volume of a wall shall be header, or bond, units.

(b) Where masonry units are larger or smaller than brick, the bond courses shall be placed at intervals not exceeding 16 inches.

(5) Use of Hollow Clay Tile and Hollow Concrete Masonry Units. Approved clay tile and concrete masonry units may be used in bearing and exterior walls of buildings not more than 3 stories, or 45 feet in height, or in panel walls in buildings of any height. In determining this height, the basement or foundation wall shall be considered a story if constructed of clay tile or concrete masonry units.

(6) Concentrated loads shall be transmitted to hollow clay tile or hollow concrete block masonry by at least 3 courses of brick or equivalent concrete or by a metal plate of sufficient thickness and size to distribute the load to the webs and shells in such a manner as not to exceed the unit stress.

(7) Where hollow clay tile or hollow concrete masonry units are used in party walls, there shall be not less than 2 such units, each 8 inches in thickness as a minimum, used in making up the thickness of the wall unless solid masonry is used for building all chases, recesses, framing of all openings, and for the support, anchorage, and protection of all joists and beams carried into such wall.

(8) Clay tile and concrete masonry units used in bearing walls shall be well bedded in mortar. The net bearing area of all clay tile and concrete masonry units as laid in the wall shall be such that the allowable unit stress in the mortar is not exceeded.

(9) All clay tile laid with cells vertical shall be laid in Portland cement mortar. All clay tile laid with cells horizontal and all cement

thick in the upper 3 stories, increasing 4 inches in thickness for each 3 stories, or fraction, below. No such 3 story height shall exceed 40 feet.

(11) A building not more than 3 stories in height may have 8 inch bearing walls in the upper story, provided such story is not more than 10 feet high in the clear, and the span is not more than 20 feet, and the wall is not more than 30 feet long between cross walls, offsets or pilasters.

(12) A building not more than one story in height may have 8 inch bearing walls, provided the clearstory height is not more than 12 feet, the roof span is not more than 25 feet, and the distance between cross walls, offsets or pilasters is not more than 20 feet.

(a) A building not more than one story in height may have 6-inch bearing walls provided the clearstory height is not more than 9 feet, the roof span is not more than 18 feet and the distance between cross walls, offsets, or pilasters is not more than 15 feet. All other 1-story buildings shall have all bearing walls not less than 12 inches thick.

(13) All bearing masonry walls shall have substantial lateral support at right angles to the wall face at intervals, measured either vertically or horizontally, not exceeding 18 times the wall thickness. Such lateral support shall be obtained by masonry cross walls, piers or buttresses when the limiting distance is measured horizontally, or by floors or roof when the limiting distance is measured vertically.

(14) Masonry walls which are in contact with the soil in any story shall be increased 4 inches in thickness in that story, except that for places of abode as specified in section Ind 57.00, not over 2 stories in height, 12 inch walls will be accepted if substantial lateral supports consisting of masonry walls, offsets or pilasters are provided at intervals not to exceed 20 feet.

(15) Rubble and rough cut stone walls shall be 4 inches thicker than required for walls of artificially formed units or of ashlar masonry.

(16) Stone and similar solid facing not less than 4 inches thick may be considered as part of the required thickness of a wall if bonded to the backing as required for brickwork. No such wall shall be less than 12 inches thick.

(17) Piers. In all buildings, the section of masonry supporting trusses or girders shall be considered as isolated piers, the least dimension of which, in inches, shall be not less than one-thirtieth of the span of the truss, or girder, in inches, and the height shall not exceed 12 times the minimum horizontal dimension.

(a) The height of masonry piers which are not built into, and as a part of bearing walls, shall be not more than 10 times the minimum horizontal dimension.

(18) Chases, Recesses and Openings. There shall be no chases in 8 inch walls or in any pier. No chase in any wall shall be deeper than 1/3 the wall thickness. No horizontal chase shall exceed 4 feet in length nor shall the horizontal projection of any diagonal chase exceed 4 feet. No vertical chase shall be closer than 2 feet to any pilaster, cross wall, end wall or other stiffener.

(a) The aggregate area of recesses and chases in the wall of any one story shall not exceed 1/4 the whole area of the face of the wall in that story. No chases or recesses shall be permitted in any wall which will reduce

the fire-resistance of such wall below the minimum required by this code.

(b) The maximum percentage of openings in the horizontal cross section of any wall shall not exceed 50 per cent, unless the wall is increased 4 inches in thickness, or such portions of the wall between openings shall be as required for piers for the entire wall height.

Ind 53.20 Plain and Reinforced Concrete Walls and Piers. (1) Definitions. Plain concrete walls shall be defined as concrete walls where the area of the horizontal reinforcement is less than 0.0025 and the area of the vertical reinforcement is less than 0.0015 times the cross sectional area of the wall where bars are used and not less than 3/4 this amount where welded wire fabric of not less than No. 10 A. S. & W. gauge is used.

(2) Thickness. The thickness of reinforced concrete bearing walls shall not be less than 6 inches for the upper 15 feet of their height, and for each successive 25 feet downward, the minimum thickness shall be increased 1 inch.

(a) Reinforced concrete bearing walls shall have a thickness of not less than 1/25 of the unsupported height or width, whichever is the shorter.

(b) Exterior basement walls, foundation walls, and party walls of either plain or reinforced concrete shall be not less than 8 inches thick.

(c) The limit of thickness and quantity of reinforcement may be waived when structural analysis shows adequate strength and stability, if approved by the Industrial Commission.

(3) Working Stresses. The allowable working stresses in reinforced concrete bearing walls with minimum reinforcement specified above shall be 0.25 f'_c for walls having a ratio of height to thickness of 10 or less and shall be reduced proportionally to 0.15 f'_c for walls having a ratio of height to thickness of 25. When the reinforcement in bearing walls is designed, placed, and anchored in position as for tied columns, the allowable working stresses for tied columns may be used. The length of wall to be considered effective for each concentrated load shall not exceed the width of the bearing plus 4 times the wall thickness,

nor shall it exceed the center to center distance between loads. The ratio p'_g shall not exceed 0.04.

(4) Non-Bearing Walls. Non-bearing panel and enclosure walls of reinforced concrete shall have a thickness of not less than 4 inches and not less than 1/30 the distance between supporting or enclosing members.

Ind 53.28 Wood Construction (1) Quality of Material. The quality and design of all wood used in the construction of all buildings and structures or parts thereof, shall conform to the minimum standards under this section.

(a) All members shall be so framed, anchored, tied and braced together as to develop the maximum strength and rigidity necessary for the purpose for which they are used. No member shall be stressed in excess of the strength of its details and connections.

(b) All wood structural members shall be of sufficient quality, size and strength, as to carry their imposed loads safely and without exceeding the allowable working stresses as specified in this order.

(c) The requirements stated are a minimum standard and apply primarily to conventional types of construction.

(d) The substitution of materials other than those called for in the code will be permitted when shown by an approved authority to be equal to or better than those specified.

(e) Workmanship in fabrication, preparation, installation, joining of wood members and the connectors and mechanical devices for the fastening thereof, shall conform throughout to good engineering practice.

(f) Where wood is used in parts of a building or structure habitually exposed to moisture, ample ventilation or sufficient preservative treatment, or both, shall be provided.

(2) Allowable Working Stresses. In the design of wood structural members and the construction of structures of wood, the following unit stresses in pounds per square inch shall not be exceeded.

(a) Stresses that exceed those given in the following table for the lowest grade of any species shall be used only when the higher grade of that species is identified by the grade mark or a certificate of inspection issued by a recognized lumber grading or inspection agency.

ALLOWABLE WORKING STRESSES FOR WOOD

Species	Commercial Grade		Rules Under Which Graded	Allowable Unit Stresses in Pounds Per Square Inch				Modulus of Elasticity
				Tension and Extreme Fiber in Bending	Maximum Horizontal Shear	Compression Perpendicular to Grain	Compression Parallel to Grain	
ASH, WHITE	2150# f Grade	J & P	National Hardwood Lumber Association	1,950	130		1,550	
	1900# f Grade	J & P-						
		B & S		1,700	130		1,400	
	1700# f Grade	J & P-						
		B & S		1,550	130		1,200	1,500,000
	1450# f Grade	J & P-						
		B & S		1,300	110		1,050	
	1300# f Grade	B & S		1,150	110	550	950	
BEECH	2150# f Grade	J & P	"	1,950	130		1,575	
	1900# f Grade	J & P-						
		B & S	"	1,700	130	550	1,375	1,600,000
	1700# f Grade	J & P-						
		B & S	"	1,550	130		1,225	
	1450# f Grade	J & P-						
		B & S	"	1,300	110		1,050	
BIRCH	2150# f Grade	J & P	"	1,950	130		1,575	
	1900# f Grade	J & P-						
		B & S	"	1,700	130		1,375	
	1700# f Grade	J & P-						
		B & S	"	1,550	130	550	1,225	1,600,000
	1450# f Grade	J & P-						
		B & S	"	1,300	110		1,050	
CHESTNUT	1450# f Grade	J & P	"	1,300	110		1,075	
	1200# f Grade	J & P-						
		B & S	"	1,100	110	325	850	1,000,000
	1075# c Grade	P & T	"				975	
CYPRESS, SOUTHERN	1700# f Grade	J & P-						
		B & S	"	1,550	130		1,275	
	1300# f Grade	J & P-						
		B & S	"	1,150	110	325	1,025	
	1450# c Grade	P & T	"				1,300	1,200,000
	1200# c Grade	P & T	"				1,075	

ALLOWABLE WORKING STRESSES FOR WOOD (continued)

Species	Commercial Grade		Rules Under Which Graded	Allowable Unit Stresses in Pounds Per Square Inch				Modulus of Elasticity
				Tension and Extreme Fiber in Bending	Maximum Horizontal Shear	Compression Perpendicular to Grain	Compression Parallel to Grain	
DOUGLAS FIR -- COAST REGION	Dense Select Structural	L.F.	West Coast Lumber Inspection Bureau	1,950	120	410	1,400	
	Select Structural 1500 f	L.F.		1,700	120	375	1,300	
	Industrial 1200 f	L.F.		1,350	120	350	1,100	
	Industrial	L.F.		1,100	95	350	900	
	Dense Select Structural	J.&P.		1,950	120	410	1,500	
	Select Structural	J.&P.		1,700	120	375	1,400	
	Dense Construction	J.&P.		1,600	120	410	1,300	1,600,000
	Construction	J.&P.		1,350	120	350	1,100	
	Standard	J.&P.		1,100	95	350	900	
	Dense Select Structural	B.&S.		1,950	120	410	1,400	
	Select Structural	B.&S.		1,700	120	375	1,300	
	Dense Construction	B.&S.		1,600	120	410	1,100	
	Construction	B.&S.		1,350	120	350	900	
	Dense Select Structural	P.&T.		1,950	120	410	1,500	
	Select Structural	P.&T.		1,700	120	375	1,400	
	Dense Const.	P.&T.		1,350	120	410	1,300	
	Construction	P.&T.		1,100	120	350	1,100	

ALLOWABLE WORKING STRESSES FOR WOOD (continued)

Species	Commercial Grade		Rules Under Which Graded	Allowable Unit Stresses in Pounds Per Square Inch				Modulus of Elasticity
				Tension and Extreme Fiber in Bending	Maximum Horizontal Shear	Compression Perpendicular to Grain	Compression Parallel to Grain	
DOUGLAS FIR — INLAND REGION	Select Structural	J&P	Western Pine Association	1,950	130	410	1,575	1,600,000
	Structural	J&P		1,700	90	360	1,250	1,500,000
	Common Structural	J&P		1,300	85	340	1,125	1,500,000
	Select Structural	P&T		-----	-	410	1,575	1,600,000
	Structural	P&T		-----	-	360	1,250	1,500,000
	Common Structural	P&T		-----	-	340	1,125	1,500,000
ELM, ROCK	2150# f Grade	J&P	National Hardwood Lumber Association	1,950	130	----	1,575	
	1900# f Grade	J&P-B&S		1,700	130	----	1,375	
	1700# f Grade	J&P-B&S		1,550	130	550	1,225	1,300,000
	1450# f Grade	J&P-B&S		1,300	110	----	1,025	
	1550# c Grade	P&T		-----	----	----	1,400	
	1450# c Grade	P&T		-----	----	----	1,300	
	1200# c Grade	P&T		-----	----	----	1,075	
GUM, BLACK & RED	1700# f Grade	J&P	"	1,550	110	-----	1,100	
	1450# f Grade	J&P-B&S		1,300	110	325	950	1,200,000
	1200# f Grade	J&P-B&S		1,100	110	----	800	
	1075# c Grade	P&T		------	----	----	975	

ALLOWABLE WORKING STRESSES FOR WOOD (continued)

Species	Commercial Grade		Rules Under Which Graded	Allowable Unit Stresses in Pounds Per Square Inch: Tension and Extreme Fiber in Bending	Maximum Horizontal Shear	Compression Perpendicular to Grain	Compression Parallel to Grain	Modulus of Elasticity
HEMLOCK, EASTERN	Select Structural	J&P-B&S	Northern Hemlock & Hardwood Manufacturers Assn.	1,200	75	-----	775	
	Prime Structural	J&P		1,100	55	325	700	1,100,000
	Common Structural	J&P		1,000	55	----	600	
	Utility Structural	J&P		850	55	----	550	
	Select Structural	P&T		----	--	----	775	
HEMLOCK, WEST COAST	1600# f Select Structural	J&P	West Coast Bureau of Lumber Grades & Inspection	1,450	90	325	1,000	
	1450# f No.1	J&P-B&S		1,300	90	325	975	1,400,000
	1100# f No.2	J&P		1,000	80	325	775	
	No.1 Hemlock Timbers	P&T		----	--	----	1,000	
HICKORY	2150# f Grade	J&P-B&S	National Hardwood Lumber Assn.	1,950	130	----	1,550	
	1900# f Grade	J&P-B&S		1,700	130	650	1,400	
	1700# f Grade	J&P-B&S		1,550	130	----	1,225	1,800,000
	1550# c Grade	P&T		-----	----	----	1,400	
	1450# c Grade	P&T		-----	----	----	1,300	
	1325# c Grade	P&T		-----	----	----	1,200	

ALLOWABLE WORKING STRESSES FOR WOOD (Continued)

Species	Commercial Grade		Rules Under Which Graded	Allowable Unit Stresses in Pounds Per Square Inch: Tension and Extreme Fiber in Bending	Maximum Horizontal Shear	Compression Perpendicular to Grain	Compression Parallel To Grain	Modulus of Elasticity
LARCH	Select Structural	J&P	Western Pine Association	1,950	130	410	1,575	
	Structural	J&P		1,700	110	375	1,300	
	Common Structural	J&P		1,300	110	350	1,200	
	Select Structural	P&T		-----	---	410	1,575	1,300,000
	Structural	P&T		-----	---	375	1,300	
	Common Structural	P&T		-----	---	350	1,200	
MAPLE, HARD	2150# f Grade	J&P	National Hardwood Lumber Association	1,950	130	---	1,575	
	1900# f Grade	J&P-B&S		1,700	130	---	1,375	
	1700# f Grade	J&P-B&S		1,550	130	550	1,225	
	1450# f Grade	J&P-B&S		1,300	110	---	1,025	
	1550# c Grade	P&T		-----	---	---	1,400	1,600,000
	1450# c Grade	P&T		-----	---	---	1,300	
	1200# c Grade	P&T		-----	---	---	1,075	
OAK, RED & WHITE	2150# f Grade	J&P	National Hardwood Lumber Association	1,950	130	---	1,400	
	1900# f Grade	J&P-B&S		1,700	130	550	1,250	
	1700# f Grade	J&P-B&S		1,550	130	---	1,075	
	1450# f Grade	J&P-B&S		1,300	110	---	950	1,500,000
	1300# f Grade	B&S		1,150	110	---	850	
	1325# c Grade	P&T		-----	---	---	1,200	
	1200# c Grade	P&T		-----	---	---	1,075	
	1075# c Grade	P&T		-----	---	---	975	
PINE, NORWAY	Prime Structural	J&P	Northern Hemlock & Hardwood Manufacturers Assn.	1,100	65	---	800	
	Common Structural	J&P		1,000	65	325	700	1,200,000
	Utility Structural	J&P		850	65	---	575	

ALLOWABLE WORKING STRESSES FOR WOOD (Continued)

Species	Commercial Grade		Rules Under Which Graded	Allowable Unit Stresses in Pounds Per Square Inch: Tension and Extreme Fiber in Bending	Maximum Horizontal Shear	Compression Perpendicular to Grain	Compression Parallel to Grain	Modulus of Elasticity
PINE, SOUTHERN	Dense Structural 86 KD	2" thick only	Southern Pine Inspection Bureau	2,700	150	410	2,000	
	Dense Structural 72 KD	"		2,250	135	410	1,800	
	Dense Structural 65 KD	"		2,000	120	410	1,600	
	Dense Structural 58 KD	"		1,850	110	410	1,500	
	No. 1 Dense KD	"		1,850	120	410	1,600	
	No. 1 KD	"		1,600	120	350	1,350	
	No. 2 Dense KD	"		1,600	110	410	1,200	
	No. 2 KD	"		1,350	110	350	1,000	
	Dense Structural 86	"		2,600	135	410	2,000	1,760,000
	Dense Structural 72	"		2,100	120	410	1,600	
	Dense Structural 65	"		1,800	110	410	1,450	
	Dense Structural 58	"		1,600	95	410	1,300	
	No. 1 Dense	"		1,600	110	410	1,400	
	No. 1	"		1,350	110	350	1,200	
	No. 2 Dense	"		1,250	95	410	900	
	No. 2	"		1,100	95	350	800	
	Dense Structural 86	3" & 4" thick		2,600	135	410	2,000	
	Dense Structural 72	"		2,100	120	410	1,600	
	Dense Structural 65	"		1,800	110	410	1,450	
	Dense Structural 58	"		1,600	95	410	1,300	

ALLOWABLE WORKING STRESSES FOR WOOD (Continued)

Species	Commercial Grade		Rules Under which Graded	Allowable Unit Stresses in Pounds Per Square Inch: Tension and Extreme Fiber in Bending	Maximum Horizontal Shear	Compression Perpendicular to Grain	Compression Parallel to Grain	Modulus of Elasticity
PINE, SOUTHERN	No.1 Dense SR	3" & 4" thick	Southern Pine Inspection Bureau	1,600	110	410	1,600	
	No. 1 SR	"		1,350	110	350	1,350	
	No. 2 Dense SR	"		1,250	95	410	900	
	No.2 SR	"		1,100	95	350	800	
	Dense Structural 86	5" thick & up		2,150	135	410	1,600	1,760,000
	Dense Structural 72	"		1,800	120	410	1,400	
	Dense Structural 65	"		1,600	110	410	1,250	
	Dense Structural 58	"		1,450	95	410	1,200	
	No.1 Dense SR	"		1,450	110	410	1,350	
	No.1 SR	"		1,250	110	350	1,200	
	No.2 Dense SR	"		1,250	95	410	900	
	No.2 SR	"		1,100	95	350	800	
	Industrial 86 KD	1", 1¼" & 1½" thick		2,350	150	350	1,750	
	Industrial 72 KD	"		2,000	135	350	1,500	
	Industrial 65 KD	"		1,800	120	350	1,400	
	Industrial 58 KD	"		1,600	110	350	1,250	

ALLOWABLE WORKING STRESSES FOR WOOD (continued)

Species	Commercial Grade		Rules Under Which Graded	Allowable Unit Stresses in Pounds Per Square Inch: Tension and Extreme Fiber in Bending	Maximum Horizontal Shear	Compression Perpendicular to Grain	Compression Parallel to Grain	Modulus of Elasticity
PINE, SOUTHERN	Industrial 50 KD	1", 1¼" & 1½" thick	Southern Pine Inspection Bureau	1,350	110	350	1,000	
	Industrial 86	"		2,250	135	350	1,700	
	Industrial 72	"		1,800	120	350	1,400	
	Industrial 65	"		1,600	110	350	1,200	1,760,000
	Industrial 58	"		1,350	95	350	1,100	
	Industrial 50	"		1,100	95	350	800	
RED CEDAR, WESTERN	Structural		West Coast Lumbermen's Assn. 1-1-41	1,000	100	200	800	1,000,000
REDWOOD	Dense Structural	J&P-B&S	California Redwood Association	1,550	100	290	1,300	
	Heart Structural	J&P-B&S		1,150	85	---	1,000	1,200,000
	Dense Structural	P&T		------	---	---	1,300	
	Heart Structural	P&T		------	---	---	1,000	
SPRUCE, EASTERN	1450# f Structural	J&P	Northeastern Lumber Mfgrs. Association	1,300	100	---	950	
	1300# f Structural	J&P		1,150	85	270	875	1,200,000
	1200# f Structural	J&P		1,050	85	---	800	

ABBREVIATIONS: J&P - Joist and Plank
B&S - Beams and Stringers
F&T - Posts and Timbers
SE&S - Square Edge and Sound
KD - Kiln Dried
SR - Stress Rated
LF - Light Framing

(3) Exterior Walls. Walls shall be designed to carry safely not less than the designated wind load (see chapter on Working Stresses) acting inwardly or outwardly combined with the dead load and one-half the full live load, or dead and full live load, whichever is the greater.

(a) Anchorage shall be provided to resist safely the vertical lifting forces (see note) and to prevent any sliding or overturning. This shall include not only anchorage to the foundation, but also anchorage of the roof to the walls. Proper tying of the walls at the corners shall be required.

Note. As a specific basis for design of roofs and anchorage, a suction or vertical lifting force of 20 pounds per square foot shall be used, assuming two-thirds of the dead load is acting to resist the vertical force.

(b) Ledger or ribbon boards used to support joists shall be not less than 1 by 4 inches nominal, shall be recessed into the studs, and securely nailed with not less than two ten penny nails to each stud. The ends of joists adjoining studs shall be securely spiked to the studs.

(c) In bearing walls and partitions no stud shall be cut more than one-third its depth to receive piping and duct work. If more depth is required, the partition studs shall be increased accordingly.

(4) Interior Partitions. Walls shall be designed to carry safely the full dead and live loads.

(a) In stud construction the bearing partitions shall be provided at the top with double plates, each at least 2 inches (nominal) thick and of same width as the stud. When the joists are placed directly above each stud, a single top plate may be used. If properly fire stopped, studs may run through the floor and rest on girders or on partition plates.

(b) Partitions not resting upon girders, or of which the studs do not rest on partition plates below, shall have sole plates of dimensions not less than that of the studs.

(c) Partitions unsupported by walls shall be supported on girders or two or more joists, or on sole plates if placed at an angle to the joists.

(d) Non-bearing partitions of stud construction shall be provided with at least one 2 inch plate on top and bottom of same width as stud or be otherwise properly fire stopped at floor lines.

(e) Angles at corners where stud walls or partitions meet shall be framed solid so no lath can extend from one room to another.

(f) Openings in stud partitions and walls shall be framed around with double studs at each side and double headers across the top resting on the short stud at each end. The double header shall be placed on edge and shall be trussed above for all openings over 4 feet in width, or where more than 2 studs are cut away.

(g) Wood lath, furring or framing shall be placed not less than 2 inches from any chimney and not less than 4 inches from the back of any fireplace.

(5) Floors Supported on Wooden Framework. When enclosing walls are of wood, each joist, beam, and girder in the wall shall be securely spiked or anchored to the wall construction so as to stay in place and to resist safely all lifts and inward and outward pressures as prescribed in this code.

(a) Girders shall be anchored to the walls and fastened to each other where they intersect or abut to resist safely an outward force equal to the wind pressure.

(b) Floor joists framing into the side of wood girders shall be supported on metal joist hangers or on a bearing strip or ledger board on the side of the girders. Size of ledger shall be at least 2 by 3 inches. The notch in the end of the joist shall be not more than one-fourth of the joist depth.

(c) The ends of joists, whether resting upon girders or bearing partitions or abutted against the girders, shall be securely tied to the girders or to each other so as to resist safely an outward thrust on the walls equal to the required wind pressure, or spreading action on the roof, whichever is the greater.

(d) The top or bottom edges of joists may be notched in the outer one-fourth of the length not to exceed one-sixth of the joist depth. Notching the

top or bottom edge of joists will not be permitted in the middle half of the length of any joist.

(e) Header joists over 6 feet long, and tail joists over 12 feet long, shall be hung in approved stirrup irons or joist hangers.

(f) Joists under bearing partitions and running parallel thereto shall be multiple, well spiked, or separated by solid bridging not more than 16 inches on centers to permit the passage of pipes.

(g) Wood cross bridging shall be placed between joists if the span is over 8 feet. The distance between lines of bridging or between bridging and bearing shall not exceed 8 feet. Wood cross bridging properly fitted and securely nailed to joists shall be not less than 3 square inches in cross sectional area.

(h) Metal cross bridging of equal or greater strength may be used in place of the wood cross bridging.

(i) Solid bridging extending the full height of the joist shall be placed between floor joists which cross bearing partitions. Solid bridging shall be placed between joists at the edge of flooring where the attic space is only partially covered.

(6) Fire Stopping. Fire stops shall be provided at all intersections of interior and exterior walls with floors, ceilings and roof in such manner as to effectively cut off communication by fire through hollow concealed spaces and prevent both vertical and horizontal drafts.

(a) Furred walls shall have fire stopping placed immediately above and below the junction of any floor construction with the walls, or shall be fire stopped the full depth of the joist.

(b) All spaces between chimneys and wood framing shall be solidly filled with incombustible material at floor levels.

(c) All fire stopping as required in this section shall be not less than 2 inches in thickness and not less in width than the enclosed space within the partition except as provided for chimneys.

(7) Floors Supported on Masonry Walls. Every girder and beam which enters, or rests on, a masonry wall shall have a bearing of at least 4 inches thereon.

(a) Wood members entering masonry party or fire walls shall be separated from the opposite side of the wall and from beams entering the opposite side of the wall by 4 inches of masonry. The ends of the joists, beams and girders shall be splayed or fire-cut to a bevel of not less than 3 inches in their depth.

(b) Where girders and beams enter masonry they shall be provided with wall plates, boxes or anchors of an approved self-releasing type so arranged as to leave an air space of not less than 1/2 inch at sides and ends of member. The ends of girders shall not be sealed in; provided, that where ends of timbers are pressure treated with creosote or other approved preservative, they may be sealed in.

(c) Anchors for each tier of joists more than 5 feet above grade shall be provided where they enter masonry walls, and also where they are parallel to masonry walls. Such anchors shall be 3/16 inch by 1-1/4 inch iron, or equal, not less than 20 inches long, fitted with a 3/8 inch by 6 inch pin at the wall end, and shall be spaced not more than 6 feet apart. The pin shall be placed horizontally in the wall and 4 inches from the opposite face of such wall. Such anchors shall in all cases occur on the opposite ends of the same run of joists, and where the length of joists is less than the distance across a building, the end of joists shall be lapped and spiked so as to form a continuous tie across the building. Anchors shall be placed across the top of joists that run parallel to the wall, and shall be fastened to the ends of joists below the neutral axis.

(8) Wooden Trusses and Built-up Members. Wood trusses and similar framing shall have all joints accurately cut and fitted together so that each bearing is true and drawn tightly to full bearing.

(a) All wood trusses shall be securely fastened to the supports and each truss shall be secured in position laterally by bracing the top and bottom chords at points not more than 25 feet apart.

(b) All girders and beams built up of strips, boards or dimension

lumber shall be fastened together by glueing, nailing, spiking or bolting in a manner to develop the full strength of the parts. The stiffness of all members, and the strength of all joints, splices and laps, shall be fully developed.

(9) Posts and Columns. Wood posts, when used in basements, shall bear on a cement base which shall extend not less than 3 inches above the finish floor. The base shall bear directly on the post footing.

(a) Short columns or posts are those having an $\frac{L}{d}$ ratio of 10 or less in which L = unsupported length in inches and d the least side in inches.

(b) Safe load for short columns may be obtained by the formula

$$\frac{P}{A} = S$$

in which $\frac{P}{A}$ represents the working stress for the column and S represents the safe unit compressive stress parallel to the grain given in the table of working stresses.

(c) Safe load for long columns of square or rectangular shape may be obtained by the formula:

$$\frac{P}{A} = \frac{0.3E}{\left(\frac{L}{d}\right)^2}$$

Where E is the modulus of elasticity as given in the table on working stresses. The value $\frac{P}{A}$ calculated by this formula shall in no case exceed S.

(10) Structural Glued Laminated Lumber.

(a) The term "structural glued laminated lumber" as used herein refers only to those glued laminated structural members in which the grain of all laminations of a member is approximately parallel.

(b) The following allowable unit stresses shall be used in design of structural glued laminated members.

ALLOWABLE UNIT STRESSES FOR STRUCTURAL GLUED LAMINATED LUMBER

SPECIES AND COMBINATIONS OF LUMBER GRADES			ALLOWABLE UNIT STRESSES IN POUNDS PER SQUARE INCH							
Outer Laminations		Inner Laminations	Extreme Fiber in Bending "f"		Tension Parallel to Grain "t"		Compression Parallel to Grain "c"		Horizontal Shear "H"	Compression perpendicular to Grain "c"
			Laminations		Laminations		Laminations			
Grade	Number Each Side	Grade	4 to 14	15 or more	4 to 14	15 or more	4 to 14	15 or more		
DOUGLAS FIR, COAST REGION										
Select Structural	1/5 of Total	Construction	2,600	2,600	2,400	2,600	2,000	2,000	165	415
Dense Construction	All	Dense Const.	2,400	2,600	2,600	2,600	2,200	2,300	165	455
Dense Construction	1/14 of Total	Construction	2,400	2,600	2,200	2,400	1,900	2,000	165	455
Select Structural	One	Construction	2,200	2,600	2,400	2,600	1,900	2,000	165	415
Select Structural	1/5 of Total	Standard	2,200	2,200	2,000	2,400	1,800	1,900	165	415
Select Structural	One	Standard	2,000	2,200	2,200	2,400	1,900	2,000	165	390
Construction	All	Construction	2,000	2,200	2,000	2,400	1,800	1,900	165	390
Standard	All	Standard	1,600	2,000	2,000	2,400	1,800	1,900	165	390
PINE, SOUTHERN										
No. 1	All	No. 1	2,600	2,600	2,600	2,600	2,100	2,100	200	385
B & B Dense	1/14 of total	No. 2	2,400	2,600	2,600	2,600	2,000	2,000	200	450
B & B	one	No. 2	2,400	2,400	2,600	2,600	2,000	2,000	200	385
No. 1	1/5 of Total	No. 2	2,400	2,600	2,400	2,600	2,000	2,000	200	385
No. 2 Dense	All	No. 2 Dense	2,000	2,600	2,600	2,600	2,200	2,300	200	450
No. 2 Dense	1/14 of Total	No. 2	2,000	2,600	2,200	2,600	1,900	2,000	200	450
No. 2	All	No. 2	1,800	2,200	2,200	2,600	1,900	2,000	200	385

The Modulus of Elasticity (E) is 1,800,000 pounds per square inch for dry conditions of use.

Allowable stresses are for normal conditions of load and dry conditions of use.

Ind 55.02 Class of Construction (1) The capacities of buildings or parts of buildings in this classification for the various types of construction shall not exceed, and shall comply, with the following requirements:

MAXIMUM CAPACITIES		
Type of Construction	With Stage	Without Stage
Fire Resistive	No limit	No limit
Mill	750	1,500
Ordinary	500	1,000
Frame	300	750

(a) Exception. The fire protection for structural steel supporting the roof may be omitted in one-story buildings in this classification provided the roof and its supports are of incombustible or mill construction throughout.

(2) Where a building of this classification is erected of frame construction, the following restrictions shall apply:

(a) Not more than one story in height without a balcony, and with no basement except a heating and fuel room enclosed with 4-hour fire resistive construction as specified in sections Ind 51.05 and Ind 51.06 with all interior openings protected as specified in section Ind 51.09.

(b) Located at least 20 feet from any other building or adjoining property line.

(c) Is not built in connection with a building used for any other purpose.

(d) Is provided with foundation walls and piers of masonry construction.

(e) Where motion picture booths are required, they shall be enclosed with 4-hour fire resistive construction.

(f) Exception: In places of worship, a full basement and a balcony seating not more than 30 persons may be provided.

(3) In any theater or assembly hall, balconies which accommodate more than 100 persons shall be of fire resistive construction as specified in section Ind 51.001.

Ind 55.29. Boiler and Furnace Rooms. (1) Every boiler or furnace room, including breeching and fuel room, shall be enclosed with a special occupancy separation as specified in section Ind 51.08, except that in the case of an assembly hall accommodating not more than 300 persons, an ordinary occupancy separation as specified in section Ind 51.08 may be used.

(2) All appliances used for heating water which are fired with solid fuel, liquid fuel or gas shall be located in a boiler or furnace room except that gas fired booster water heaters used exclusively for sanitizing dishes and cooking utensils need not be installed in a fire resistive enclosure.

Ind 57.53 Automobile Parking Decks (1) Definition. For the purpose of this code, a parking deck is an unenclosed or partially enclosed structure used for the parking or storage of self-propelled vehicles, which are driven into the structure and are parked under their own power with no facilities for the repairing of such vehicles.

(2) Construction Requirements.

(a) Parking decks may be erected without enclosing walls except that unpierced enclosing walls of not less than 2-hour fire resistive construction, as specified in section Ind 51.05, shall be provided on all sides which are located less than 10 feet from the boundary line between premises or from any other building.

(b) Parking decks of 4-hour fire resistive construction shall not be limited in height or in floor area.

(c) Parking decks more than 50 feet in height shall have floors and supporting members of 2-hour fire resistive construction or better. Such structures shall not exceed 75 feet in height or 30,000 square feet in area.

(d) Parking decks of unprotected incombustible construction shall not exceed 50 feet in height or 20,000 square feet in area. This area may be increased to 25,000 square feet where the structure faces 2 streets and to 30,000 square feet where it faces 3 or more streets.

( ) A continuous wheel guard not less than 10 inches in height

(f) A guard rail not less than 3 feet 6 inches in height and having an intermediate rail at mid-height and a toeboard at least 6 inches high at the base, or the equivalent, shall be provided on all open sides of the structure on each floor.

(g) Live Loads. All parking decks and parts thereof shall be designed and constructed to support the following minimum superimposed live loads in pounds per square foot of horizontal area, in addition to the dead load:

PASSENGER CARS ONLY	POUNDS PER SQUARE FOOT
Top floor	80
First floor	80
Intermediate floors	50
Ramps	80
BUSSES AND TRUCKS	
All floor and ramp areas	8000 pound axle load in any possible position or 80 pounds per square foot, whichever produces the greater stress.