Chapters SPS 320–325 Appendix

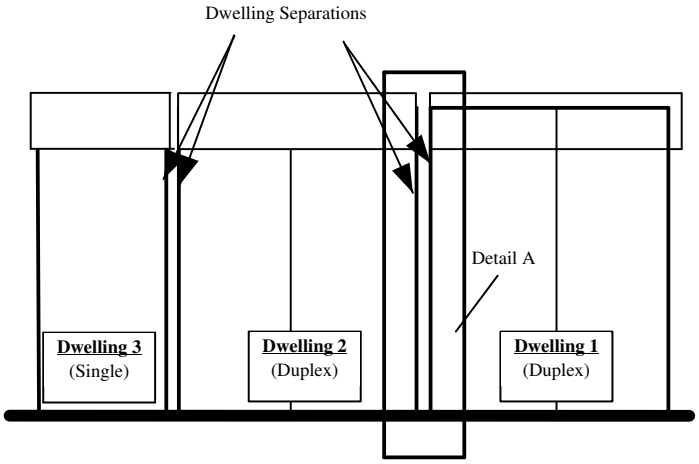
UDC Appendix

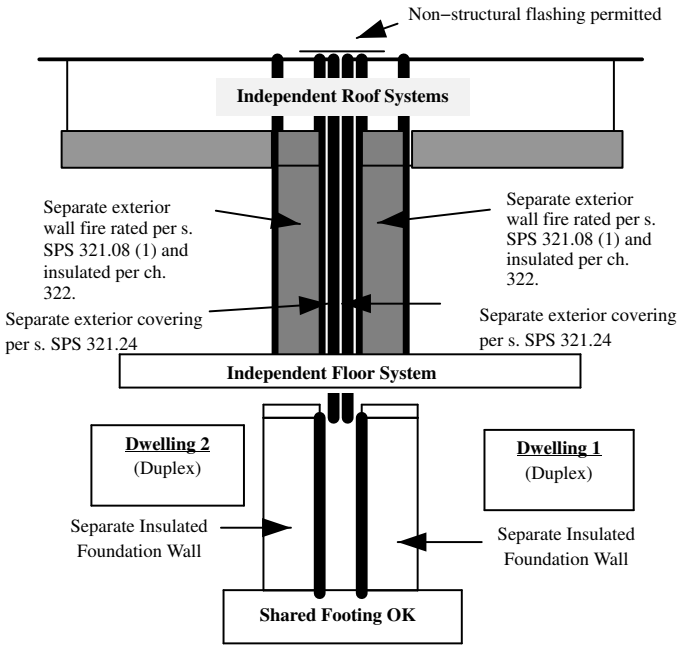
Table of Contents

320.04 (6) – Dwelling Separations

Normally, for 3 or more attached dwelling units, the Commercial Building Code (CBC) applies. Attached means some construction (other than footings and their bearing material) is shared by the units.

Where 3 or more adjacent but unattached dwelling units are each built with the outside walls that comply with the Uniform Dwelling Code (UDC), the UDC applies throughout and the CBC does *not* apply, even if those outside walls are adjacent to or adjoin each other. If flashing is added over the top of two such adjoining walls, the UDC would still apply.





Detail A

Model Ordinance for Adoption of Wisconsin Uniform Dwelling Code

It is intended that this model will assist local jurisdictions, working with corporation counsel, through regular procedures, in adopting a local ordinance. The Wisconsin Division of Safety and Buildings also offers an electronic version of this model ordinance and a more comprehensive model building code on our website at https://dsps.state.wi.us/sb on the One– & Two–Family (UDC) program page. Upon adoption of a new building code, send a certified copy to: Safety & Buildings Division, P.O. Box 2658, Madison, WI 53707, Telephone (608) 267–5113, Fax (608) 283–7409 along with the name of your certified inspector(s).

Town, Village, City, County of _____.

ORDINANCE #

CONTENTS

1.1 AUTHORITY. These regulations are adopted under the authority granted by s. 101.65, Wisconsin Statutes

[IF COUNTY ORDINANCE] This ordinance shall apply in any municipality of over 2,500 population without a Uniform Dwelling Code enforcement program and the following other municipalities requesting county enforcement: _____ _____ and in the following other municipalities that the Wisconsin Department of Safety and Professional Services has delegated enforcement to our county _____.

1.2 PURPOSE. The purpose of this ordinance is to promote the general health, safety and welfare and to maintain required local uniformity with the administrative and technical requirements of the Wisconsin Uniform Dwelling Code.

1.3 SCOPE. The scope of this ordinance includes the construction and inspection of one– and two–family dwellings built since June 1, 1980.

[OPTIONAL] Not withstanding s. SPS 320.05, the scope also includes the construction and inspection of alterations and additions to one– and two–family dwellings built before June 1, 1980. Because such projects are not under state jurisdiction, petitions for variance and final appeals under ss. SPS 320.19 and 320.21, respectively, shall be decided by the municipal board of appeals. Petitions for variance shall be decided per s. SPS 320.19 (intro.) so that equivalency is maintained to the intent of the rule being petitioned. As the board of appeals approves petitions for variance, the chief inspector is granted the power to apply the results to similar circumstances by precedent.

[OPTIONAL] Not withstanding s. SPS 320.05, the scope also includes the construction and inspection of detached garages serving one and two family dwellings. The building structure and any heating, electrical or plumbing systems shall comply with the Uniform Dwelling Code. Petitions for variance and appeals shall be handled as in the previous paragraph.

1.4 WISCONSIN UNIFORM DWELLING CODE ADOPTED. The Wisconsin Uniform Dwelling Code, Chs. SPS 320–325 of the Wisconsin Administrative Code, and all amendments thereto, is adopted and incorporated by reference and shall apply to all buildings within the scope of this ordinance.

1.5 BUILDING INSPECTOR. There is hereby created the position of Building Inspector, who shall administer and enforce this ordinance and shall be certified by the Division of Safety & Buildings, as specified by Wisconsin Statutes, Section 101.66 (2), in the category of Uniform Dwelling Code Construction Inspector. Additionally, this or other assistant inspectors shall possess the certification categories of UDC HVAC, UDC Electrical, and UDC Plumbing. (**NOTE**: Contact the Division of Safety & Buildings at (608) 261–8500 for certification information.)

1.6 BUILDING PERMIT REQUIRED. If a person alters a building in excess of **[INSERT AMOUNT]** $_____ value in any 12–month period, adds onto a building in excess of **[INSERT VALUE or AREA AMOUNT]** _____ in any

12–month period, or builds or installs a new building, within the scope of this ordinance, they shall first obtain a building permit for such work from the building inspector. Any structural changes or major changes to mechanical systems that involve extensions shall require permits if over the foregoing thresholds. Restoration or repair of an installation to its previous code–compliant condition as determined by the building inspector is exempted from permit requirements. Residing, re–roofing, finishing of interior surfaces and installation of cabinetry shall be **[CHOOSE OPTION]** included/exempted from permit requirements.

(**NOTE**: Fill in the threshold amount above which permits are required. Also decide whether new interior and exterior surfaces or cabinetry shall be included or exempted.)

1.7 BUILDING PERMIT FEE. The building permit fees shall be determined by resolution and shall include $25.00 to be forwarded to the Wisconsin Department of Safety and Professional Services for a UDC permit seal that shall be assigned to any new dwelling.

1.8 PENALTIES. The enforcement of this section and all other laws and ordinances relating to building shall be by means of the withholding of building permits, imposition of forfeitures and injunctive action. Forfeitures shall be not less than $25.00 nor more than $1,000.00 for each day of noncompliance.

1.9 EFFECTIVE DATE. This ordinance shall be effective _____, upon passage and publication as provided by law.

1.10 The building inspector(s) shall keep a log of all inspections completed.

Adopted this _____, day of _____,

_____

(Mayor, President, Chairperson)

Attest: _____

Published: _____

Wisconsin Division of Safety and Buildings Wisconsin Stats. 101.63, 101.73	**WISCONSIN UNIFORM BUILDING PERMIT APPLICATION** **Instructions on back of second ply.** The information you provide may be used by other government agency programs [(Privacy Law, s. 15.04 (1)(m)]	Application No. Parcel No.

PERMIT REQUESTED Constr. HVAC Electric Plumbing Erosion Control Other:

Owner's Name	Mailing Address		Tel.
Contractor Name & Type	Lic/Cert#	Mailing Address	Tel. & Fax
Dwelling Contractor (Constr.)			
Dwelling Contr. Qualifier		The Dwelling Contr. Qualifier shall be an owner, CEO, COB or employee of the Dwelling Contr.	
HVAC			
Electrical			
Plumbing			

PROJECT LOCATION	Lot area Sq.ft.	One acre or more of soil will be disturbed	_____ 1/4, _____ 1/4, of Section , T N, R E (or) W

Building Address	Subdivision Name	Lot No.	Block No.

Zoning District(s)	Zoning Permit No.	**Setbacks:**	Front ft.	Rear ft.	Left ft.	Right ft.

1. PROJECT
New Repair
Alteration Raze
Addition Move
Other:

2. AREA INVOLVED (sq ft)

	Unit 1	Unit 2	Total
Unfin. Bsmt			
Living Area			
Garage			
Deck			
Totals			

3. OCCUPANCY
Single Family
Two Family
Garage
Other:

4. CONST. TYPE
Site-Built
Mfd. per WI UDC
Mfd. per US
HUD

5. STORIES
1-Story
2-Story
Other:
Plus Basement

6. ELECTRIC
Entrance Panel
Amps: _____
Underground
Overhead

7.WALLS
Wood Frame
Steel
☐ ICF
☐ Timber/Pole
☐ Other:

8. USE
Seasonal
Permanent
Other:

9. HVAC EQUIP.
Furnace
Radiant Basebd
Heat Pump
Boiler
Central AC
☐Fireplace
Other:

10. SEWER
Municipal
Sanitary Permit#
_____

11. WATER
Municipal
On-Site Well

12. ENERGY SOURCE

Fuel	Nat Gas	LP	Oil	Elec	Solid	Solar
Space Htg	☐	☐	☐	☐	☐	☐
Water Htg	☐	☐	☐	☐	☐	☐

13. HEAT LOSS
_____ BTU/HR Total Calculated Envelope and Infiltration Losses ("Maximum Allowable Heating Equipment Output" on Energy Worksheet; "Total Building Heating Load" on Rescheck report)

14. EST. BUILDING COST w/o LAND
$

I understand that I am subject to all applicable codes, statutes and ordinances and with the conditions of this permit; understand that the issuance of the permit creates no legal liability, express or implied, on the state or municipality; and certify that all the above information is accurate. If one acre or more of soil will be disturbed, I understand that this project is subject to ch. NR 151 regarding additional erosion control and stormwater management and the owner shall sign the statement on the back of the permit if not signing below. I expressly grant the building inspector, or the inspector's authorized agent, permission to enter the premises for which this permit is sought at all reasonable hours and for any proper purpose to inspect the work which is being done.

I vouch that I am or will be an owner-occupant of this dwelling for which I am applying for an erosion control or construction permit without a Dwelling Contractor Certification and have read the cautionary statement regarding contractor responsibility on the reverse side of the last ply.

APPLICANT (Print:) _____ **Sign:** _____ **DATE** _____

APPROVAL CONDITIONS This permit is issued pursuant to the following conditions. Failure to comply may result in suspension or revocation of this permit or other penalty. **See attached for conditions of approval.**

ISSUING JURISDICTION	Town of Village of City of County of State→	State-Contracted Inspection Agency#:	Municipality Number of Dwelling Location ___ ___ - ___ ___ ___

FEES:		**PERMIT(S) ISSUED**	**WIS PERMIT SEAL #**	**PERMIT ISSUED BY:**
Plan Review	$ _____	Construction		
Inspection	$ _____	HVAC		Name _____
Wis. Permit Seal	$ _____	Electrical		
Other	$ _____	Plumbing		Date _____ Tel. _____
		Erosion Control		
Total	$ _____	_____		Cert No. _____

SBD-5823(R.10/08) Distribute: Ply 1 – Issuing Jurisdiction; Ply 2- Issuer forwards to State w/in 30 days; Ply 3- Inspector; Ply 4- Applicant

INSTRUCTIONS

The owner, builder or agents shall complete the application form down through the Signature of Applicant block and submit it and building plans and specifications to the enforcing municipality. Permit application data is used for statewide statistical gathering on new one– and two–family dwellings, as well as for local code administration. **Please type or use ink and press firmly with multi–ply form.**

PERMIT REQUESTED

- Check off type of Permit Requested, such as structural, HVAC, Electrical or Plumbing.
- Fill in owner's current Mailing Address and Telephone Number.
- If the project will disturb one acre or more of soil, the project is subject to the additional erosion control and stormwater provisions of ch. NR 151 of the WI Administrative Code. Checking this box will satisfy the related notification requirements of ch. NR 216.
- Fill in Contractor and Contractor Qualifier Information. Per s. 101.654 (1) WI Stats., an individual taking out an erosion control or construction permit shall enter his or her dwelling contractor certificate number, and name and certificate number of the dwelling contractor qualifier employed by the contactor, unless they reside or will reside in the dwelling. Per s. 101.63 (7) Wis. Stats., the master plumber name and license number must be entered before issuing a plumbing permit.

PROJECT LOCATION

- Fill in Building Address with number and street or sufficient information so that the building inspector can locate the site.
- Local zoning, land use and flood plain requirements must be satisfied before a building permit can be issued. County approval may be necessary.
- Fill in Zoning District, lot area and required building setbacks.

PROJECT DATA – Fill in all numbered project data blocks (1–14) with the required information. All data blocks must be filled in, including the following:

2. Area (involved in project):
   Basements – include unfinished area only
   Living area – include any finished area including finished areas in basements
   Two–family dwellings – include separate and total combined areas
3. Occupancy – Check only "Single–Family" or "Two–Family" if that is what is being worked on. In other words, do not check either of these two blocks if only a new detached garage is being built, even if it serves a one– or two–family dwelling. Instead, check "Garage" and number of stalls. If the project is a community–based residential facility serving 3 to 8 residents, it is considered a single–family dwelling.
9. HVAC Equipment – Check only the major source of heat, plus central air conditioning if present. Only check "Radiant Baseboard" if there is no central source of heat.
10. Plumbing – A building permit cannot be issued until a sanitary permit has been issued for any new or affected existing private onsite wastewater treatment system.
14. Estimated Cost – Include the total cost of construction, including materials and market rate labor, but not the cost of land or landscaping.

SIGNATURE – Sign and date this application form. If you do not possess the Dwelling Contractor certification, then you will need to check the owner–occupancy statement for any erosion control or construction permits.

CONDITIONS OF APPROVAL – The authority having jurisdiction uses this section to state any conditions that must be complied with pursuant to issuing the building permit.

ISSUING JURISDICTION: This must be completed by the authority having jurisdiction.

- Check off Jurisdiction Status, such as town, village, city, county or state and fill in Municipality Name.
- Fill in State Inspection Agency number only if working under state inspection jurisdiction.
- Fill in Municipality Number of Dwelling Location.
- Check off type of Permit Issued, such as construction, HVAC, electrical or plumbing.
- Fill in Wisconsin Uniform Permit Seal Number, if project is a new one– or two–family dwelling.
- Fill in Name and Inspector Certification Number of person reviewing building plans and date building permit issued.

PLEASE RETURN SECOND PLY WITHIN 30 DAYS AFTER ISSUANCE TO: (You may fold along the dashed lines and insert this form into a window envelope.)

Safety & Buildings Division
P.O. Box 2509
Madison, WI 53701–2509

(Part of Ply 4 for Applicants)

Cautionary Statement to Owners Obtaining Building Permits

101.65 (lr) of the Wisconsin Statutes requires municipalities that enforce the Uniform Dwelling Code to provide an owner who applies for a building permit with a statement advising the owner that:

If the owner hires a contractor to perform work under the building permit and the contractor is not bonded or insured as required under s. 101.654 (2) (a), the following consequences might occur:

(a) The owner may be held liable for any bodily inquiry to or death of others or for any damage to the property of others that arises out of the work performed under the building permit or that is caused by any negligence by the contractor that occurs in connection with the work performed under the building permit.

(b) The owner may not be able to collect from the contractor damages for any loss sustained by the owner because of a violation by the contractor of the one– and two– family dwelling code or an ordinance enacted under sub. (1) (a), because of any bodily injury to or death of others or damage to the property of others that arises out of the work performed under the building permit or because of any bodily injury to or death of others or damage to the property of others that is caused by any negligence by the contractor that occurs in connection with the work performed under the building permit.

Additional Responsibilities for Owners of Projects Disturbing One or More Acre of Soil

I understand that this project is subject to ch. NR 151 regarding additional erosion control and stormwater management and will comply with those standards.

Owner's Signature: _____ Date:_____

SITE INFO

SUBDIVISION _____

LOT NO. _____ BLOCK NO. _____

ZONING DISTRICT _____

_____ 1/4, _____ 1/4, SEC _____, T _____, N, R _____ E or W

PARCEL NO. _____

SETBACKS:

FRONT _____ft REAR _____ft

LEFT _____ft RIGHT _____ft

INSPECTIONS

PHASE	ROUGH	FINAL	EROSION
FOOTING			
FOUNDATION			
BSMT DRAIN TILES			
CONSTRUCTION			
PLUMBING			
HEAT/VENT/AC			
ELECTRICAL			
INSULATION			
OCCUPANCY			

CONTRACTORS

NAME	CREDENTIAL #	PHONE
G.C.		
HVAC		
ELECT.		
PLBG		

SBD-5824 (R. 01/08)

Work shall not proceed until the inspector has approved the various stages of construction or two business days have elapsed since the day of inspection request. This permit will expire __24__ months after the date of issuance if the building's exterior has not been completed. **Keep this card posted until final inspection has been made.** (WI Stats. 101.63)

WISCONSIN UNIFORM BUILDING PERMIT

Affix uniform permit seal here (when applicable) Seal No.:

_____

☐ Constr ☐ HVAC ☐ Elect ☐ Plumb ☐ Erosion

Project:

Issued To	OWNER (AGENT)	PHONE
	BUILDING SITE ADDRESS	
	CITY, VILLAGE, TOWN	

Issued by	PERSON ISSUING		CERT. NO.
	DATE ISSUED	TELEPHONE	

Comments: _____

NOTICE OF NONCOMPLIANCE: This issuing jurisdiction shall notify the applicant in writing of any violations to be corrected. All cited violations, except erosion control ones, shall be corrected within 30 days of notification, unless extension time is granted.

INSPECTION REPORT AND NOTICE OF NONCOMPLIANCE

Print legibly using black ink.

Report Date:	Inspection Date	Permit No.:	State Seal #	Parcel No:	
Project Address		Subdivision		Lot No.:	Block No.:

Inspection Type(s): ☐Footing ☐Erosion Control ☐Foundation ☐Bsmt Drain Tile ☐Underslab Plbg ☐Rough HVAC ☐Rough Plumbing ☐Rough Electrical ☐Construction ☐Insulation/Energy ☐Final ☐Other:

Area Inspected, if Partial Inspection:	If Final Inspection, Occupancy May: ☐ Take Place Now ☐ Take Place Temporarily for _____ days ☐ Not Take Place Until The Items Below Are Corrected and Inspected ☐ Other:

Owner:	**Contractor:**

AN INSPECTION OF THE ABOVE PREMISES HAS DISCLOSED THE FOLLOWING NONCOMPLIANCES: ☐ **None Noted**

ORDER NO.	CODE SECTION	FINDINGS AND REQUIREMENTS

IMPORTANT: Please report when violations are corrected. AVOID DELAY

NOTICE OF NONCOMPLIANCE: All cited violations shall be corrected within ____30__days after written notification unless an extension of time is granted. Each day that the violation continues after notice shall constitute a separate offense and is subject to remedies and penalties by the authority having jurisdiction. Appeals per ch. 68, WI Stats. and s. Comm 20.21.

Enforcing Jurisdiction: ☐Town ☐ Village ☐ City ☐ County **OF:** ☐State Staff ☐ State Insp Agency#	Bldg Location Muni # --	Authority By Municipal Ordinance Section::

Inspector's Name:	Violations Explained To:	Compliance Date:

Inspector's Address:	Office Hours:	Telephone No:

Orders Referred for Followup Legal Action To:	Date	Noncompliances Verified to Still Exist? (If needed, notate orders above.) ☐ Yes ☐ No	Additional Fees Collected(+)/Refunded(-) By State-Contracted Agency $ Since Original Permit Issuance:

Distribution: Ply 1 – Contractor Ply 2 – Inspector/State Ply 3 - Owner Ply 4 - File

SBD-6025 (R.06/05

DO NOT REMOVE

OFFICIAL NOTICE

Location/Item: _____

☐ **Lacking** _____ **Permit(s)** ☐ **Need** _____ **Inspection**
☐ **Expired** _____ **Permit** ☐ **Premises Housekeeping**
☐ **Unfit for Use**
☐ **Erosion Control:** ☐ **Perimeter Measures** ☐ Install ☐ Maintain
☐ **Non-Tracking Driveway** ☐ Install ☐ Maintain
☐ **Sediment Cleanup** ☐ Street & Sidewalks ☐ Adjoining Property

Code Section/Other: _____

_____

Action:

☐ **Contact Inspector** ☐ Now ☐ After Corrections
☐ **Correct** ☐ Now ☐ By End Of Today (UDC Tracking Cleanup)
☐ By End Of Next Workday (UDC Sediment Cleanup)
☐ In 48 Hrs (UDC Erosion Controls) ☐ By _____
☐ **Stop All Work** ☐ Except Corrections Code Section: _____

Failure To Comply Subjects You To Applicable Fines & Penalties or Work Stoppages

_____ _____ _____
Inspector/Agency **Phone Number** **Date**

SBD-10266 (R.6/07)

commerce.wi.gov
Wisconsin
Department of Commerce

Application for Review, Petition for Variance SBD-9890X
SBD-9890X (R. 02/08) (Check our website at http://www.commerce.state,wi.us/SB/SB-DivForms.html for the most current version of this form)

-Complete all pages-

Safety & Buildings Division

Use this page for fax appointments (fax 877-840-9172)
Indicate date plans will be in S&B office _____

NOTE: Personal information you provide may be used for secondary purposes [Privacy Law s. 15.04(1)(m), Stats.]

1. Facility Information

Facility (Building) Name:_____

Number and Street:_____ Zip:_____

Commerce Site Number (if known):_____

Legal Description:_____

County of:_____

( ) City ( ) Village ( ) Town of:_____

Complete for confirmed appointments*:

Transaction ID: _____

Previous Related Trans. ID: _____

Assigned Reviewer: _____

Assigned Office: _____

Review Start Date*: _____

***Submittal must be received in the office of the appointment no later than 2 working days before the confirmed appointment.**

2. Owner Information	**Customer #**	**3. Designer Information**	**Customer #**
Name		Designer	
Company Name		Design Firm	
Number and Street		Number and Street	
City, State, Zip Code		City, State, Zip Code	
Contact Person		Contact Person	
Telephone Number	Fax Number	Telephone Number	Fax Number

4. Plan Review Status

__ Plan submitted with petition
__ Plan will be submitted after petition determination
__ Requesting revision __ Other: _____
Commerce Transaction Number _____

Plan previously review by (please enclose a copy of review letter)

__ State __ Municipality __ Approved __ Held __ Denied
Code Being Petitioned ___Commercial Building __ HVAC __ Plumbing
__ Private Sewage System__ Swimming Pool __ Electrical __ Flammable Liquids
__ Amusement Rides __ Uniform Dwelling Code __ Boilers __ Elevators
__ Gas Systems__ Refrigeration __ Rental Weatherization __ Other:_____

5. State the code section being petitioned AND the specific condition or issue you are requesting be covered under this petition for variance.

_____

6. Reason why compliance with the code cannot be attained without the variance. (Attach additional sheets, if necessary.)

_____

7. State your proposed means and rationale of providing equivalent degree of health, safety, or welfare as addressed by the code section petitioned.

_____

8. List attachments to be considered as part of the petitioner's statements (i.e., model code sections, test reports, research articles, expert opinion, previously approved variances, pictures, plans, sketches, etc.).

_____

. **VERIFICATION BY OWNER - PETITION IS VALID ONLY IF NOTARIZED WITH AFFIXED SEAL AND ACCOMPANIED BY REVIEW FEE**
Note: Petitioner must be the owner of the building or system or credential applicant for a Comm 5 petition. Tenants, agents, designers, contractors, attorneys, etc., shall not sign petition unless Power of Attorney is submitted with the Petition for Variance Application.

_____, being duly sworn, I state as petitioner that I have read the foregoing petition and I believe
Petitioner's Name (type or print) it is true and that I have significant ownership rights to the subject building or project.

Petitioner's Signature	Subscribed and sworn to before me this date	Notary Public	My commission expires on

MAKE CHECKS PAYABLE TO DEPT. OF COMMERCE **Complete other side for variance from Comm 20-25 and Comm 61-65**	**TOTAL AMOUNT DUE** **$_____** **Attach check here.**

Owner's Name	Project Location	Plan Number

Page 2 of _____

Fire Department Position Statement

To be completed for fire or life-safety related variances requested from Comm 61-65, Comm 10, Comm 16 and other fire related requirements.

I have read the application for variance and recommend: (check appropriate box)
☐ Approval ☐ Conditional Approval ☐ Denial ☐ No Comment

Explanation for recommendation including any conflicts with local rules and regulations and suggested conditions:

_____

_____

_____

_____

_____

Fire Department Name and Address	
Name of Fire Chief or Designee (type or print)	Telephone Number
Signature of Fire Chief or Designee	Date Signed

MUNICIPAL BUILDING INSPECTION RECOMMENDATION

To be completed for variances requested from Comm 20-23. Also to be used for Comm 16 electrical petitions, if Comm 61-65 plan review is by municipality or orders are written on the building under construction; optional in other cases. Please submit a copy of the orders

I have read the application for variance and recommend: (check appropriate box)
☐ Approval ☐ Conditional Approval ☐ Denial ☐ No Comment

Explanation for recommendation including any conflicts with local rules and regulations and suggested conditions:

_____

_____

_____

_____

Municipality Exercising Jurisdiction	
Name and Address of Municipal Official (type or print)	Telephone Number of Enforcement Official
Signature of Municipal Enforcement Official	Date Signed

SBD-9890X (R. 12/01/2008)

Safety and Buildings Division
Bureau of Integrated Services

PETITION FOR VARIANCE

INFORMATION AND INSTRUCTIONS SPS 303

In instances where exact compliance with a particular code requirement cannot be met or alternative designs are desired, the Division has a petition for variance program where it reviews and considers acceptance of alternatives which are not in strict conformance with the letter of the code, but which meet the intent of the code. **A variance is not a waiver from a code requirement.** The petitioner must **provide an equivalency which meets the intent** of the code section petitioned to obtain a variance. Documentation of the rationale for the equivalency is requested below. Failure to provide adequate information may delay your petition. Pictures, sketches, and plans may be submitted to support equivalency. If the proposed equivalency does not adequately safeguard the health, safety, and welfare of building occupants, frequenters, firefighters, etc., the variance request will be denied. NOTE: A SEPARATE PETITION IS REQUIRED FOR EACH BUILDING AND EACH CODE ISSUE PETITIONED (i.e., 57.13 window issue cannot be processed on the same petition as 51.16 stair issue). It should be noted that **a petition for variance does not take the place of any required plan review submittal.**

The Division is unable to process petitions for variance that are not properly completed. Before submitting the application, the following items should be checked for completeness in order to avoid delays:

- Petitioner's name (typed or printed)
- Petitioner's signature
- The Petition for Variance Application must be signed by the owner of the building or system unless a Power of Attorney is submitted.
- Notary Public signature with affixed seal
- Analysis to establish equivalency, including any pictures, illustrations or sketches of the existing and proposed conditions to clearly convey your proposal to the reviewer.
- Proper fee
- Any required position statements by fire chief or municipal official

A position statement from the chief of the local fire department is required for fire– or life–safety issues. No fire department position statement is required for nonfire safety topics such as sanitary, plumbing or POWTS systems and energy conservation. Submit a municipal building inspection department position for SPS 316 electrical petitions, if SPS 361–365 plan review is by municipality or orders are written on the building under construction; optional in other cases. (Please submit a copy of the orders.) For rules relating to one– and two–family dwellings, only a position statement from the local enforcing municipality is required. Position statements must be completed and signed by the appropriate fire chief or municipal enforcement official. See the back of SBD–9890–X, Petition for Variance Application form for these position statement forms. Signatures or seals on all documents must be originals. Photocopies are not acceptable.

Contact numbers and fees for the Division's review of the petition for variance are as follows:

Chapter (circle appropriate category)	Revenue Code	Review Office	Contact Number	Fee	Revision Fee
SPS 316, Electrical	7631.	Madison, Waukesha	(608) 266–3064	$300	$100
SPS 318, Elevators	8260	Waukesha	(262) 521–5444	$300	$100
SPS 320–325, Uniform Dwelling Code	7655	Madison	(608) 267–5113	$175	$ 50
SPS 334, Amusement Rides	8266	Madison	(608) 267–4434	$300	$100
SPS 340, Gas Systems	8258	Waukesha	(262) 548–8617	$300	$100
SPS 341, Boilers and Pressure Vessels	8258	Waukesha	(262) 548–8617	$300	$100
SPS 343, Anhydrous Ammonia	8258	Waukesha	(262) 548–8617	$300	$100
SPS 345, Mechanical Refrigeration	8258	Waukesha	(262) 548–8617	$300	$100
SPS 361–366, Commercial Building Code	7648	All Offices See Office Numbers Below		$550	$100
(For Fire System Petition for Variances — Contact the Green Bay or Waukesha offices)					
SPS 367, Rental Unit Energy Efficiency Code	7646	Madison	(608) 267–2240	$175	$ 50
SPS 381–385, General Plumbing	7657	All Offices See Office Numbers Below		$300	$ 75
SPS 390, Swimming Pools	7650	Madison	(608) 267–5265	$300	$ 75
SPS 383, POWTS	7657	All Offices See Office Numbers Below		$300	$ 75
All Other Chapters				$300	$100

Revisions are accepted only for 1 year after action on original petition.

Priority Review: The Department will schedule Petitions for Variance at the earliest available date, or the date requested at time of scheduling, whichever is later. Therefore, Priority Reviews are not generally available. In special circumstances, the Section Chief of the reviewing office may permit review prior to the scheduled date upon request by the submitter. If earlier review is permitted by the Section Chief, the Petition review fees will be doubled.

Except for special cases, the Division will review and make a determination on a petition for variance within 30 business days of the scheduled beginning date, provided all calculations, documents, and fees required for the review have been received.

Appointment and Scheduling Information

It is strongly recommended that an appointment be made in advance. **For your convenience we have installed a 24–hour, toll–free number dedicated to receiving faxed plan review appointment requests. The dedicated fax number is (877) 840–9172. Be sure to indicate whether you want the next available review statewide or prefer a choice of an office.** The petition review will be scheduled with the same office where the plan was/will be reviewed. You will receive a Schedule Letter back with an Appointment Date, Transaction ID No. and Assigned Reviewer. You may also email the request to PlanSchedule@commerce.state.wi.us. At the time of making an appointment, you may request review for a specific office of desired (beginning) date for review. Plans must be received in the office of the appointment no later than 2 working days before the confirmed appointment. Non–scheduled submittals or submittals received without a confirmed appointment date and transaction number on the form may be assigned to offices other than the receiving office depending on reviewer availability. **Certain petitions may be limited to certain offices depending on the petition issues. See above table for appropriate office.**

Madison S&BD	**Hayward S&BD**	**LaCrosse S&BD**	**Shawano S&BD**	**Green Bay S&BD**	**Waukesha S&BD**
201 W Washington Ave P.O. Box 7162 Madison WI 53707–7162 (608) 266–3151 Fax: (for sending questions or additional info to reviewers) (608) 267–9566 TTY: Contact Through Relay Email: PlanSchedule@commerce.state.wi.us	10541N Ranch Rd Hayward WI 54843 (715) 634–4870 Fax: (for sending questions to additional info to reviewers) (715) 634–5150 Email: PlanSchedule@commerce.state.wi.us	3824 Creekside La Holmen WI 54636 (608) 785–9334 Fax: (for sending questions or additional info to reviewers) (608) 785–9330 Email: PlanSchedule@commerce.state.wi.us	1340 E Green Bay Shawano WI 54166 (715) 524–3626 Fax: (for sending questions or additional info to reviewers) (608) 283–7444 Email: PlanSchedule@commerce.state.wi.us	2331 San Luis Place Green Bay WI 54304 (920) 492–5601 FAX: (for sending questions or additional info to reviewers) (920) 492–5604 Email: PlanSchedule@commerce.state.wi.us	141 NW Barstow St 4th Floor Waukesha WI 53188–3789 (262) 548–8600 Fax: (for sending questions or additional info to reviewers) (262) 548–8614 Email: PlanSchedule@commerce.state.wi.us

SANITARY PERMIT REQUIREMENTS

Section SPS 320.09 (9) (c) refers to s. SPS 383.25 (2), which reads as follows:

SPS 383.25 (2) ISSUANCE OF BUILDING PERMITS. (a) *General.* Pursuant to s. 145.195, Stats., the issuance of building permits by a municipality for unsewered properties shall be in accordance with this subsection.

Note: See appendix for a reprint of s. 145.195, Stats.

(b) *New construction.* A municipality may not issue a building permit to commence construction or installation of a structure that necessitates the use of a POWTS to serve the structure, unless:

1. The owner of the property possesses a sanitary permit for the installation of a POWTS in accordance with s. SPS 383.21; or

Note: Section SPS 383.21 outlines the procedures for the issuance of sanitary permits. Sections 145.135 and 145.19, Stats., mandate that no private sewage system may be installed unless the owner of the property holds a valid sanitary permit.

2. A POWTS of adequate capability and capacity to accommodate the wastewater flow and contaminant load already exists to serve the structure.

Note: See ss. SPS 383.02 and 383.03 concerning the application of current code requirements to existing POWTS.

(c) *Construction affecting wastewater flow or contaminant load.* 1. A municipality may not issue a building permit to commence construction of any addition or alteration to an existing structure when the proposed construction will modify the design wastewater flow or contaminant load, or both, to an existing POWTS, unless the owner of the property:

a. Possesses a sanitary permit to either modify the existing POWTS or construct a POWTS to accommodate the modification in wastewater flow or contaminant load, or both; or

b. Provides documentation to verify that the existing POWTS is sufficient to accommodate the modification in wastewater flow or contaminant load, or both.

2. For the purpose of this paragraph, a modification in wastewater flow or contaminant load shall be considered to occur:

a. For commercial facilities, public buildings, and places of employment, when there is a proposed change in occupancy of the structure; or the proposed modification affects either the type or number of plumbing appliances, fixtures or devices discharging to the system; and

b. For dwellings, when there is an increase or decrease in the number of bedrooms.

(d) *Documentation of existing capabilities.* Documentation to verify whether an existing POWTS can accommodate a modification in wastewater flow or contaminant load, or both, shall include at least one of the following:

1. A copy of the plan for the existing POWTS that delineates minimum and maximum performance capabilities and which has been previously approved by the department or the governmental unit.

2. Information on the performance capabilities for the existing POWTS that has been recognized through a product approval under ch. SPS 384.

3. A written investigative report prepared by an architect, engineer, designer of plumbing systems, designer of private sewage systems, master plumber, master plumber–restricted service or certified POWTS inspector analyzing the proposed modification and the performance capabilities of the existing POWTS.

(e) Where the performance capability of the existing POWTS serving a dwelling is not based on the number of bedrooms within the dwelling, information documenting that design condition shall be recorded as a covenant running with the deed for the property.

(f) *Setbacks.* 1. A municipality may not issue a building permit for construction of any structure or addition to a structure on a site where there exists a POWTS, unless the proposed construction conforms to the applicable setback limitations under s. SPS 383.43 (8) (i).

2. The applicant for a building permit shall provide documentation to the municipality issuing the building permit showing the location and setback distances for the proposed construction relative to all of the following:

a. Existing POWTS treatment components.

b. Existing POWTS holding components.

c. Existing POWTS dispersal components.

Note: A municipality which issues building permits may delegate to the governmental unit responsible for issuing sanitary permits the determination of whether the proposed construction will affect or interfere with an existing POWTS relating to capability or location of the existing POWTS.

MINIMUM FASTENER SCHEDULE TABLE

Other interior and exterior panel products and finishes installed per manufacturer requirements.

For engineered connectors, use manufacturer's specified fasteners.

Description of Building Materials/Connection	Number and Type of Fastener[1 2 3]
Floor Framing	
Joist to joist, face nailed over support	2–12d
Joist to sill or girder, toe nail	2–16d, 3–8d
Band or rim joist to joist, end nail	3–16d
Band or rim joist to sill or top plate	2–16d at 16″ o.c.
Bridging to joist, toe nail each end	2–8d
Built–up girder and beams, top loaded	10d at 32″ o.c. at top and bottom and staggered and two at ends and at each splice
Built–up girder and beams, side–loaded	16d at 16″ o.c. at top and bottom and staggered and two at ends and at each splice
Ledger strip to beam, face nail	3–16d each joist
Joist on ledger to beam, toe nail	3–8d
Wall Framing	
Sole plate to joist or blocking, face nail	16d at 16″ o.c.
Top or sole plate to stud, end nail	2–16d
Stud to sole plate, toe nail	4–8d or 3–16d
Doubled studs, face nail	16d at 24″ o.c.
Doubled top plates, face nail	16d at 16″ o.c.
Top plates, laps and intersections, face nail	2–16d
Continuous header, two pieces	16d at 16″ o.c. along each edge
Continuous header to stud, toe nail	4–8d
1″ corner brace to each stud and plate, face nail	2–8d or 2 staples, 1¾″
Built–up corner studs	16d at 30″ o.c., 16d at 24″ o.c.
Roof/Ceiling Framing	
Ceiling joists to plate, toe nail	2–16d, 3–8d
Ceiling joist, laps over partitions, face nail	3–16d
Ceiling joist to parallel rafters, face nail	3–16d
Rafter to plate, toe nail (maximum 6 rafter span, engineered connector for longer)	2–16d, 3–8d
Roof rafters to ridge, valley or hip rafters, toe nail	4–16d
Roof rafters to ridge, valley or hip rafters, face nail	3–16d
Collar ties to rafters, face nail	3–8d
Boards and planks	
1″ x 6″ subfloor or less to each joist, face nail	2–8d or 2 staples, 1¾″
Wider than 1″ x 6″ subfloor toe to each joist, face nail	3–8d or 4 staples 1¾″
2″ subfloor to joist or girder, blind and face nail	2–16d
1″ x 6″ roof or wall sheathing to each bearing, face nail	2–8d or 2 staples, 1¾″
1″ x 8″ roof or wall sheathing to each bearing, face nail	2–8d or 3 staples, 1¾″
Wider than 1″ x 8″ roof sheathing to each bearing, face nail	3–8d or 4 staples, 1¾″
2″planks	2–16d at each bearing

Panel Sheathing

Material	Fastener	Spacing of Fastener	
		Edges	Intermediate Supports
Engineered wood panel for subfloor and roof sheathing and wall corner wind bracing to framing			
5/16″ to ½″	6d common or deformed nail or staple, 1½″	6″	12″ [4]
5/8″ to ¾″	8d smooth or common, 6d deformed nail, or staple, 14 ga. 1¾″	6″	12″ [4]
7/8″ to 1″	8d common or deformed nail	6″	12″
1 1/8″ to 1¼″	10d smooth or common, or 8d deformed nail	6″	12″
Combination subfloor/ underlayment to framing			
¾″ or less	6d deformed or 8d smooth or common nail	6″	12″
7/8″ to 1″	8d smooth, common or deformed nail	6″	12″
1 1/8″ to 1 ¼″	10d smooth or common or 8d deformed nail	6″	12″
Wood panel siding to framing			
½″ or less	6d corrosion–resistant siding and casing nails	6″	12″
5/8″	8d corrosion–resistant siding and casing nails	6″	12″
½″ structural cellulosic fiberboard sheathing	1½″ galvanized roofing nail; 8d common nail; staple 16 ga., 1½″ long	3″	6″
25/32″ structural cellulosic fiberboard sheathing	1¾″ galvanized roofing nail; 8d common nail; staple 16 ga., 1¾″ long	3″	6″
½″ gypsum sheathing[5]	1½″ galvanized roofing nail; 6d common nail; staple galvanized 1½″ long; 1¼″ screws, Type W or S	4″	8″
5/8″ gypsum sheathing[5]	1¾″ galvanized roofing nail; 8d common nail; staple galvanized 1 5/8″ long; 1 5/8″ screws, Type W or S	4″	8″

[1] All nails are smooth–common, box or deformed shank except where otherwise stated.

[2] Nail is a general description and may be T–head, modified round head or round head.

[3] Staples are 16–gauge wire, unless otherwise noted, and have a minimum 7/16″ o.d. crown width.

[4] Staples shall be spaced at not more than 10″ o.c. at intermediate supports for floors.

[5] Apply vertically 4′ x 8′ or 4′ x 9′ panels.

UDC Floor & Ceiling Joist and Roof Rafter Span Tables and Design Value Tables

Use the following Span Tables to determine the maximum spans for floor and ceiling joists and roof rafters. These spans are based on:

- Simple, single spans (although the tables may be safely used for continuous two−span floor joists)
- Uniformly distributed loads
- Fully supported members with one edge properly sheathed and nailed
- For floor joists and roof rafters, the top edge shall be properly sheathed and nailed
- Rafters with a minimum 3:12 slope

The criteria for each Span Table is given in the upper left hand corner and is also summarized in the table of Span Tables below. Choose the appropriate Span Table based on the member type and required loading. Select your desired member depth, member spacing and span to determine the minimum Fb value. Note that these tables include recommended deflection criteria. However, for strict code compliance, only the Fb strength requirements must be satisfied. The modulus of elasticity (E) values, would be met for serviceability purposes only.

Note that straight−line interpolation is permitted for intermediate spans and design values. Span is measured from face to face of supports plus one−half of the required bearing of 1.5″ on wood or metal and 3″ on masonry or concrete at each end. For sloping rafters, the span is measured along the horizontal projection.

Section SPS 321.27 allows reduction of the snow live load for roof slopes greater than 30 degrees (7/12 slope) based on the formula Cs = 1 − (a−30)/40, where "a" is the slope of the roof expressed in degrees. Following is a table of tabulated values for certain roof slopes.

Slope	Angle in Degrees	Zone 1 Live Load (psf)	Zone 2 Live Load (psf)
7/12	30	40	30
10/12	40	30	22.5
12/12	45	25	18.8
14/12	50	20	15

Use the Design Value tables following the Span Tables to determine the acceptable species and grades to satisfy minimum Fb values obtained from the Span Tables. The Design Value tables assume at least three members spaced no more than 24″ on center. Use the Normal Duration column Fb values for joists and the Snow Loading column Fb values for rafters.

See the following examples for further guidance.

Tables are reprinted courtesy of American Forest & Paper Association.

Table No.	Member Type	Live Load (psf)	Dead Load (psf)	Condition	(Deflection)*
F–2	Floor Joists	40	10	–	L/360
C–1	Ceiling Joists	10	5	Drywall ceiling, no attic storage	L/240
C–2	Ceiling Joists	20	10	Attic storage	L/240
R–2	Roof Rafters	30 (Zone 2)	10	Maximum 2 layers of asphalt shingles or wood shakes/shingles	L/240
R–3	Roof Rafters	40 (Zone 1)	10	Maximum 2 layers of asphalt shingles or wood shakes/shingles	L/240
R–10	Roof Rafters	30 (Zone 2)	20	Heavy roof covering (clay tile)	L/240
R–11	Roof Rafters	40 (Zone 1)	20	Heavy roof covering (clay tile)	L/240
R–14	Roof Rafters	30 (Zone 2)	10	Maximum 2 layers of asphalt shingles or wood shakes/shingles	L/180
R–15	Roof Rafters	40 (Zone 1)	10	Maximum 2 layers of asphalt shingles or wood shakes/shingles	L/180
R–22	Roof Rafters	30 (Zone 2)	20	Heavy roof covering (clay tile)	L/180
R–23	Roof Rafters	40 (Zone 1)	20	Heavy roof covering (clay tile)	L/180

*Deflection criteria are optional. For roof rafters with drywall on the underside, use the stricter L/240 tables to limit deflection.

Example 1. Floor Joists. Assume a required single span of 12′–9″, dead load of 10 psf and joists spaced 16″ on center. Table F–2 (see following highlighted tables) shows that one solution is a grade of 2x8 having an Fb value of 1255 would allow a span of 12′–10″ which satisfies the condition. (Note that the recommended E value to limit deflection would be 1,600,000.) Going to the Design Value Tables, we find that as an example, 2x8 Hem Fir grade No.1 has an Fb value of 1310 for normal duration. (It also has an E value of 1,500,000 which does not satisfy the recommended deflection criteria.)

Example 2. Rafters. Assume a horizontal projected span of 13′–0″, a live load of 40 psf, dead load of 10 psf, a roof slope of 4/12 and rafters spaced 16″ on center. Since the slope is shallower than 7/12, there is no allowable reduction of the snow live load. Table R–3 shows that a 2x8 having an Fb value of 1300 would allow a span of 13′–1″ which satisfies the condition. (Note that the recommended E value to limit deflection would be 1,120,000.) Going to the Design Value Tables, we find that as an example, 2x8 Douglas Fir–Larch grade No.2 has an Fb value of 1390 for snow loading. (It also has an E value of 1,600,000 which satisfies the recommended deflection criteria.)

Example 1

TABLE F- 2
FLOOR JOISTS WITH L/360 DEFLECTION LIMITS

DESIGN CRITERIA:
Deflection - For 40 psf live load.
Limited to span in inches divided by 360.
Strength - Live load of 40 psf plus dead load
of 10 psf determines the required bending design value.

Joist Size (in)	Spacing (in)	Modulus of Elasticity, E, in 1,000,000 psi																
		0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4
2x 6	12.0	8- 6	8-10	9- 2	9- 6	9- 9	10- 0	10- 3	10- 6	10- 9	10-11	11- 2	11- 4	11- 7	11- 9	11-11	12- 1	12- 3
	16.0	7- 9	8- 0	8- 4	8- 7	8-10	9- 1	9- 4	9- 6	9- 9	9-11	10- 2	10- 4	10- 6	10- 8	10-10	11- 0	11- 2
	19.2	7- 3	7- 7	7-10	8- 1	8- 4	8- 7	8- 9	9- 0	9- 2	9- 4	9- 6	9- 8	9-10	10- 0	10- 2	10- 4	10- 6
	24.0	6- 9	7- 0	7- 3	7- 6	7- 9	7-11	8- 2	8- 4	8- 6	8- 8	8-10	9- 0	9- 2	9- 4	9- 6	9- 7	9- 9
2x 8	12.0	11- 3	11- 8	12- 1	12- 6	12-10	13- 2	13- 6	13-10	14- 2	14- 5	14- 8	15- 0	15- 3	15- 6	15- 9	15-11	16- 2
	16.0	10- 2	10- 7	11- 0	11- 4	11- 8	12- 0	12- 3	12- 7	12-10	13- 1	13- 4	13- 7	13-10	14- 1	14- 3	14- 6	14- 8
	19.2	9- 7	10- 0	10- 4	10- 8	11- 0	11- 3	11- 7	11-10	12- 1	12- 4	12- 7	12-10	13- 0	13- 3	13- 5	13- 8	13-10
	24.0	8-11	9- 3	9- 7	9-11	10- 2	10- 6	10- 9	11- 0	11- 3	11- 5	11- 8	11-11	12- 1	12- 3	12- 6	12- 8	12-10
2x10	12.0	14- 4	14-11	15- 5	15-11	16- 5	16-10	17- 3	17- 8	18- 0	18- 5	18- 9	19- 1	19- 5	19- 9	20- 1	20- 4	20- 8
	16.0	13- 0	13- 6	14- 0	14- 6	14-11	15- 3	15- 8	16- 0	16- 5	16- 9	17- 0	17- 4	17- 8	17-11	18- 3	18- 6	18- 9
	19.2	12- 3	12- 9	13- 2	13- 7	14- 0	14- 5	14- 9	15- 1	15- 5	15- 9	16- 0	16- 4	16- 7	16-11	17- 2	17- 5	17- 8
	24.0	11- 4	11-10	12- 3	12- 8	13- 0	13- 4	13- 8	14- 0	14- 4	14- 7	14-11	15- 2	15- 5	15- 8	15-11	16- 2	16- 5
2x12	12.0	17- 5	18- 1	18- 9	19- 4	19-11	20- 6	21- 0	21- 6	21-11	22- 5	22-10	23- 3	23- 7	24- 0	24- 5	24- 9	25- 1
	16.0	15-10	16- 5	17- 0	17- 7	18- 1	18- 7	19- 1	19- 6	19-11	20- 4	20- 9	21- 1	21- 6	21-10	22- 2	22- 6	22-10
	19.2	14-11	15- 6	16- 0	16- 7	17- 0	17- 6	17-11	18- 4	18- 9	19- 2	19- 6	19-10	20- 2	20- 6	20-10	21- 2	21- 6
	24.0	13-10	14- 4	14-11	15- 4	15-10	16- 3	16- 8	17- 0	17- 5	17- 9	18- 1	18- 5	18- 9	19- 1	19- 4	19- 8	19-11
F_b	12.0	718	777	833	888	941	993	1043	1092	1140	1187	1233	1278	1323	1367	1410	1452	1494
F_b	16.0	790	855	917	977	1036	1093	1148	1202	1255	1306	1357	1407	1456	1504	1551	1598	1644
F_b	19.2	840	909	975	1039	1101	1161	1220	1277	1333	1388	1442	1495	1547	1598	1649	1698	1747
F_b	24.0	905	979	1050	1119	1186	1251	1314	1376	1436	1496	1554	1611	1667	1722	1776	1829	1882

Note: The required bending design value, F_b, in pounds per square inch is shown at the bottom of each table and is applicable to all lumber sizes shown. Spans are shown in feet-inches and are limited to 26' and less. Check sources of supply for availability of lumber in lengths greater than 20'.

Example 1

Species and Grade	Size	Design Value in Bending, "Fb"		Modulus of Elasticity "E"	Grading Rules Agency
		Normal Duration	Snow Loading		
Eastern White Pine					
Select Structural	2x4	2155	2480	1,200,000	NELMA NSLB
No.1		1335	1535	1,100,000	
No.2		990	1140	1,100,000	
No.3		605	695	900,000	
Stud		570	655	900,000	
Construction		775	895	1,000,000	
Standard		430	495	900,000	
Utility		200	230	800,000	
Select Structural	2x6	1870	2150	1,200,000	
No.1		1160	1330	1,100,000	
No.2		860	990	1,100,000	
No.3		525	600	900,000	
Stud		520	595	900,000	
Select Structural	2x8	1725	1985	1,200,000	
No.1		1070	1230	1,100,000	
No.2		795	915	1,100,000	
No.3		485	555	900,000	
Select Structural	2x10	1580	1820	1,200,000	
No.1		980	1125	1,100,000	
No.2		725	835	1,100,000	
No.3		445	510	900,000	
Select Structural	2x12	1440	1655	1,200,000	
No.1		890	1025	1,100,000	
No.2		660	760	1,100,000	
No.3		405	465	900,000	
Hem Fir					
Select Structural	2x4	2415	2775	1,600,000	WCLIB WWPA
No.1 & Btr		1810	2085	1,500,000	
No.1		1640	1885	1,500,000	
No.2		1465	1685	1,300,000	
No.3		865	990	1,200,000	
Stud		855	980	1,200,000	
Construction		1120	1290	1,300,000	
Standard		635	725	1,200,000	
Utility		290	330	1,100,000	
Select Structural	2x6	2095	2405	1,600,000	
No.1 & Btr		1570	1805	1,500,000	
No.1		1420	1635	1,500,000	
No.2		1270	1460	1,300,000	
No.3		750	860	1,200,000	
Stud		775	895	1,200,000	
Select Structural	2x8	1930	2220	1,600,000	
No.1 & Btr		1450	1665	1,500,000	
No.1		1310	1510	1,500,000	
No.2		1175	1350	1,300,000	
No.3		690	795	1,200,000	
Select Structural	2x10	1770	2035	1,600,000	
No.1 & Btr		1330	1525	1,500,000	
No.1		1200	1380	1,500,000	
No.2		1075	1235	1,300,000	
No.3		635	725	1,200,000	
Select Structural	2x12	1610	1850	1,600,000	
No.1 & Btr		1210	1390	1,500,000	
No.1		1095	1255	1,500,000	
No.2		980	1125	1,300,000	
No.3		575	660	1,200,000	

Example 2

TABLE R-3

RAFTERS WITH L/240 DEFLECTION LIMITATION

DESIGN CRITERIA:
Strength - Live Load of 40 psf plus
Dead Load of 10 psf determines the required bending design value.
Deflection - For 40 psf live load.
Limited to span in inches divided by 240.

Size (in)	Spacing (in)	Rafter Bending Design Value, F_b, (psi)																				
		300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400
2x 6	12.0	5- 6	6- 4	7- 1	7- 9	8- 5	9- 0	9- 6	10- 0	10- 6	11- 0	11- 5	11-11	12- 4	12- 8	13- 1	13- 6	13-10	14- 2				
	16.0	4- 9	5- 6	6- 2	6- 9	7- 3	7- 9	8- 3	8- 8	9- 1	9- 6	9-11	10- 3	10- 8	11- 0	11- 4	11- 8	12- 0	12- 4	12- 7	12-11		
	19.2	4- 4	5- 0	5- 7	6- 2	6- 8	7- 1	7- 6	7-11	8- 4	8- 8	9- 1	9- 5	9- 9	10- 0	10- 4	10- 8	10-11	11- 3	11- 6	11- 9	12- 0	12- 4
	24.0	3-11	4- 6	5- 0	5- 6	5-11	6- 4	6- 9	7- 1	7- 5	7- 9	8- 1	8- 5	8- 8	9- 0	9- 3	9- 6	9- 9	10- 0	10- 3	10- 6	10- 9	11- 0
2x 8	12.0	7- 3	8- 4	9- 4	10- 3	11- 1	11-10	12- 7	13- 3	13-11	14- 6	15- 1	15- 8	16- 3	16- 9	17- 3	17- 9	18- 3	18- 9				
	16.0	6- 3	7- 3	8- 1	8-11	9- 7	10- 3	10-10	11- 6	12- 0	12- 7	13- 1	13- 7	14- 0	14- 6	14-11	15- 5	15-10	16- 3	16- 7	17- 0		
	19.2	5- 9	6- 7	7- 5	8- 1	8- 9	9- 4	9-11	10- 6	11- 0	11- 6	11-11	12- 5	12-10	13- 3	13- 8	14- 0	14- 5	14-10	15- 2	15- 6	15-10	16- 3
	24.0	5- 2	5-11	6- 7	7- 3	7-10	8- 4	8-11	9- 4	9-10	10- 3	10- 8	11- 1	11- 6	11-10	12- 2	12- 7	12-11	13- 3	13- 7	13-11	14- 2	14- 6
2x10	12.0	9- 3	10- 8	11-11	13- 1	14- 2	15- 1	16- 0	16-11	17- 9	18- 6	19- 3	20- 0	20- 8	21- 4	22- 0	22- 8	23- 3	23-11				
	16.0	8- 0	9- 3	10- 4	11- 4	12- 3	13- 1	13-10	14- 8	15- 4	16- 0	16- 8	17- 4	17-11	18- 6	19- 1	19- 7	20- 2	20- 8	21- 2	21- 8		
	19.2	7- 4	8- 5	9- 5	10- 4	11- 2	11-11	12- 8	13- 4	14- 0	14- 8	15- 3	15-10	16- 4	16-11	17- 5	17-11	18- 5	18-11	19- 4	19-10	20- 3	20- 8
	24.0	6- 6	7- 7	8- 5	9- 3	10- 0	10- 8	11- 4	11-11	12- 6	13- 1	13- 7	14- 2	14- 8	15- 1	15- 7	16- 0	16- 6	16-11	17- 4	17- 9	18- 1	18- 6
2x12	12.0	11- 3	13- 0	14- 6	15-11	17- 2	18- 4	19- 6	20- 6	21- 7	22- 6	23- 5	24- 4	25- 2	26- 0								
	16.0	9- 9	11- 3	12- 7	13- 9	14-11	15-11	16-10	17- 9	18- 8	19- 6	20- 3	21- 1	21- 9	22- 6	23- 2	23-10	24- 6	25- 2	25- 9			
	19.2	8-11	10- 3	11- 6	12- 7	13- 7	14- 6	15- 5	16- 3	17- 0	17- 9	18- 6	19- 3	19-11	20- 6	21- 2	21- 9	22- 5	23- 0	23- 6	24- 1	24- 8	25- 2
	24.0	7-11	9- 2	10- 3	11- 3	12- 2	13- 0	13- 9	14- 6	15- 3	15-11	16- 7	17- 2	17- 9	18- 4	18-11	19- 6	20- 0	20- 6	21- 1	21- 7	22- 0	22- 6
E	12.0	0.14	0.22	0.31	0.41	0.51	0.63	0.75	0.88	1.01	1.15	1.30	1.45	1.61	1.77	1.94	2.12	2.30	2.48				
E	16.0	0.12	0.19	0.27	0.35	0.44	0.54	0.65	0.76	0.88	1.00	1.12	1.26	1.39	1.54	1.68	1.83	1.99	2.15	2.31	2.48		
E	19.2	0.11	0.18	0.24	0.32	0.41	0.50	0.59	0.69	0.80	0.91	1.03	1.15	1.27	1.40	1.54	1.67	1.81	1.96	2.11	2.26	2.42	2.58
E	24.0	0.10	0.16	0.22	0.29	0.36	0.44	0.53	0.62	0.71	0.81	0.92	1.03	1.14	1.25	1.37	1.50	1.62	1.75	1.89	2.02	2.16	2.30

Note: The required modulus of elasticity, E, in 1,000,000 pounds per square inch is shown at the bottom of each table, is limited to 2.6 million psi and less, and is applicable to all lumber sizes shown. Spans are shown in feet-inches and are limited to 26' and less. Check sources of supply for availability of lumber in lengths greater than 20'.

Example 2

Species and Grade	Size	Design Value in Bending, "Fb"		Modulus of Elasticity "E"	Grading Rules Agency
		Normal Duration	Snow Loading		
Cottonwood					
Select Structural	2x4	1510	1735	1,200,000	NSLB
No.1		1080	1240	1,200,000	
No.2		1080	1240	1,100,000	
No.3		605	695	1,000,000	
Stud		600	690	1,000,000	
Construction		805	925	1,000,000	
Standard		460	530	900,000	
Utility		200	230	900,000	
Select Structural	2x6	1310	1505	1,200,000	
No.1		935	1075	1,200,000	
No.2		935	1075	1,100,000	
No.3		525	600	1,000,000	
Stud		545	630	1,000,000	
Select Structural	2x8	1210	1390	1,200,000	
No.1		865	990	1,200,000	
No.2		865	990	1,100,000	
No.3		485	555	1,000,000	
Select Structural	2x10	1105	1275	1,200,000	
No.1		790	910	1,200,000	
No.2		790	910	1,100,000	
No.3		445	510	1,000,000	
Select Structural	2x12	1005	1155	1,200,000	
No.1		720	825	1,200,000	
No.2		720	825	1,100,000	
No.3		405	465	1,000,000	
Douglas Fir-Larch					
Select Structural	2x4	2500	2875	1,900,000	WCLIB WWPA
No.1 & Btr		1985	2280	1,800,000	
No.1		1725	1985	1,700,000	
No.2		1510	1735	1,600,000	
No.3		865	990	1,400,000	
Stud		855	980	1,400,000	
Construction		1150	1325	1,500,000	
Standard		635	725	1,400,000	
Utility		315	365	1,300,000	
Select Structural	2x6	2170	2495	1,900,000	
No.1 & Btr		1720	1975	1,800,000	
No.1		1495	1720	1,700,000	
No.2		1310	1505	1,600,000	
No.3		750	860	1,400,000	
Stud		775	895	1,400,000	
Select Structural	2x8	2000	2300	1,900,000	
No.1 & Str		1585	1825	1,800,000	
No.1		1380	1585	1,700,000	
No.2		1210	1390	1,600,000	
No.3		690	795	1,400,000	
Select Structural	2x10	1835	2110	1,900,000	
No.1 & Btr		1455	1675	1,800,000	
No.1		1265	1455	1,700,000	
No.2		1105	1275	1,600,000	
No.3		635	725	1,400,000	
Select Structural	2x12	1670	1920	1,900,000	
No.1 & Btr		1325	1520	1,800,000	
No.1		1150	1325	1,700,000	
No.2		1005	1155	1,600,000	
No.3		575	660	1,400,000	

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TABLE F– 2
FLOOR JOISTS WITH L/360 DEFLECTION LIMITS

DESIGN CRITERIA:
Deflection – For 40 psf live load.
Limited to span in inches divided by 360.
Strength – Live load of 40 psf plus dead load
of 10 psf determines the required bending design value.

Joist Size (in)	Spacing (in)	Modulus of Elasticity, E, in 1,000,000 psi																
		0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4
	12.0	8– 6	8–10	9– 2	9– 6	9– 9	10– 0	10– 3	10– 6	10– 9	10–11	11– 2	11– 4	11– 7	11– 9	11–11	12– 1	12– 3
	16.0	7– 9	8– 0	8– 4	8– 7	8–10	9– 1	9– 4	9– 6	9– 9	9–11	10– 2	10– 4	10– 6	10– 8	10–10	11– 0	11– 2
2x 6	19.2	7– 3	7– 7	7–10	8– 1	8– 4	8– 7	8– 9	9– 0	9– 2	9– 4	9– 6	9– 8	9–10	10– 0	10– 2	10– 4	10– 6
	24.0	6– 9	7– 0	7– 3	7– 6	7– 9	7–11	8– 2	8– 4	8– 6	8– 8	8–10	9– 0	9– 2	9– 4	9– 6	9– 7	9– 9
	12.0	11– 3	11– 8	12– 1	12– 6	12–10	13– 2	13– 6	13–10	14– 2	14– 5	14– 8	15– 0	15– 3	15– 6	15– 9	15–11	16– 2
	16.0	10– 2	10– 7	11– 0	11– 4	11– 8	12– 0	12– 3	12– 7	12–10	13– 1	13– 4	13– 7	13–10	14– 1	14– 3	14– 6	14– 8
2x 8	19.2	9– 7	10– 0	10– 4	10– 8	11– 0	11– 3	11– 7	11–10	12– 1	12– 4	12– 7	12–10	13– 0	13– 3	13– 5	13– 8	13–10
	24.0	8–11	9– 3	9– 7	9–11	10– 2	10– 6	10– 9	11– 0	11– 3	11– 5	11– 8	11–11	12– 1	12– 3	12– 6	12– 8	12–10
	12.0	14– 4	14–11	15– 5	15–11	16– 5	16–10	17– 3	17– 8	18– 0	18– 5	18– 9	19– 1	19– 5	19– 9	20– 1	20– 4	20– 8
	16.0	13– 0	13– 6	14– 0	14– 6	14–11	15– 3	15– 8	16– 0	16– 5	16– 9	17– 0	17– 4	17– 8	17–11	18– 3	18– 6	18– 9
2x10	19.2	12– 3	12– 9	13– 2	13– 7	14– 0	14– 5	14– 9	15– 1	15– 5	15– 9	16– 0	16– 4	16– 7	16–11	17– 2	17– 5	17– 8
	24.0	11– 4	11–10	12– 3	12– 8	13– 0	13– 4	13– 8	14– 0	14– 4	14– 7	14–11	15– 2	15– 5	15– 8	15–11	16– 2	16– 5
	12.0	17– 5	18– 1	18– 9	19– 4	19–11	20– 6	21– 0	21– 6	21–11	22– 5	22–10	23– 3	23– 7	24– 0	24– 5	24– 9	25– 1
	16.0	15–10	16– 5	17– 0	17– 7	18– 1	18– 7	19– 1	19– 6	19–11	20– 4	20– 9	21– 1	21– 6	21–10	22– 2	22– 6	22–10
2x12	19.2	14–11	15– 6	16– 0	16– 7	17– 0	17– 6	17–11	18– 4	18– 9	19– 2	19– 6	19–10	20– 2	20– 6	20–10	21– 2	21– 6
	24.0	13–10	14– 4	14–11	15– 4	15–10	16– 3	16– 8	17– 0	17– 5	17– 9	18– 1	18– 5	18– 9	19– 1	19– 4	19– 8	19–11
F_b	12.0	718	777	833	888	941	993	1043	1092	1140	1187	1233	1278	1323	1367	1410	1452	1494
F_b	16.0	790	855	917	977	1036	1093	1148	1202	1255	1306	1357	1407	1456	1504	1551	1598	1644
F_b	19.2	840	909	975	1039	1101	1161	1220	1277	1333	1388	1442	1495	1547	1598	1649	1698	1747
F_b	24.0	905	979	1050	1119	1186	1251	1314	1376	1436	1496	1554	1611	1667	1722	1776	1829	1882

Note: The required bending design value, F_b, in pounds per square inch is shown at the bottom of each table and is applicable to all lumber sizes shown. Spans are shown in feet–inches and are limited to 26′ and less. Check sources of supply for availability of lumber in lengths greater than 20′.

TABLE C–1
CEILING JOISTS WITH L/240 DEFLECTION LIMITS

DESIGN CRITERIA:
Deflection – For 10 psf live load.
Limited to span in inches divided by 240.
Strength – Live Load of 10 psf plus
dead load of 5 psf determines the required fiber stress value.

Joist Size (in)	Spacing (in)	Modulus of Elasticity, E, in 1,000,000 psi																
		0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4
	12.0	9–10	10– 3	10– 7	10–11	11– 3	11– 7	11–10	12– 2	12– 5	12– 8	12–11	13– 2	13– 4	13– 7	13– 9	14– 0	14– 2
	16.0	8–11	9– 4	9– 8	9–11	10– 3	10– 6	10– 9	11– 0	11– 3	11– 6	11– 9	11–11	12– 2	12– 4	12– 6	12– 9	12–11
2x 4	19.2	8– 5	8– 9	9– 1	9– 4	9– 8	9–11	10– 2	10– 4	10– 7	10–10	11– 0	11– 3	11– 5	11– 7	11– 9	12– 0	12– 2
	24.0	7–10	8– 1	8– 5	8– 8	8–11	9– 2	9– 5	9– 8	9–10	10– 0	10– 3	10– 5	10– 7	10– 9	10–11	11– 1	11– 3
	12.0	15– 6	16– 1	16– 8	17– 2	17– 8	18– 2	18– 8	19– 1	19– 6	19–11	20– 3	20– 8	21– 0	21– 4	21– 8	22– 0	22– 4
	16.0	14– 1	14– 7	15– 2	15– 7	16– 1	16– 6	16–11	17– 4	17– 8	18– 1	18– 5	18– 9	19– 1	19– 5	19– 8	20– 0	20– 3
2x 6	19.2	13– 3	13– 9	14– 3	14– 8	15– 2	15– 7	15–11	16– 4	16– 8	17– 0	17– 4	17– 8	17–11	18– 3	18– 6	18–10	19– 1
	24.0	12– 3	12– 9	13– 3	13– 8	14– 1	14– 5	14– 9	15– 2	15– 6	15– 9	16– 1	16– 4	16– 8	16–11	17– 2	17– 5	17– 8
	12.0	20– 5	21– 2	21–11	22– 8	23– 4	24– 0	24– 7	25– 2	25– 8								
	16.0	18– 6	19– 3	19–11	20– 7	21– 2	21– 9	22– 4	22–10	23– 4	23–10	24– 3	24– 8	25– 2	25– 7	25–11		
2x 8	19.2	17– 5	18– 1	18– 9	19– 5	19–11	20– 6	21– 0	21– 6	21–11	22– 5	22–10	23– 3	23– 8	24– 0	24– 5	24– 9	25– 2
	24.0	16– 2	16–10	17– 5	18– 0	18– 6	19– 0	19– 6	19–11	20– 5	20–10	21– 2	21– 7	21–11	22– 4	22– 8	23– 0	23– 4
	12.0	26– 0																
	16.0	23– 8	24– 7	25– 5														
2x10	19.2	22– 3	23– 1	23–11	24– 9	25– 5												
	24.0	20– 8	21– 6	22– 3	22–11	23– 8	24– 3	24–10	25– 5	26– 0								
F_b	12.0	711	769	825	880	932	983	1033	1082	1129	1176	1221	1266	1310	1354	1396	1438	1480
F_b	16.0	783	847	909	968	1026	1082	1137	1191	1243	1294	1344	1394	1442	1490	1537	1583	1629
F_b	19.2	832	900	965	1029	1090	1150	1208	1265	1321	1375	1429	1481	1533	1583	1633	1682	1731
F_b	24.0	896	969	1040	1108	1174	1239	1302	1363	1423	1481	1539	1595	1651	1706	1759	1812	1864

Note: The required bending design value, F_b, in pounds per square inch is shown at the bottom of each table and is applicable to all lumber sizes shown. Spans are shown in feet–inches and are limited to 26′ and less. Check sources of supply for availability of lumber in lengths greater than 20′.

TABLE C–2
CEILING JOISTS WITH L/240 DEFLECTION LIMITS

DESIGN CRITERIA:
Deflection – For 20 psf live load.
Limited to span in inches divided by 240.
Strength – Live Load of 20 psf plus
dead load of 10 psf determines the required bending design value.

Size (in)	Spacing (in)	Joist Modulus of Elasticity, E, in 1,000,000 psi															
		0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4
	12.0	7–10	8– 1	8– 5	8– 8	8–11	9– 2	9– 5	9– 8	9–10	10– 0	10– 3	10– 5	10– 7	10– 9	10–11	11– 1	11– 3
	16.0	7– 1	7– 5	7– 8	7–11	8– 1	8– 4	8– 7	8– 9	8–11	9– 1	9– 4	9– 6	9– 8	9– 9	9–11	10– 1	10– 3
2x 4	19.2	6– 8	6–11	7– 2	7– 5	7– 8	7–10	8– 1	8– 3	8– 5	8– 7	8– 9	8–11	9– 1	9– 3	9– 4	9– 6	9– 8
	24.0	6– 2	6– 5	6– 8	6–11	7– 1	7– 3	7– 6	7– 8	7–10	8– 0	8– 1	8– 3	8– 5	8– 7	8– 8	8–10	8–11
	12.0	12– 3	12– 9	13– 3	13– 8	14– 1	14– 5	14– 9	15– 2	15– 6	15– 9	16– 1	16– 4	16– 8	16–11	17– 2	17– 5	17– 8
	16.0	11– 2	11– 7	12– 0	12– 5	12– 9	13– 1	13– 5	13– 9	14– 1	14– 4	14– 7	14–11	15– 2	15– 5	15– 7	15–10	16– 1
2x 6	19.2	10– 6	10–11	11– 4	11– 8	12– 0	12– 4	12– 8	12–11	13– 3	13– 6	13– 9	14– 0	14– 3	14– 6	14– 8	14–11	15– 2
	24.0	9– 9	10– 2	10– 6	10–10	11– 2	11– 5	11– 9	12– 0	12– 3	12– 6	12– 9	13– 0	13– 3	13– 5	13– 8	13–10	14– 1
	12.0	16– 2	16–10	17– 5	18– 0	18– 6	19– 0	19– 6	19–11	20– 5	20–10	21– 2	21– 7	21–11	22– 4	22– 8	23– 0	23– 4
	16.0	14– 8	15– 3	15–10	16– 4	16–10	17– 3	17– 9	18– 1	18– 6	18–11	19– 3	19– 7	19–11	20– 3	20– 7	20–11	21– 2
2x 8	19.2	13–10	14– 5	14–11	15– 5	15–10	16– 3	16– 8	17– 1	17– 5	17– 9	18– 1	18– 5	18– 9	19– 1	19– 5	19– 8	19–11
	24.0	12–10	13– 4	13–10	14– 3	14– 8	15– 1	15– 6	15–10	16– 2	16– 6	16–10	17– 2	17– 5	17– 9	18– 0	18– 3	18– 6
	12.0	20– 8	21– 6	22– 3	22–11	23– 8	24– 3	24–10	25– 5	26– 0								
	16.0	18– 9	19– 6	20– 2	20–10	21– 6	22– 1	22– 7	23– 1	23– 8	24– 1	24– 7	25– 0	25– 5	25–10			
2x10	19.2	17– 8	18– 4	19– 0	19– 7	20– 2	20– 9	21– 3	21– 9	22– 3	22– 8	23– 1	23– 7	23–11	24– 4	24– 9	25– 1	25– 5
	24.0	16– 5	17– 0	17– 8	18– 3	18– 9	19– 3	19– 9	20– 2	20– 8	21– 1	21– 6	21–10	22– 3	22– 7	22–11	23– 4	23– 8
F_b	12.0	896	969	1040	1108	1174	1239	1302	1363	1423	1481	1539	1595	1651	1706	1759	1812	1864
F_b	16.0	986	1067	1145	1220	1293	1364	1433	1500	1566	1631	1694	1756	1817	1877	1936	1995	2052
F_b	19.2	1048	1134	1216	1296	1374	1449	1522	1594	1664	1733	1800	1866	1931	1995	2058	2120	2181
F_b	24.0	1129	1221	1310	1396	1480	1561	1640	1717	1793	1866	1939	2010	2080	2149	2217	2283	2349

Note: The required bending design value, F_b, in pounds per square inch is shown at the bottom of each table and is applicable to all lumber sizes shown. Spans are shown in feet–inches and are limited to 26′ and less. Check sources of supply for availability of lumber in lengths greater than 20′.

TABLE R–2
RAFTERS WITH L/240 DEFLECTION LIMITATION

DESIGN CRITERIA:
Strength – Live Load of 30 psf plus
Dead Load of 10 psf determines the required bending design value.
Deflection – For 30 psf live load.
Limited to span in inches divided by 240.

Size (in)	Spacing (in)	Rafter Bending Design Value, F_b, (psi)																				
		300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400
	12.0	6– 2	7– 1	7–11	8– 8	9– 5	10– 0	10– 8	11– 3	11– 9	12– 4	12–10	13– 3	13– 9	14– 2	14– 8	15– 1	15– 6	15–11				
	16.0	5– 4	6– 2	6–10	7– 6	8– 2	8– 8	9– 3	9– 9	10– 2	10– 8	11– 1	11– 6	11–11	12– 4	12– 8	13– 1	13– 5	13– 9	14– 1	14– 5		
2x 6	19.2	4–10	5– 7	6– 3	6–10	7– 5	7–11	8– 5	8–11	9– 4	9– 9	10– 1	10– 6	10–10	11– 3	11– 7	11–11	12– 3	12– 7	12–10	13– 2	13– 6	
	24.0	4– 4	5– 0	5– 7	6– 2	6– 8	7– 1	7– 6	7–11	8– 4	8– 8	9– 1	9– 5	9– 9	10– 0	10– 4	10– 8	10–11	11– 3	11– 6	11– 9	12– 0	12– 4
	12.0	8– 1	9– 4	10– 6	11– 6	12– 5	13– 3	14– 0	14–10	15– 6	16– 3	16–10	17– 6	18– 1	18– 9	19– 4	19–10	20– 5	20–11				
	16.0	7– 0	8– 1	9– 1	9–11	10– 9	11– 6	12– 2	12–10	13– 5	14– 0	14– 7	15– 2	15– 8	16– 3	16– 9	17– 2	17– 8	18– 1	18– 7	19– 0		
2x 8	19.2	6– 5	7– 5	8– 3	9– 1	9– 9	10– 6	11– 1	11– 8	12– 3	12–10	13– 4	13–10	14– 4	14–10	15– 3	15– 8	16– 2	16– 7	16–11	17– 4	17– 9	
	24.0	5– 9	6– 7	7– 5	8– 1	8– 9	9– 4	9–11	10– 6	11– 0	11– 6	11–11	12– 5	12–10	13– 3	13– 8	14– 0	14– 5	14–10	15– 2	15– 6	15–10	16– 3
	12.0	10– 4	11–11	13– 4	14– 8	15–10	16–11	17–11	18–11	19–10	20– 8	21– 6	22– 4	23– 1	23–11	24– 7	25– 4	26– 0					
	16.0	8–11	10– 4	11– 7	12– 8	13– 8	14– 8	15– 6	16– 4	17– 2	17–11	18– 8	19– 4	20– 0	20– 8	21– 4	21–11	22– 6	23– 1	23– 8	24– 3		
2x10	19.2	8– 2	9– 5	10– 7	11– 7	12– 6	13– 4	14– 2	14–11	15– 8	16– 4	17– 0	17– 8	18– 3	18–11	19– 6	20– 0	20– 7	21– 1	21– 8	22– 2	22– 8	
	24.0	7– 4	8– 5	9– 5	10– 4	11– 2	11–11	12– 8	13– 4	14– 0	14– 8	15– 3	15–10	16– 4	16–11	17– 5	17–11	18– 5	18–11	19– 4	19–10	20– 3	20– 8
	12.0	12– 7	14– 6	16– 3	17– 9	19– 3	20– 6	21– 9	23– 0	24– 1	25– 2												
	16.0	10–11	12– 7	14– 1	15– 5	16– 8	17– 9	18–10	19–11	20–10	21– 9	22– 8	23– 6	24– 4	25– 2	25–11							
2x12	19.2	9–11	11– 6	12–10	14– 1	15– 2	16– 3	17– 3	18– 2	19– 0	19–11	20– 8	21– 6	22– 3	23– 0	23– 8	24– 4	25– 0	25– 8				
	24.0	8–11	10– 3	11– 6	12– 7	13– 7	14– 6	15– 5	16– 3	17– 0	17– 9	18– 6	19– 3	19–11	20– 6	21– 2	21– 9	22– 5	23– 0	23– 6	24– 1	24– 8	25– 2
E	12.0	0.15	0.23	0.32	0.43	0.54	0.66	0.78	0.92	1.06	1.21	1.36	1.52	1.69	1.86	2.04	2.22	2.41	2.60				
E	16.0	0.13	0.20	0.28	0.37	0.47	0.57	0.68	0.80	0.92	1.05	1.18	1.32	1.46	1.61	1.76	1.92	2.08	2.25	2.42	2.60		
E	19.2	0.12	0.18	0.26	0.34	0.43	0.52	0.62	0.73	0.84	0.95	1.08	1.20	1.33	1.47	1.61	1.75	1.90	2.05	2.21	2.37	2.53	
E	24.0	0.11	0.16	0.23	0.30	0.38	0.46	0.55	0.65	0.75	0.85	0.96	1.08	1.19	1.31	1.44	1.57	1.70	1.84	1.98	2.12	2.27	2.41

Note: The required modulus of elasticity, E, in 1,000,000 pounds per square inch is shown at the bottom of each table, is limited to 2.6 million psi and less, and is applicable to all lumber sizes shown. Spans are shown in feet–inches and are limited to 26′ and less. Check sources of supply for availability of lumber in lengths greater than 20′.

TABLE R–3
RAFTERS WITH L/240 DEFLECTION LIMITATION

DESIGN CRITERIA:
Strength – Live Load of 40 psf plus
Dead Load of 10 psf determines the required bending design value.
Deflection – For 40 psf live load.
Limited to span in inches divided by 240.

Size (in)	Spacing (in)	Rafter Bending Design Value, F_b, (psi)																				
		300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400
	12.0	5–6	6–4	7–1	7–9	8–5	9–0	9–6	10–0	10–6	11–0	11–5	11–11	12–4	12–8	13–1	13–6	13–10	14–2				
	16.0	4–9	5–6	6–2	6–9	7–3	7–9	8–3	8–8	9–1	9–6	9–11	10–3	10–8	11–0	11–4	11–8	12–0	12–4	12–7	12–11		
2x 6	19.2	4–4	5–0	5–7	6–2	6–8	7–1	7–6	7–11	8–4	8–8	9–1	9–5	9–9	10–0	10–4	10–8	10–11	11–3	11–6	11–9	12–0	12–4
	24.0	3–11	4–6	5–0	5–6	5–11	6–4	6–9	7–1	7–5	7–9	8–1	8–5	8–8	9–0	9–3	9–6	9–9	10–0	10–3	10–6	10–9	11–0
	12.0	7–3	8–4	9–4	10–3	11–1	11–10	12–7	13–3	13–11	14–6	15–1	15–8	16–3	16–9	17–3	17–9	18–3	18–9				
	16.0	6–3	7–3	8–1	8–11	9–7	10–3	10–10	11–6	12–0	12–7	13–1	13–7	14–0	14–6	14–11	15–5	15–10	16–3	16–7	17–0		
2x 8	19.2	5–9	6–7	7–5	8–1	8–9	9–4	9–11	10–6	11–0	11–6	11–11	12–5	12–10	13–3	13–8	14–0	14–5	14–10	15–2	15–6	15–10	16–3
	24.0	5–2	5–11	6–7	7–3	7–10	8–4	8–11	9–4	9–10	10–3	10–8	11–1	11–6	11–10	12–2	12–7	12–11	13–3	13–7	13–11	14–2	14–6
	12.0	9–3	10–8	11–11	13–1	14–2	15–1	16–0	16–11	17–9	18–6	19–3	20–0	20–8	21–4	22–0	22–8	23–3	23–11				
	16.0	8–0	9–3	10–4	11–4	12–3	13–1	13–10	14–8	15–4	16–0	16–8	17–4	17–11	18–6	19–1	19–7	20–2	20–8	21–2	21–8		
2x10	19.2	7–4	8–5	9–5	10–4	11–2	11–11	12–8	13–4	14–0	14–8	15–3	15–10	16–4	16–11	17–5	17–11	18–5	18–11	19–4	19–10	20–3	20–8
	24.0	6–6	7–7	8–5	9–3	10–0	10–8	11–4	11–11	12–6	13–1	13–7	14–2	14–8	15–1	15–7	16–0	16–6	16–11	17–4	17–9	18–1	18–6
	12.0	11–3	13–0	14–6	15–11	17–2	18–4	19–6	20–6	21–7	22–6	23–5	24–4	25–2	26–0								
	16.0	9–9	11–3	12–7	13–9	14–11	15–11	16–10	17–9	18–8	19–6	20–3	21–1	21–9	22–6	23–2	23–10	24–6	25–2	25–9			
2x12	19.2	8–11	10–3	11–6	12–7	13–7	14–6	15–5	16–3	17–0	17–9	18–6	19–3	19–11	20–6	21–2	21–9	22–5	23–0	23–6	24–1	24–8	25–2
	24.0	7–11	9–2	10–3	11–3	12–2	13–0	13–9	14–6	15–3	15–11	16–7	17–2	17–9	18–4	18–11	19–6	20–0	20–6	21–1	21–7	22–0	22–6
E	12.0	0.14	0.22	0.31	0.41	0.51	0.63	0.75	0.88	1.01	1.15	1.30	1.45	1.61	1.77	1.94	2.12	2.30	2.48				
E	16.0	0.12	0.19	0.27	0.35	0.44	0.54	0.65	0.76	0.88	1.00	1.12	1.26	1.39	1.54	1.68	1.83	1.99	2.15	2.31	2.48		
E	19.2	0.11	0.18	0.24	0.32	0.41	0.50	0.59	0.69	0.80	0.91	1.03	1.15	1.27	1.40	1.54	1.67	1.81	1.96	2.11	2.26	2.42	2.58
E	24.0	0.10	0.16	0.22	0.29	0.36	0.44	0.53	0.62	0.71	0.81	0.92	1.03	1.14	1.25	1.37	1.50	1.62	1.75	1.89	2.02	2.16	2.30

Note: The required modulus of elasticity, E, in 1,000,000 pounds per square inch is shown at the bottom of each table, is limited to 2.6 million psi and less, and is applicable to all lumber sizes shown. Spans are shown in feet–inches and are limited to 26′ and less. Check sources of supply for availability of lumber in lengths greater than 20′.

TABLE R–10
RAFTERS WITH L/240 DEFLECTION LIMITATION

DESIGN CRITERIA
Strength – Live Load of 30 psf plus
Dead Load of 20 psf determines the required bending design value
Deflection – For 30 psf live load.
Limited to span in inches divided by 240.

Size (in)	Spacing (in)	Rafter Bending Design Value, F_b, (psi)																							
		300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700
	12.0	5–6	6–4	7–1	7–9	8–5	9–0	9–6	10–0	10–6	11–0	11–5	11–11	12–4	12–8	13–1	13–6	13–10	14–2	14–7	14–11	15–3	15–7	15–11		
	16.0	4–9	5–6	6–2	6–9	7–3	7–9	8–3	8–8	9–1	9–6	9–11	10–3	10–8	11–0	11–4	11–8	12–0	12–4	12–7	12–11	13–2	13–6	13–9	14–0	14–3
2x 6	19.2	4–4	5–0	5–7	6–2	6–8	7–1	7–6	7–11	8–4	8–8	9–1	9–5	9–9	10–0	10–4	10–8	10–11	11–3	11–6	11–9	12–0	12–4	12–7	12–10	13–1
	24.0	3–11	4–6	5–0	5–6	5–11	6–4	6–9	7–1	7–5	7–9	8–1	8–5	8–8	9–0	9–3	9–6	9–9	10–0	10–3	10–6	10–9	11–0	11–3	11–5	11–8
	12.0	7–3	8–4	9–4	10–3	11–1	11–10	12–7	13–3	13–11	14–6	15–1	15–8	16–3	16–9	17–3	17–9	18–3	18–9	19–2	19–8	20–1	20–6	20–11		
	16.0	6–3	7–3	8–1	8–11	9–7	10–3	10–10	11–6	12–0	12–7	13–1	13–7	14–0	14–6	14–11	15–5	15–10	16–3	16–7	17–0	17–5	17–9	18–1	18–6	18–10
2x 8	19.2	5–9	6–7	7–5	8–1	8–9	9–4	9–11	10–6	11–0	11–6	11–11	12–5	12–10	13–3	13–8	14–0	14–5	14–10	15–2	15–6	15–10	16–3	16–7	16–10	17–2
	24.0	5–2	5–11	6–7	7–3	7–10	8–4	8–11	9–4	9–10	10–3	10–8	11–1	11–6	11–10	12–2	12–7	12–11	13–3	13–7	13–11	14–2	14–6	14–10	15–1	15–5
	12.0	9–3	10–8	11–11	13–1	14–2	15–1	16–0	16–11	17–9	18–6	19–3	20–0	20–8	21–4	22–0	22–8	23–3	23–11	24–6	25–1	25–7				
	16.0	8–0	9–3	10–4	11–4	12–3	13–1	13–10	14–8	15–4	16–0	16–8	17–4	17–11	18–6	19–1	19–7	20–2	20–8	21–2	21–8	22–2	22–8	23–1	23–7	24–0
2x10	19.2	7–4	8–5	9–5	10–4	11–2	11–11	12–8	13–4	14–0	14–8	15–3	15–10	16–4	16–11	17–5	17–11	18–5	18–11	19–4	19–10	20–3	20–8	21–1	21–6	21–11
	24.0	6–6	7–7	8–5	9–3	10–0	10–8	11–4	11–11	12–6	13–1	13–7	14–2	14–8	15–1	15–7	16–0	16–6	16–11	17–4	17–9	18–1	18–6	18–11	19–3	19–7
	12.0	11–3	13–0	14–6	15–11	17–2	18–4	19–6	20–6	21–7	22–6	23–5	24–4	25–2	26–0											
	16.0	9–9	11–3	12–7	13–9	14–11	15–11	16–10	17–9	18–8	19–6	20–3	21–1	21–9	22–6	23–2	23–10	24–6	25–2	25–9						
2x12	19.2	8–11	10–3	11–6	12–7	13–7	14–6	15–5	16–3	17–0	17–9	18–6	19–3	19–11	20–6	21–2	21–9	22–5	23–0	23–6	24–1	24–8	25–2	25–8		
	24.0	7–11	9–2	10–3	11–3	12–2	13–0	13–9	14–6	15–3	15–11	16–7	17–2	17–9	18–4	18–11	19–6	20–0	20–6	21–1	21–7	22–0	22–6	23–0	23–5	23–10
E	12.0	0.11	0.17	0.23	0.31	0.38	0.47	0.56	0.66	0.76	0.86	0.97	1.09	1.21	1.33	1.46	1.59	1.72	1.86	2.00	2.14	2.29	2.44	2.60		
E	16.0	0.09	0.14	0.20	0.26	0.33	0.41	0.49	0.57	0.66	0.75	0.84	0.94	1.05	1.15	1.26	1.37	1.49	1.61	1.73	1.86	1.99	2.12	2.25	2.39	2.53
E	19.2	0.09	0.13	0.18	0.24	0.30	0.37	0.44	0.52	0.60	0.68	0.77	0.86	0.95	1.05	1.15	1.25	1.36	1.47	1.58	1.70	1.81	1.93	2.05	2.18	2.31
E	24.0	0.08	0.12	0.16	0.22	0.27	0.33	0.40	0.46	0.54	0.61	0.69	0.77	0.85	0.94	1.03	1.12	1.22	1.31	1.41	1.52	1.62	1.73	1.84	1.95	2.06

Note: The required modulus of elasticity, E, in 1,000,000 pounds per square inch is shown at the bottom of each table, is limited to 2.6 million psi and less, and is applicable to all lumber sizes shown. Spans are shown in feet–inches and are limited to 26′ and less. Check sources of supply for availability of lumber in lengths greater than 20′.

TABLE R–11
RAFTERS WITH L/240 DEFLECTION LIMITATION

DESIGN CRITERIA:
Strength – Live Load of 40 psf plus
Dead Load of 20 psf determines the required bending design value.
Deflection – For 40 psf live load.
Limited to span in inches divided by 240.

Size (in)	Spacing (in)	Rafter Bending Design Value, F_b, (psi)																							
		300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700
2x6	12.0	5–0	5–10	6–6	7–1	7–8	8–2	8–8	9–2	10–6	11–0	11–5	11–11	12–4	12–8	13–1	13–6	13–10	14–2	14–7	14–11	15–3	15–7	15–11		
	16.0	4–4	5–0	5–7	6–2	6–8	7–1	7–6	7–11	9–1	9–6	9–11	10–3	10–8	11–0	11–4	11–8	12–0	12–4	12–7	12–11	13–2	13–6	13–9	14–0	14–3
	19.2	4–0	4–7	5–1	5–7	6–1	6–6	6–10	7–3	8–4	8–8	9–1	9–5	9–9	10–0	10–4	10–8	10–11	11–3	11–6	11–9	12–0	12–4	12–7	12–10	13–1
	24.0	3–7	4–1	4–7	5–0	5–5	5–10	6–2	6–6	7–5	7–9	8–1	8–5	8–8	9–0	9–3	9–6	9–9	10–0	10–3	10–6	10–9	11–0	11–3	11–5	11–8
2x8	12.0	6–7	7–8	8–7	9–4	10–1	10–10	11–6	12–1	13–11	14–6	15–1	15–8	16–3	16–9	17–3	17–9	18–3	18–9	19–2	19–8	20–1	20–6	20–11		
	16.0	5–9	6–7	7–5	8–1	8–9	9–4	9–11	10–6	12–0	12–7	13–1	13–7	14–0	14–6	14–11	15–5	15–10	16–3	16–7	17–0	17–5	17–9	18–1	18–6	18–10
	19.2	5–3	6–0	6–9	7–5	8–0	8–7	9–1	9–7	11–0	11–6	11–11	12–5	12–10	13–3	13–8	14–0	14–5	14–10	15–2	15–6	15–10	16–3	16–7	16–10	17–2
	24.0	4–8	5–5	6–0	6–7	7–2	7–9	8–1	8–7	9–10	10–3	10–8	11–1	11–6	11–10	12–2	12–7	12–11	13–3	13–7	13–11	14–2	14–6	14–10	15–1	15–5
2x10	12.0	8–5	9–9	10–11	11–11	12–11	13–9	14–8	15–5	17–9	18–6	19–3	20–0	20–8	21–4	22–0	22–8	23–3	23–11	24–6	25–1	25–7				
	16.0	7–4	8–5	9–5	10–4	11–2	11–11	12–8	13–4	15–4	16–0	16–8	17–4	17–11	18–6	19–1	19–7	20–2	20–8	21–2	21–8	22–2	22–8	23–1	23–7	24–0
	19.2	6–8	7–8	8–7	9–5	10–2	10–11	11–7	12–2	14–0	14–8	15–3	15–10	16–4	16–11	17–5	17–11	18–5	18–11	19–4	19–10	20–3	20–8	21–1	21–6	21–11
	24.0	6–0	6–11	7–8	8–5	9–1	9–9	10–4	10–11	12–6	13–1	13–7	14–2	14–8	15–1	15–7	16–0	16–6	16–11	17–4	17–9	18–1	18–6	18–11	19–3	19–7
2x12	12.0	10–3	11–10	13–3	14–6	15–8	16–9	17–9	18–9	21–7	22–6	23–5	24–4	25–2	26–0											
	16.0	8–11	10–3	11–6	12–7	13–7	14–6	15–5	16–3	18–8	19–6	20–3	21–1	21–9	22–6	23–2	23–10	24–6	25–2	25–9						
	19.2	8–1	9–4	10–6	11–6	12–5	13–3	14–1	14–10	17–0	17–9	18–6	19–3	19–11	20–6	21–2	21–9	22–5	23–0	23–6	24–1	25–2	25–8			
	24.0	7–3	8–5	9–4	10–3	11–1	11–10	12–7	13–3	15–3	15–11	16–7	17–2	17–9	18–4	18–11	19–6	20–0	20–6	21–1	21–7	22–0	22–6	23–0	23–5	23–10
E	12.0	0.11	0.17	0.24	0.31	0.39	0.48	0.57	0.67	0.76	0.86	0.97	1.09	1.21	1.33	1.46	1.59	1.72	1.86	2.00	2.14	2.29	2.44	2.60		
E	16.0	0.09	0.15	0.20	0.27	0.34	0.41	0.49	0.58	0.66	0.75	0.84	0.94	1.05	1.15	1.26	1.37	1.49	1.61	1.73	1.86	1.99	2.12	2.25	2.39	2.53
E	19.2	0.09	0.13	0.19	0.24	0.31	0.38	0.45	0.53	0.60	0.68	0.77	0.86	0.95	1.05	1.15	1.25	1.36	1.47	1.58	1.70	1.81	1.93	2.05	2.18	2.31
E	24.0	0.08	0.12	0.17	0.22	0.28	0.34	0.40	0.47	0.54	0.61	0.69	0.77	0.85	0.94	2.03	1.12	1.22	1.31	1.41	1.52	1.62	1.73	1.84	1.95	2.06

Note: The required modulus of elasticity, E, in 1,000,000 pounds per square inch is shown at the bottom of each table, is limited to 2.6 million psi and less, and is applicable to all lumber sizes shown. Spans are shown in feet–inches and are limited to 26′ and less. Check sources of supply for availability of lumber in lengths greater than 20′.

TABLE R–14
RAFTERS WITH L/180 DEFLECTION LIMITATION

DESIGN CRITERIA:
Strength – Live Load of 30 psf plus
Dead Load of 10 psf determines the required bending design value.
Deflection – For 30 psf live load.
Limited to span in inches divided by 180.

Size (in)	Spacing (in)	Rafter Bending Design Value, F_b, (psi)																											
		200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
2x4	12.0	3–2	3–11	4–6	5–1	5–6	6–0	6–5	6–9	7–2	7–6	7–10	8–2	8–5	8–9	9–0	9–4	9–7	9–10	10–1	10–4	10–7	10–10	11–1						
	16.0	2–9	3–5	3–11	4–4	4–10	5–2	5–6	5–10	6–2	6–6	6–9	7–1	7–4	7–7	7–10	8–1	8–40	8–6	8–9	9–0	9–2	9–5	9–7	9–9	10–0				
	19.2	2–6	3–1	3–7	4–0	4–4	4–9	5–1	5–4	5–8	5–11	6–2	6–5	6–8	6–11	7–2	7–4	7–7	7–9	8–0	8–2	8–5	8–7	8–9	8–11	9–1	9–3	9–5		
	24.0	2–3	2–9	3–2	3–7	3–11	4–3	4–6	4–10	5–1	5–4	5–6	5–9	6–0	6–2	6–5	6–7	6–9	7–0	7–2	7–4	7–6	7–8	7–10	8–0	8–2	8–4	8–5	8–7	8–9
2x6	12.0	5–0	6–2	7–1	7–11	8–8	9–5	10–0	10–8	11–3	11–9	12–4	12–10	13–3	13–9	14–2	14–8	15–1	15–6	15–11	16–3	16–8	17–0	17–5						
	16.0	4–4	5–4	6–2	6–10	7–6	8–2	8–8	9–3	9–9	10–2	10–8	11–1	11–6	11–11	12–4	12–8	13–1	13–5	13–9	14–1	14–5	14–9	15–1	15–4	15–8				
	19.2	4–0	4–10	5–7	6–3	6–10	7–5	7–11	8–5	8–11	9–4	9–9	10–1	10–6	10–10	11–3	11–7	11–11	12–3	12–7	12–10	13–2	13–6	13–9	14–0	14–4	14–7	14–10		
	24.0	3–7	4–4	5–0	5–7	6–2	6–8	7–1	7–6	7–11	8–4	8–8	9–1	9–5	9–9	10–0	10–4	10–8	10–11	11–3	11–6	11–9	12–0	12–4	12–7	12–10	13–1	13–3	13–6	13–9
2x8	12.0	6–7	8–1	9–4	10–6	11–6	12–5	13–3	14–0	14–10	15–6	16–3	16–10	17–6	18–1	18–9	19–4	19–10	20–5	20–11	21–5	21–11	22–5	22–11						
	16.0	5–9	7–0	8–1	9–1	9–11	10–9	11–6	12–2	12–10	13–5	14–0	14–7	15–2	15–8	16–3	16–9	17–2	17–8	18–1	18–7	19–0	19–5	19–10	20–3	20–8				
	19.2	5–3	6–5	7–5	8–3	9–1	9–9	10–6	11–1	11–8	12–3	12–10	13–4	13–10	14–4	14–10	15–3	15–8	16–2	16–7	16–11	17–4	17–9	18–1	18–6	18–10	19–3	19–7		
	24.0	4–8	5–9	6–7	7–5	8–1	8–9	9–4	9–11	10–6	11–0	11–6	11–11	12–5	12–10	13–3	13–8	14–0	14–5	14–10	15–2	15–6	15–10	16–3	16–7	16–10	17–2	17–6	17–10	18–1
2x10	12.0	8–5	10–4	11–11	13–4	14–8	15–10	16–11	17–11	18–11	19–10	20–8	21–6	22–4	23–1	23–11	24–7	25–4	26–0											
	16.0	7–4	8–11	10–4	11–7	12–8	13–8	14–8	15–6	16–4	17–2	17–11	18–8	19–4	20–0	20–8	21–4	21–11	22–6	23–1	23–8	24–3	24–10	25–4	25–10					
	19.2	6–8	8–2	9–5	10–7	11–7	12–6	13–4	14–2	14–11	15–8	16–4	17–0	17–8	18–3	18–11	19–6	20–0	20–7	21–1	21–8	22–2	22–8	23–1	23–7	24–1	24–6	25–0		
	24.0	6–0	7–4	8–5	9–5	10–4	11–2	11–11	12–8	13–4	14–0	14–8	15–3	15–10	16–4	16–11	17–5	17–11	18–5	18–11	19–4	19–10	20–3	20–8	21–1	21–6	21–11	22–4	22–9	23–1
E	12.0	0.06	0.11	0.17	0.24	0.32	0.40	0.49	0.59	0.69	0.79	0.91	1.02	1.14	1.27	1.39	1.53	1.66	1.80	1.95	2.10	2.25	2.40	2.56						
E	16.0	0.05	0.10	0.15	0.21	0.28	0.35	0.43	0.51	0.60	0.69	0.78	0.88	0.99	1.10	1.21	1.32	1.44	1.56	1.69	1.82	1.95	2.08	2.22	2.36	2.50				
E	19.2	0.05	0.09	0.14	0.19	0.25	0.32	0.39	0.47	0.54	0.63	0.72	0.81	0.90	1.00	1.10	1.21	1.32	1.43	1.54	1.66	1.78	1.90	2.03	2.15	2.28	2.42	2.55		
E	24.0	0.04	0.08	0.12	0.17	0.23	0.29	0.35	0.42	0.49	0.56	0.64	0.72	0.81	0.89	0.99	1.08	1.18	1.28	1.38	1.48	1.59	1.70	1.81	1.93	2.04	2.16	2.28	2.41	2.53

Note: The required modulus of elasticity, E, in 1,000,000 pounds per square inch is shown at the bottom of each table, is limited to 2.6 million psi and less, and is applicable to all lumber sizes shown. Spans are shown in feet–inches and are limited to 26′ and less. Check sources of supply for availability of lumber in lengths greater than 20′.

TABLE R–15
RAFTERS WITH L/180 DEFLECTION LIMITATION

DESIGN CRITERIA:
Strength – Live Load of 40 psf plus
Dead Load of 10 psf determines the required bending design value.
Deflection – For 40 psf live load.
Limited to span in inches divided by 180.

Size (in)	Spacing (in)	Rafter Bending Design Value, F_b, (psi)																												
		200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
2x4	12.0	2–10	3–6	4–0	4–6	4–11	5–4	5–9	6–1	6–5	6–8	7–0	7–3	7–7	7–10	8–1	8–4	8–7	8–10	9–1	9–3	9–6	9–8	9–11	10–1					
	16.0	2–6	3–0	3–6	3–11	4–3	4–8	4–11	5–3	5–6	5–10	6–1	6–4	6–7	6–9	7–0	7–3	7–5	7–8	7–10	8–0	8–2	8–5	8–7	8–9	8–11	9–1			
	19.2	2–3	2–9	3–2	3–7	3–11	4–3	4–6	4–10	5–1	5–4	5–6	5–9	6–0	6–2	6–5	6–7	6–9	7–0	7–2	7–4	7–6	7–8	7–10	8–0	8–2	8–4	8–5	8–7	
	24.0	2–0	2–6	2–10	3–2	3–6	3–9	4–0	4–3	4–6	4–9	4–11	5–2	5–4	5–6	5–9	5–11	6–1	6–3	6–5	6–7	6–8	6–10	7–0	7–2	7–3	7–5	7–7	7–8	7–10
2x6	12.0	4–6	5–6	6–4	7–1	7–9	8–5	9–0	9–6	10–0	10–6	11–0	11–5	11–11	12–4	12–8	13–1	13–6	13–10	14–2	14–7	14–11	15–3	15–7	15–11					
	16.0	3–11	4–9	5–6	6–2	6–9	7–3	7–9	8–3	8–8	9–1	9–6	9–11	10–3	10–8	11–0	11–4	11–8	12–0	12–4	12–7	12–11	13–2	13–6	13–9	14–0	14–3			
	19.2	3–7	4–4	5–0	5–7	6–2	6–8	7–1	7–6	7–11	8–4	8–8	9–1	9–5	9–9	10–0	10–4	10–8	10–11	11–3	11–6	11–9	12–0	12–4	12–7	12–10	13–1	13–3	13–6	
	24.0	3–2	3–11	4–6	5–0	5–6	5–11	6–4	6–9	7–1	7–5	7–9	8–1	8–5	8–8	9–0	9–3	9–6	9–9	10–0	10–3	10–6	10–9	11–0	11–3	11–5	11–8	11–11	12–1	12–4
2x8	12.0	5–11	7–3	8–4	9–4	10–3	11–1	11–10	12–7	13–3	13–11	14–6	15–1	15–8	16–3	16–9	17–3	17–9	18–3	18–9	19–2	19–8	20–1	20–6	20–11					
	16.0	5–2	6–3	7–3	8–1	8–11	9–7	10–3	10–10	11–6	12–0	12–7	13–1	13–7	14–0	14–6	14–11	15–5	15–10	16–3	16–7	17–0	17–5	17–9	18–1	18–6	18–10			
	19.2	4–8	5–9	6–7	7–5	8–1	8–9	9–4	9–11	10–6	11–0	11–6	11–11	12–5	12–10	13–3	13–8	14–0	14–5	14–10	15–2	15–6	15–10	16–3	16–7	16–10	17–2	17–6	17–10	
	24.0	4–2	5–2	5–11	6–7	7–3	7–10	8–4	8–11	9–4	9–10	10–3	10–8	11–1	11–6	11–10	12–2	12–7	12–11	13–3	13–7	13–11	14–2	14–6	14–10	15–1	15–5	15–8	15–11	16–3
2x10	12.0	7–7	9–3	10–8	11–11	13–1	14–2	15–1	16–0	16–11	17–9	18–6	19–3	20–0	20–8	21–4	22–0	22–8	23–3	23–11	24–6	25–1	25–7							
	16.0	6–6	8–0	9–3	10–4	11–4	12–3	13–1	13–10	14–8	15–4	16–0	16–8	17–4	17–11	18–6	19–1	19–7	20–2	20–8	21–2	21–8	22–2	22–8	23–1	23–7	24–0			
	19.2	6–0	7–4	8–5	9–5	10–4	11–2	11–11	12–8	13–4	14–0	14–8	15–3	15–10	16–4	16–11	17–5	17–11	18–5	18–11	19–4	19–10	20–3	20–8	21–1	21–6	21–11	22–4	22–9	
	24.0	5–4	6–6	7–7	8–5	9–3	10–0	10–8	11–4	11–11	12–6	13–1	13–7	14–2	14–8	15–1	15–7	16–0	16–6	16–11	17–4	17–9	18–1	18–6	18–11	19–3	19–7	20–0	20–4	20–8
E	12.0	0.06	0.11	0.17	0.23	0.31	0.38	0.47	0.56	0.66	0.76	0.86	0.97	1.09	1.21	1.33	1.46	1.59	1.72	1.86	2.00	2.14	2.29	2.44	2.60					
E	16.0	0.05	0.09	0.14	0.20	0.26	0.33	0.41	0.49	0.57	0.66	0.75	0.84	0.94	1.05	1.15	1.26	1.37	1.49	1.61	1.73	1.86	1.99	2.12	2.25	2.39	2.53			
E	19.2	0.05	0.09	0.13	0.18	0.24	0.30	0.37	0.44	0.52	0.60	0.68	0.77	0.86	0.95	1.05	1.15	1.25	1.36	1.47	1.58	1.70	1.81	1.93	2.05	2.18	2.31	2.43	2.57	
E	24.0	0.04	0.08	0.12	0.16	0.22	0.27	0.33	0.40	0.46	0.54	0.61	0.69	0.77	0.85	0.94	1.03	1.12	1.22	1.31	1.41	1.52	1.62	1.73	1.84	1.95	2.06	2.18	2.30	2.41

Note: The required modulus of elasticity, E, in 1,000,000 pounds per square inch is shown at the bottom of each table, is limited to 2.6 million psi and less, and is applicable to all lumber sizes shown. Spans are shown in feet–inches and are limited to 26′ and less. Check sources of supply for availability of lumber in lengths greater than 20′.

TABLE R–22
RAFTERS WITH L/180 DEFLECTION LIMITATION

DESIGN CRITERIA:
Strength – Live Load of 30 psf plus
Dead Load of 20 psf determines the required bending design value.
Deflection – For 30 psf live load.
Limited to span in inches divided by 180.

Size (in)	Spacing (in)	Rafter Bending Design Value, F_b, (psi)																												
		200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
2x4	12.0	2–10	3–6	4–0	4–6	4–11	5–4	5–9	6–1	6–5	6–8	7–0	7–3	7–7	7–10	8–1	8–4	8–7	8–10	9–0	9–3	9–6	9–8	9–11	10–1	10–4	10–6	10–8	10–11	11–1
	16.0	2–6	3–0	3–6	3–11	4–3	4–8	4–11	5–3	5–6	5–10	6–1	6–4	6–7	6–9	7–0	7–3	7–5	7–8	7–10	8–0	8–2	8–5	8–7	8–9	8–11	9–1	9–3	9–5	9–7
	19.2	2–3	2–9	3–2	3–7	3–11	4–3	4–6	4–10	5–1	5–4	5–6	5–9	6–0	6–2	6–5	6–7	6–9	7–0	7–2	7–4	7–6	7–8	7–10	8–0	8–2	8–4	8–5	8–7	8–9
	24.0	2–0	2–6	2–10	3–2	3–6	3–9	4–0	4–3	4–6	4–9	4–11	5–2	5–4	5–6	5–9	5–11	6–1	6–3	6–5	6–7	6–8	6–10	7–0	7–2	7–3	7–5	7–7	7–8	7–10
2x6	12.0	4–6	5–6	6–4	7–1	7–9	8–5	9–0	9–6	10–0	10–6	11–0	11–5	11–11	12–4	12–8	13–1	13–6	13–10	14–2	14–7	14–11	15–3	15–7	15–11	16–2	16–6	16–10	17–1	17–5
	16.0	3–11	4–9	5–6	6–2	6–9	7–3	7–9	8–3	8–8	9–1	9–6	9–11	10–3	10–8	11–0	11–4	11–8	12–0	12–4	12–7	12–11	13–2	13–6	13–9	14–0	14–3	14–7	14–10	15–1
	19.2	3–7	4–4	5–0	5–7	6–2	6–8	7–1	7–6	7–11	8–4	8–8	9–1	9–5	9–9	10–0	10–4	10–8	10–11	11–3	11–6	11–9	12–0	12–4	12–7	12–10	13–1	13–3	13–6	13–9
	24.0	3–2	3–11	4–6	5–0	5–6	5–11	6–4	6–9	7–1	7–5	7–9	8–1	8–5	8–8	9–0	9–3	9–6	9–9	10–0	10–3	10–6	10–9	11–0	11–3	11–5	11–8	11–11	12–1	12–4
2x8	12.0	5–11	7–3	8–4	9–4	10–3	11–1	11–10	12–7	13–3	13–11	14–6	15–1	15–8	16–3	16–9	17–3	17–9	18–3	18–9	19–2	19–8	20–1	20–6	20–11	21–4	21–9	22–2	22–6	22–11
	16.0	5–2	6–3	7–3	8–1	8–11	9–7	10–3	10–10	11–6	12–0	12–7	13–1	13–7	14–0	14–6	14–11	15–5	15–10	16–3	16–7	17–0	17–5	17–9	18–1	18–6	18–10	19–2	19–6	19–10
	19.2	4–8	5–9	6–7	7–5	8–1	8–9	9–4	9–11	10–6	11–0	11–6	11–11	12–5	12–10	13–3	13–8	14–0	14–5	14–10	15–2	15–6	15–10	16–3	16–7	16–10	17–2	17–6	17–10	18–1
	24.0	4–2	5–2	5–11	6–7	7–3	7–10	8–4	8–11	9–4	9–10	10–3	10–8	11–1	11–6	11–10	12–2	12–7	12–11	13–3	13–7	13–11	14–2	14–6	14–10	15–1	15–5	15–8	15–11	16–3
2x10	12.0	7–7	9–3	10–8	11–11	13–1	14–2	15–1	16–0	16–11	17–9	18–6	19–3	20–0	20–8	21–4	22–0	22–8	23–3	23–11	24–6	25–1	25–7							
	16.0	6–6	8–0	9–3	10–4	11–4	12–3	13–1	13–10	14–8	15–4	16–0	16–8	17–4	17–11	18–6	19–1	19–7	20–2	20–8	21–2	21–8	22–2	22–8	23–1	23–7	24–0	24–6	24–11	25–4
	19.2	6–0	7–4	8–5	9–5	10–4	11–2	11–11	12–8	13–4	14–0	14–8	15–3	15–10	16–4	16–11	17–5	17–11	18–5	18–11	19–4	19–10	20–3	20–8	21–1	21–6	21–11	22–4	22–9	23–1
	24.0	5–4	6–6	7–7	8–5	9–3	10–0	10–8	11–4	11–11	12–6	13–1	13–7	14–2	14–8	15–1	15–7	16–0	16–6	16–11	17–4	17–9	18–1	18–6	18–11	19–3	19–7	20–0	20–4	20–8
E	12.0	0.04	0.08	0.12	0.17	0.23	0.29	0.35	0.42	0.49	0.57	0.65	0.73	0.82	0.91	1.00	1.09	1.19	1.29	1.39	1.50	1.61	1.72	1.83	1.95	2.07	2.19	2.31	2.43	2.56
E	16.0	0.04	0.07	0.11	0.15	0.20	0.25	0.31	0.36	0.43	0.49	0.56	0.63	0.71	0.78	0.86	0.95	1.03	1.12	1.21	1.30	1.39	1.49	1.59	1.69	1.79	1.89	2.00	2.11	2.22
E	19.2	0.03	0.06	0.10	0.14	0.18	0.23	0.28	0.33	0.39	0.45	0.51	0.58	0.65	0.72	0.79	0.86	0.94	1.02	1.10	1.19	1.27	1.36	1.45	1.54	1.63	1.73	1.83	1.92	2.03
E	24.0	0.03	0.06	0.09	0.12	0.16	0.20	0.25	0.30	0.35	0.40	0.46	0.52	0.58	0.64	0.71	0.77	0.84	0.91	1.99	1.06	1.14	1.22	1.30	1.38	1.46	1.55	1.63	1.72	1.81

Note: The required modulus of elasticity, E, in 1,000,000 pounds per square inch is shown at the bottom of each table, is limited to 2.6 million psi and less, and is applicable to all lumber sizes shown. Spans are shown in feet–inches and are limited to 26′ and less. Check sources of supply for availability of lumber in lengths greater than 20′.

TABLE R–23
RAFTERS WITH L/180 DEFLECTION LIMITATION

DESIGN CRITERIA:
Strength – Live Load of 40 psf plus
Dead Load of 20 psf determines the required bending design value.
Deflection – For 40 psf live load.
Limited to span in inches divided by 180.

Size (in)	Spacing (in)	Rafter Bending Design Value, F_b, (psi)																												
		200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
2x4	12.0	2–7	3–2	3–8	4–1	4–6	4–11	5–3	5–6	5–10	6–1	6–5	6–8	6–11	7–2	7–5	7–7	7–10	8–0	8–3	8–5	8–8	8–10	9–0	9–3	9–5	9–7	9–9	9–11	10–1
	16.0	2–3	2–9	3–2	3–7	3–11	4–3	4–6	4–10	5–1	5–4	5–6	5–9	6–0	6–2	6–5	6–7	6–9	7–0	7–2	7–4	7–6	7–8	7–10	8–0	8–2	8–4	8–5	8–7	8–9
	19.2	2–1	2–6	2–11	3–3	3–7	3–10	4–1	4–4	4–7	4–10	5–1	5–3	5–5	5–8	5–10	6–0	6–2	6–4	6–6	6–8	6–10	7–0	7–2	7–3	7–5	7–7	7–9	7–10	8–0
	24.0	1–10	2–3	2–7	2–11	3–2	3–5	3–8	3–11	4–1	4–4	4–6	4–8	4–11	5–1	5–3	5–5	5–6	5–8	5–10	6–0	6–1	6–3	6–5	6–6	6–8	6–9	6–11	7–0	7–2
2x6	12.0	4–1	5–0	5–10	6–6	7–1	7–8	8–2	8–8	9–2	9–7	10–0	10–5	10–10	11–3	11–7	11–11	12–4	12–8	13–0	13–3	13–7	13–11	14–2	14–6	14–9	15–1	15–4	15–7	15–11
	16.0	3–7	4–4	5–0	5–7	6–2	6–8	7–1	7–6	7–11	8–4	8–8	9–1	9–5	9–9	10–0	10–4	10–8	10–11	11–3	11–6	11–9	12–0	12–4	12–7	12–10	13–1	13–3	13–6	13–9
	19.2	3–3	4–0	4–7	5–1	5–7	6–1	6–6	6–10	7–3	7–7	7–11	8–3	8–7	8–11	9–2	9–5	9–9	10–0	10–3	10–6	10–9	11–0	11–3	11–5	11–8	11–11	12–2	12–4	12–7
	24.0	2–11	3–7	4–1	4–7	5–0	5–5	5–10	6–2	6–6	6–10	7–1	7–5	7–8	7–11	8–2	8–5	8–8	8–11	9–2	9–5	9–7	9–10	10–0	10–3	10–5	10–8	10–10	11–0	11–3
2x8	12.0	5–5	6–7	7–8	8–7	9–4	10–1	10–10	11–6	12–1	12–8	13–3	13–9	14–4	14–10	15–3	15–9	16–3	16–8	17–1	17–6	17–11	18–4	18–9	19–1	19–6	19–10	20–3	20–7	20–11
	16.0	4–8	5–9	6–7	7–5	8–1	8–9	9–4	9–11	10–6	11–0	11–6	11–11	12–5	12–10	13–3	13–8	14–0	14–5	14–10	15–2	15–6	15–10	16–3	16–7	16–10	17–2	17–6	17–10	18–1
	19.2	4–3	5–3	6–0	6–9	7–5	8–0	8–7	9–1	9–7	10–0	10–6	10–11	11–4	11–8	12–1	12–5	12–10	13–2	13–6	13–10	14–2	14–6	14–10	15–1	15–5	15–8	16–0	16–3	16–7
	24.0	3–10	4–8	5–5	6–0	6–7	7–2	7–8	8–1	8–7	9–0	9–4	9–9	10–1	10–6	10–10	11–2	11–6	11–9	12–1	12–5	12–8	12–11	13–3	13–6	13–9	14–0	14–4	14–7	14–10
2x10	12.0	6–11	8–5	9–9	10–11	11–11	12–11	13–9	14–8	15–5	16–2	16–11	17–7	18–3	18–11	19–6	20–1	20–8	21–3	21–10	22–4	22–10	23–5	23–11	24–5	24–10	25–4	25–10		
	16.0	6–0	7–4	8–5	9–5	10–4	11–2	11–11	12–8	13–4	14–0	14–8	15–3	15–10	16–4	16–11	17–5	17–11	18–5	18–11	19–4	19–10	20–3	20–8	21–1	21–6	21–11	22–4	22–9	23–1
	19.2	5–5	6–8	7–8	8–7	9–5	10–2	10–11	11–7	12–2	12–9	13–4	13–11	14–5	14–11	15–5	15–11	16–4	16–10	17–3	17–8	18–1	18–6	18–11	19–3	19–8	20–0	20–5	20–9	21–1
	24.0	4–11	6–0	6–11	7–8	8–5	9–1	9–9	10–4	10–11	11–5	11–11	12–5	12–11	13–4	13–9	14–3	14–8	15–0	15–5	15–10	16–2	16–6	16–11	17–3	17–7	17–11	18–3	18–7	18–11
E	12.0	0.04	0.08	0.13	0.18	0.23	0.29	0.36	0.43	0.50	0.58	0.66	0.74	0.83	0.92	1.01	1.11	1.21	1.31	1.41	1.52	1.63	1.74	1.86	1.98	2.10	2.22	2.34	2.47	2.60
E	16.0	0.04	0.07	0.11	0.15	0.20	0.25	0.31	0.37	0.43	0.50	0.57	0.64	0.72	0.80	0.88	0.96	1.05	1.13	1.22	1.32	1.41	1.51	1.61	1.71	1.82	1.92	2.03	2.14	2.25
E	19.2	0.04	0.06	0.10	0.14	0.18	0.23	0.28	0.34	0.40	0.46	0.52	0.59	0.65	0.73	0.80	0.88	0.95	1.04	1.12	1.20	1.29	1.38	1.47	1.56	1.66	1.75	1.85	1.95	2.05
E	24.0	0.03	0.06	0.09	0.13	0.16	0.21	0.25	0.30	0.35	0.41	0.46	0.52	0.59	0.65	0.72	0.78	0.85	0.93	1.00	1.08	1.15	1.23	1.31	1.40	1.48	1.57	1.66	1.75	1.84

Note: The required modulus of elasticity, E, in 1,000,000 pounds per square inch is shown at the bottom of each table, is limited to 2.6 million psi and less, and is applicable to all lumber sizes shown. Spans are shown in feet–inches and are limited to 26′ and less. Check sources of supply for availability of lumber in lengths greater than 20′.

NIL

Design Values for Joists and Rafters

These "Fb" values are for use where repetitive members are spaced not more than 24 inches. Values for surfaced dry or surfaced green lumber apply at 19% maximum moisture content in use.

Species and Grade	Size	Design Value in Bending, "Fb"		Modulus of Elasticity "E"	Grading Rules Agency
		Normal Duration	Snow Loading		
Cottonwood					
Select Structural	2x4	1510	1735	1,200,000	
No.1		1080	1240	1,200,000	
No.2		1080	1240	1,100,000	
No.3		605	695	1,000,000	
Stud		600	690	1,000,000	
Construction		805	925	1,000,000	
Standard		460	530	900,000	
Utility		200	230	900,000	
Select Structural	2x6	1310	1505	1,200,000	
No.1		935	1075	1,200,000	
No.2		935	1075	1,100,000	
No.3		525	600	1,000,000	
Stud		545	630	1,000,000	
Select Structural	2x8	1210	1390	1,200,000	NSLB
No.1		865	990	1,200,000	
No.2		865	990	1,100,000	
No.3		485	555	1,000,000	
Select Structural	2x10	1105	1275	1,200,000	
No.1		790	910	1,200,000	
No.2		790	910	1,100,000	
No.3		445	510	1,000,000	
Select Structural	2x12	1005	1155	1,200,000	
No.1		720	825	1,200,000	
No.2		720	825	1,100,000	
No.3		405	465	1,000,000	
Douglas Fir–Larch					
Select Structural	2x4	2500	2875	1,900,000	
No.1 & Btr		1985	2280	1,800,000	
No.1		1725	1985	1,700,000	
No.2		1510	1735	1,600,000	
No.3		865	990	1,400,000	
Stud		855	980	1,400,000	
Construction		1150	1325	1,500,000	
Standard		635	725	1,400,000	
Utility		315	365	1,300,000	
Select Structural	2x6	2170	2495	1,900,000	
No.1 & Btr		1720	1975	1,800,000	
No.1		1495	1720	1,700,000	
No.2		1310	1505	1,600,000	
No.3		750	860	1,400,000	
Stud		775	895	1,400,000	
Select Structural	2x8	2000	2300	1,900,000	WCLIB
No.1 & Str		1585	1825	1,800,000	WWPA
No.1		1380	1585	1,700,000	
No.2		1210	1390	1,600,000	
No.3		690	795	1,400,000	
Select Structural	2x10	1835	2110	1,900,000	
No.1 & Btr		1455	1675	1,800,000	
No.1		1265	1455	1,700,000	
No.2		1105	1275	1,600,000	
No.3		635	725	1,400,000	
Select Structural	2x12	1670	1920	1,900,000	
No.1 & Btr		1325	1520	1,800,000	
No.1		1150	1325	1,700,000	
No.2		1005	1155	1,600,000	
No.3		575	660	1,400,000	

Species and Grade	Size	Design Value in Bending, "Fb"		Modulus of Elasticity "E"	Grading Rules Agency
		Normal Duration	Snow Loading		
Douglas Fir–Larch (North)					
Select Structural	2x4	2245	2580	1,900,000	NLGA
No.1 /No.2		1425	1635	1,600,000	
No.3		820	940	1,400,000	
Stud		820	945	1,400,000	
Construction		1095	1255	1,500,000	
Standard		605	695	1,400,000	
Utility		290	330	1,300,000	
Select Structural	2x6	1945	2235	1,900,000	
No.1 /No.2		1235	1420	1,600,000	
No.3		710	815	1,400,000	
Stud		750	860	1,400,000	
Select Structural	2x8	1795	2065	1,900,000	
No.1 /No.2		1140	1310	1,600,000	
No.3		655	755	1,400,000	
Select Structural	2x10	1645	1890	1,900,000	
No.1 /No–2		1045	1200	1,600,000	
No.3		600	690	1,400,000	
Select Structural	2x12	1495	1720	1,900,000	
No.1 /No.2		950	1090	1,600,000	
No.3		545	630	1,400,000	
Douglas Fir–South					
Select Structural	2x4	2245	2580	1,400,000	WWPA
No.1		1555	1785	1,300,000	
No.2		1425	1635	1,200,000	
No.3		820	940	1,100,000	
Stud		820	945	1,100,000	
Construction		1065	1225	1,200,000	
Standard		605	695	1,100,000	
Utility		290	330	1,000,000	
Select Structural	2x6	1945	2235	1,400,000	
No.1		1345	1545	1,300,000	
No.2		1235	1420	1,200,000	
No.3		710	815	1,100,000	
Stud		750	860	1,100,000	
Select Structural	2x8	1795	2065	1,400,000	
No.1		1240	1430	1,300,000	
No.2		1140	1310	1,200,000	
No.3		655	755	1,100,000	
Select Structural	2x10	1645	1890	1,400,000	
No.1		1140	1310	1,300,000	
No.2		1045	1200	1,200,000	
No.3		600	690	1,100,000	
Select Structural	2x12	1495	1720	1,400,000	
No.1		1035	1190	1,300,000	
No.2		950	1090	1,200,000	
No.3		545	630	1,100,000	

Species and Grade	Size	Design Value in Bending, "Fb"		Modulus of Elasticity "E"	Grading Rules Agency
		Normal Duration	Snow Loading		
Eastern Hemlock–Tamarack					
Select Structural	2x4	2155	2480	1,200,000	NELMA NSLB
No.1		1335	1535	1,100,000	
No.2		990	1140	1,100,000	
No.3		605	695	900,000	
Stud		570	655	900,000	
Construction		775	895	1,000,000	
Standard		430	495	900,000	
Utility		200	230	800,000	
Select Structural	2x6	1870	2150	1,200,000	
No.1		1160	1330	1,100,000	
No.2		860	990	1,100,000	
No.3		525	600	900,000	
Stud		520	595	900,000	
Select Structural	2x8	1725	1985	1,200,000	
No.1		1070	1230	1,100,000	
No.2		795	915	1,100,000	
No.3		485	555	900,000	
Select Structural	2x10	1580	1820	1,200,000	
No.1		980	1125	1,100,000	
No.2		725	835	1,100,000	
No.3		445	510	900,000	
Select Structural	2x12	1440	1655	1,200,000	
No.1		890	1025	1,100,000	
No.2		660	760	1,100,000	
No.3		405	465	900,000	
Eastern Softwoods					
Select Structural	2x4	2155	2480	1,200,000	NELMA NSLB
No.1		1335	1535	1,100,000	
No.2		990	1140	1,100,000	
No.3		605	695	900,000	
Stud		570	655	900,000	
Construction		775	895	1,000,000	
Standard		430	495	900,000	
Utility		200	230	800,000	
Select Structural	2x6	1870	2150	1,200,000	
No.1		1160	1330	1,100,000	
No.2		860	990	1,100,000	
No.3		525	600	900,000	
Stud		520	595	900,000	
Select Structural	2x8	1725	1985	1,200,000	
No.1		1070	1230	1,100,000	
No.2		795	915	1,100,000	
No.3		485	555	900,000	
Select Structural	2x10	1580	1820	1,200,000	
No.1		980	1125	1,100,000	
No.2		725	835	1,100,000	
No.3		445	510	900,000	
Select Structural	2x12	1440	1655	1,200,000	
No.1		890	1025	1,100,000	
No.2		660	760	1,100,000	
No.3		405	465	900,000	

Species and Grade	Size	Design Value in Bending, "Fb"		Modulus of Elasticity "E"	Grading Rules Agency
		Normal Duration	Snow Loading		
Eastern White Pine					
Select Structural	2x4	2155	2480	1,200,000	
No.1		1335	1535	1,100,000	
No.2		990	1140	1,100,000	
No.3		605	695	900,000	
Stud		570	655	900,000	
Construction		775	895	1,000,000	
Standard		430	495	900,000	
Utility		200	230	800,000	
Select Structural	2x6	1870	2150	1,200,000	
No.1		1160	1330	1,100,000	
No.2		860	990	1,100,000	
No.3		525	600	900,000	
Stud		520	595	900,000	NELMA
Select Structural	2x8	1725	1985	1,200,000	NSLB
No.1		1070	1230	1,100,000	
No.2		795	915	1,100,000	
No.3		485	555	900,000	
Select Structural	2x10	1580	1820	1,200,000	
No.1		980	1125	1,100,000	
No.2		725	835	1,100,000	
No.3		445	510	900,000	
Select Structural	2x12	1440	1655	1,200,000	
No.1		890	1025	1,100,000	
No.2		660	760	1,100,000	
No.3		405	465	900,000	
Hem Fir					
Select Structural	2x4	2415	2775	1,600,000	
No.1 & Btr		1810	2085	1,500,000	
No.1		1640	1885	1,500,000	
No.2		1465	1685	1,300,000	
No.3		865	990	1,200,000	
Stud		855	980	1,200,000	
Construction		1120	1290	1,300,000	
Standard		635	725	1,200,000	
Utility		290	330	1,100,000	
Select Structural	2x6	2095	2405	1,600,000	
No.1 & Btr		1570	1805	1,500,000	
No.1		1420	1635	1,500,000	
No.2		1270	1460	1,300,000	
No.3		750	860	1,200,000	
Stud		775	895	1,200,000	
Select Structural	2x8	1930	2220	1,600,000	WCLIB
No.1 & Btr		1450	1665	1,500,000	WWPA
No.1		1310	1510	1,500,000	
No.2		1175	1350	1,300,000	
No.3		690	795	1,200,000	
Select Structural	2x10	1770	2035	1,600,000	
No.1 & Btr		1330	1525	1,500,000	
No.1		1200	1380	1,500,000	
No.2		1075	1235	1,300,000	
No.3		635	725	1,200,000	
Select Structural	2x12	1610	1850	1,600,000	
No.1 & Btr		1210	1390	1,500,000	
No.1		1095	1255	1,500,000	
No.2		980	1125	1,300,000	
No.3		575	660	1,200,000	

Species and Grade	Size	Design Value in Bending, "Fb"		Modulus of Elasticity "E"	Grading Rules Agency
		Normal Duration	Snow Loading		
Hem–Fir (North)					
Select Structural	2x4	2245	2580	1,700,000	
No.1 /No.2		1725	1985	1,600,000	
No.3		990	1140	1,400,000	
Stud		980	1125	1,400,000	
Construction		1325	1520	1,500,000	
Standard		720	825	1,400,000	
Utility		345	395	1,300,000	
Select Structural	2x6	1945	2235	1,700,000	
No.1 /No.2		1495	1720	1,600,000	
No.3		860	990	1,400,000	
Stud		890	1025	1,400,000	NLGA
Select Structural	2x8	1795	2065	1,700,000	
No.1 /No.2		1380	1585	1,600,000	
No.3		795	915	1,400,000	
Select Structural	2x10	1645	1890	1,700,000	
No.1 /No.2		1265	1455	1,600,000	
No.3		725	835	1,400,000	
Select Structural	2x12	1495	1720	1,700,000	
No.1 /No.2		1150	1325	1,600,000	
No.3		660	760	1,400,000	
Mixed Maple					
Select Structural	2x4	1725	1985	1,300,000	
No.1		1250	1440	1,200,000	
No.2		1210	1390	1,100,000	
No.3		690	795	1,000.000	
Stud		695	Boo	1,000,000	
Construction		920	1060	1,100,000	
Standard		520	595	1,000,000	
Utility		260	300	900,000	
Select Structural	2x6	1495	1720	1,300,000	
No.1		1085	1245	1,200,000	
No.2		1045	1205	1,100,000	
No.3		600	690	1,000,000	
Stud		635	725	1,000,000	NELMA
Select Structural	2x8	1380	1585	1,300,000	
No.1		1000	1150	1,200,000	
No.2		965	1110	1,100,000	
No.3		550	635	1,000,000	
Select Structural	2x10	1265	1455	1,300,000	
No.1		915	1055	1,200,000	
No.2		885	1020	1,100,000	
No.3		505	580	1,000,000	
Select Structural	2x12	1150	1325	1,300,000	
No.1		835	960	1,200,000	
No.2		805	925	1,100,000	
No.3		460	530	1,000,000	

Species and Grade	Size	Design Value in Bending, "Fb"		Modulus of Elasticity "E"	Grading Rules Agency
		Normal Duration	Snow Loading		
Mixed Oak					
Select Structural	2x4	1985	2280	1,100,000	NELMA
No.1		1425	1635	1,000,000	
No.2		1380	1585	900,000	
No.3		820	940	800,000	
Stud		790	910	800,000	
Construction		1065	1225	900,000	
Standard		605	695	800,000	
Utility		290	330	800,000	
Select Structural	2x6	1720	1975	1,100,000	
No.1		1235	1420	1,000,000	
No.2		1195	1375	900,000	
No.3		710	815	800,000	
Stud		720	825	800,000	
Select Structural	2x8	1585	1825	1,100,000	
No.1		1140	1310	1,000,000	
No.2		1105	1270	900,000	
No.3		655	755	800,000	
Select Structural	2x10	1455	1675	1,100,000	
No.1		1045	1200	1,000,000	
No.2		1010	1165	900,000	
No.3		600	690	800,000	
Select Structural	2x12	1325	1520	1,100,000	
No.1		950	1090	1,000,000	
No.2		920	1060	900,000	
No.3		545	630	800,000	
Mixed Southern Pine					
Select Structural	2x4	2360	2710	1,600,000	SPIB
No.1		1670	1920	1,500,000	
No.2		1500	1720	1,400,000	
No.3		865	990	1,200,000	
Stud		890	1020	1,200,000	
Construction		1150	1320	1,300,000	
Standard		635	725	1,200,000	
Utility		315	365	1,100,000	
Select Structural	2x6	2130	2450	1,600,000	
No.1		1490	1720	1,500,000	
No.2		1320	1520	1,400,000	
No.3		775	895	1,200,000	
Stud		775	895	1,200,000	
Select Structural	2x8	2010	2310	1,600,000	
No.1		1380	1590	1,500,000	
No.2		1210	1390	1,400,000	
No.3		720	825	1,200,000	
Select Structural	2x10	1730	1980	1,600,000	
No.1		1210	1390	1,500,000	
No.2		1060	1220	1,400,000	
No.3		605	695	1,200,000	
Select Structural	2x12	1610	1850	1,600,000	
No.1		1120	1290	1,500,000	
No.2		1010	1160	1,400,000	
No.3		575	660	1,200,000	

Species and Grade	Size	Design Value in Bending, "Fb"		Modulus of Elasticity "E"	Grading Rules Agency
		Normal Duration	Snow Loading		
Northern Red Oak					
Select Structural	2x4	2415	2775	1,400,000	
No.1		1725	1985	1,400,000	
No.2		1680	1935	1,300,000	
No.3		950	1090	1,200,000	
Stud		950	1090	1,200,000	
Construction		1265	1455	1,200,000	
Standard		720	825	1,100,000	
Utility		345	395	1,000,000	
Select Structural	2x6	2095	2405	1,400,000	
No.1		1495	1720	1,400,000	
No.2		1460	1675	1,300,000	
No.3		820	945	1,200,000	
Stud		865	990	1,200,000	NELMA
Select Structural	2x8	1930	2220	1,400,000	
No.1		1380	1585	1,400,000	
No.2		1345	1545	1,300,000	
No.3		760	875	1,200,000	
Select Structural	2x10	1770	2035	1,400,000	
No.1		1265	1455	1,400,000	
No.2		1235	1420	1,300,000	
No.3		695	800	1,200,000	
Select Structural	2x12	1610	1850	1,400,000	
No.1		1150	1325	1,400,000	
No.2		1120	1290	1,300,000	
No.3		635	725	1,200,000	
Northern Species					
Select Structural	2x4	1640	1885	1,100,000	
No.1 /No.2		990	1140	1,100,000	
No.3		605	695	1,000,000	
Stud		570	655	1,000,000	
Construction		775	895	1,000,000	
Standard		430	495	900,000	
Utility		200	230	900,000	
Select Structural	2x6	1420	1635	1,100,000	
No. 1 / No.2		860	990	1,100,000	
No.3		525	600	1,000,000	
Stud		520	595	1,000,000	NLGA
Select Structural	2x8	1310	1510	1,100,000	
No.1/No.2		795	915	1,100,000	
No.3		485	555	1,000,000	
Select Structural	2x10	1200	1380	1,100,000	
No.1 /No.2		725	835	1,100,000	
No.3		445	510	1,000,000	
Select Structural	2x12	1095	1255	1,100,000	
No.1 /No.2		660	760	1,100,000	
No.3		405	465	1,000,000	

Species and Grade	Size	Design Value in Bending, "Fb"		Modulus of Elasticity "E"	Grading Rules Agency
		Normal Duration	Snow Loading		
Northern White Cedar					
Select Structural	2x4	1335	1535	800,000	
No.1		990	1140	700,000	
No.2		950	1090	700,000	
No.3		560	645	600,000	
Stud		540	620	600,000	
Construction		720	825	700,000	
Standard		405	465	600,000	
Utility		200	230	600,000	
Select Structural	2x6	1160	1330	800,000	
No.1		860	990	700,000	
No.2		820	945	700,000	
No.3		485	560	600,000	
Stud		490	560	600,000	NELMA
Select Structural	2x8	1070	1230	800,000	
No.1		795	915	700,000	
No.2		760	875	700,000	
No.3		450	515	600,000	
Select Structural	2x10	980	1125	800,000	
No.1		725	835	700,000	
No.2		695	800	700,000	
No.3		410	475	600,000	
Select Structural	2x12	890	1025	800,000	
No.1		660	760	700,000	
No.2		635	725	700,000	
No.3		375	430	600,000	
Red Maple					
Select Structural	2x4	2245	2580	1,700,000	
No.1		1595	1835	1,600,000	
No.2		1555	1785	1,500,000	
No.3		905	1040	1,300,000	
Stud		885	1020	1,300,000	
Construction		1210	1390	1,400,000	
Standard		660	760	1,300,000	
Utility		315	365	1,200,000	
Select Structural	2x6	1945	2235	1,700,000	
No.1		1385	1590	1,600,000	
No.2		1345	1545	1,500,000	
No.3		785	905	1,300,000	
Stud		805	925	1,300,000	NELMA
Select Structural	2x8	1795	2065	1,700,000	
No.1		1275	1470	1,600,000	
No.2		1240	1430	1,500,000	
No.3		725	835	1,300,000	
Select Structural	2x10	1645	1890	1,700,000	
No.1		1170	1345	1,600,000	
No.2		1140	1310	1,500,000	
No.3		665	765	1,300,000	
Select Structural	2x12	1495	1720	1,700,000	
No.1		1065	1225	1,600,000	
No.2		1035	1190	1,500,000	
No.3		605	695	1,300,000	

Species and Grade	Size	Design Value in Bending, "Fb"		Modulus of Elasticity "E"	Grading Rules Agency
		Normal Duration	Snow Loading		
Red Oak					
Select Structural	2x4	1985	2280	1,400,000	NELMA
No.1		1425	1635	1,300,000	
No.2		1380	1585	1,200,000	
No.3		820	940	1,100,000	
Stud		790	910	1,100,000	
Construction		1065	1225	1,200,000	
Standard		605	695	1,100,000	
Utility		290	330	1,000,000	
Select Structural	2x6	1720	1975	1,400,000	
No.1		1235	1420	1,300,000	
No.2		1195	1375	1,200,000	
No.3		710	815	1,100,000	
Stud		720	825	1,100,000	
Select Structural	2x8	1585	1825	1,400,000	
No.1		1140	1310	1,300,000	
No.2		1105	1270	1,200,000	
No.3		655	755	1,100,000	
Select Structural	2x10	1455	1675	1,400,000	
No.1		1045	1200	1,300,000	
No.2		1010	1165	1,200,000	
No.3		600	690	1,100,000	
Select Structural	2x12	1325	1520	1,400,000	
No.1		950	1090	1,300,000	
No.2		920	1060	1,200,000	
No.3		545	630	1,100,000	

Species and Grade	Size	Design Value in Bending, "Fb"		Modulus of Elasticity "E"	Grading Rules Agency
		Normal Duration	Snow Loading		
Redwood					
Clear Structural	2x4	3020	3470	1,400,000	
Select Structural		2330	2680	1,400,000	
Select Structural, open grain		1900	2180	1,100,000	
No.1		1680	1935	1,300,000	
No.1, open grain		1335	1535	1,100,000	
No.2		1595	1835	1,200,000	
No.2, open grain		1250	1440	1,000,000	
No.3		905	1040	1,100,000	
No.3, open grain		735	845	900,000	
Stud		725	835	900,000	
Construction		950	1090	900,000	
Standard		520	595	900,000	
Utility		260	300	800,000	
Clear Structural	2x6	2615	3010	1,400,000	
Select Structural		2020	2320	1,400,000	
Select Structural, open grain		1645	1890	1,100,000	
No.1		1460	1675	1,300,000	
No.1, open grain		1160	1330	1,100,000	
No.2		1385	1590	1,200,000	
No.2, open grain		1085	1245	1,000,000	
No.3		785	905	1,100,000	
No.3, open grain		635	730	900,000	
Stud		660	760	900,000	
Clear Structural	2x8	2415	2775	1,400,000	
Select Structural		1865	2140	1,400,000	RIS
Select Structural, open grain		1520	1745	1,100,000	
No.1		1345	1545	1,300,000	
No.1, open grain		1070	1230	1,100,000	
No.2		1275	1470	1,200,000	
No.2, open grain		1000	1150	1,000,000	
No.3		725	835	1,100,000	
No.3, open grain		585	675	900,000	
Clear Structural	2x10	2215	2545	1,400,000	
Select Structural		1710	1965	1,400,000	
Select Structural, open grain		1390	1600	1,100,000	
No.1		1235	1420	1,300,000	
No.1, open grain		980	1125	1,100,000	
No.2		1170	1345	1,200,000	
No.2, open grain		915	1055	1,000,000	
No.3		665	765	1,100,000	
No.3, open grain		540	620	900,000	
Clear Structural	2x12	2015	2315	1,400,000	
Select Structural		1555	1785	1,400,000	
Select Structural, open grain		1265	1455	1,100,000	
No.1		1120	1290	1,300,000	
No.1, open grain		890	1025	1,100,000	
No.2		1065	1225	1,200,000	
No.2, open grain		835	960	1,000,000	
No.3		605	695	1,100,000	
No.3, open grain		490	560	900,000	

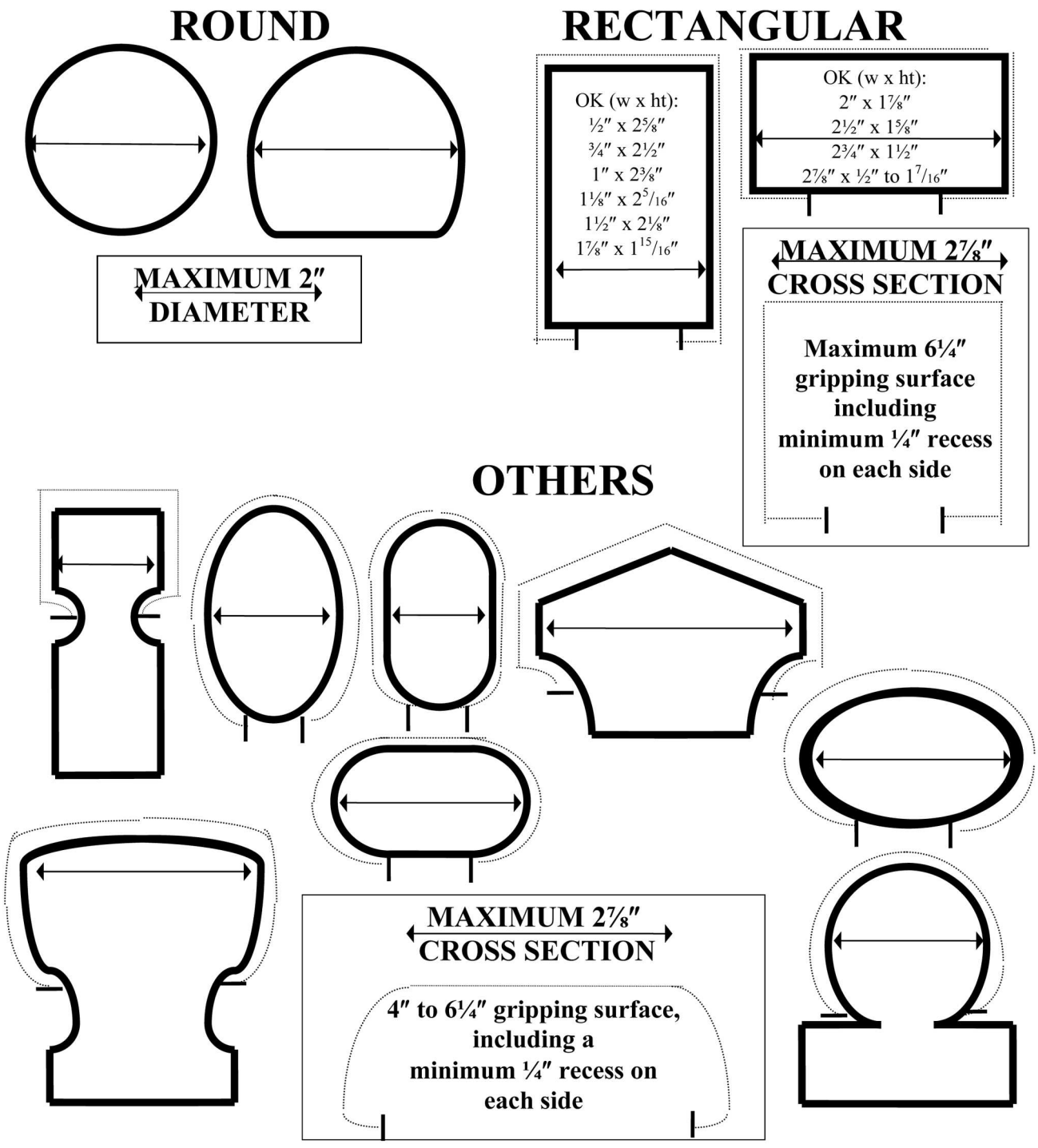
Species and Grade	Size	Design Value in Bending, "Fb"		Modulus of Elasticity "E"	Grading Rules Agency
		Normal Duration	Snow Loading		
Southern Pine					
Dense Select Structural	2x4	3510	4030	1,900,000	SPIB
Select Structural		3280	3770	1,800,000	
Non–Dense Select Structural		3050	3500	1,700,000	
No.1 Dense		2300	2650	1,800,000	
No.1		2130	2450	1,700,000	
No.1 Non–Dense		1950	2250	1,600,000	
No.2 Dense		1960	2250	1,700,000	
No.2		1720	1980	1,600,000	
No.2 Non–Dense		1550	1790	1,400,000	
No.3		980	1120	1,400,000	
Stud		1010	1160	1,400,000	
Construction		1270	1450	1,500,000	
Standard		720	825	1,300,000	
Utility		345	395	1,300,000	
Dense Select Structural	2x6	3100	3570	1,900,000	
Select Structural		2930	3370	1,800,000	
Non–Dense Select Structural		2700	3110	1,700,000	
No.1 Dense		2010	2310	1,800,000	
No.1		1900	2180	1,700,000	
No.1 Non–Dense		1720	1980	1,600,000	
No.2 Dense		1670	1920	1,700,000	
No.2		1440	1650	1,600,000	
No.2 Non–Dense		1320	T520	1,400,000	
No.3		865	990	1,400,000	
Stud		890	1020	1,400,000	
Dense Select Structural	2x8	2820	3240	1,900,000	
Select Structural		2650	3040	1,800,000	
Non–Dense Select Structural		2420	2780	1,700,000	
No.1 Dense		1900	2180	1,800,000	
No.1		1730	1980	1,700,000	
No.1 Non–Dense		1550	1790	1,600,000	
No.2 Dense		1610	1850	1,700,000	
No.2		1380	1590	1,600,000	
No.2 Non–Dense		1260	1450	1,400,000	
No.3		805	925	1,400,000	
Dense Select Structural	2x10	2470	2840	1,900,000	
Select Structural		2360	2710	1,800,000	
Non–Dense Select Structural		2130	2450	1,700,000	
No.1 Dense		1670	1920	1,800,000	
No.1		1500	1720	1,700,000	
No.1 Non–Dense		1380	1590	1,600,000	
No.2 Dense		1380	1590	1,700,000	
No.2		1210	1390	1,600,000	
No.2 Non–Dense		1090	1260	1,400,000	
No.3		690	795	1,400,000	
Dense Select Structural	2x12	2360	2710	1,900,000	
Select Structural		2190	2510	1,800,000	
Non–Dense Select Structural		2010	2310	1,700,000	
No.1 Dense		1550	1790	1,800,000	
No.1		1440	1650	1,700,000	
No.1 Non–Dense		1320	1520	1,600,000	
No.2 Dense		1320	1520	1,700,000	
No.2		1120	1290	1,600,000	
No.2 Non–Dense		1040	1190	1,400,000	
No.3		660	760	1,400,000	

Species and Grade	Size	Design Value in Bending, "Fb"		Modulus of Elasticity "E"	Grading Rules Agency
		Normal Duration	Snow Loading		
Spruce–Pine–Fir					
Select Structural	2x4	2155	2480	1,500,000	
No.1 /No.2		1510	1735	1,400,000	
No.3		865	990	1,200,000	
Stud		855	980	1,200,000	
Construction		1120	1290	1,300,000	
Standard		635	725	1,200,000	
Utility		290	330	1,100,000	
Select Structural	2x6	1870	2150	1,500,000	
No.1 /No.2		1310	1505	1,400,000	
No.3		750	860	1,200,000	
Stud		775	895	1,200,000	NLGA
Select Structural	2x8	1725	1985	1,500,000	
No. 1 / No.2		1210	1390	1,400,000	
No.3		690	795	1,200,000	
Select Structural	2x10	1580	1820	1,500,000	
No.1/No.2		1105	1275	1,400,000	
No.3		635	725	1,200,000	
Select Structural	2x12	1440	1655	1,500,000	
No.1 /No.2		1005	1155	1,400,000	
No.3		575	660	1,200,000	
Spruce–Pine–Fir (South)					
Select Structural	2x4	2245	2580	1,300,000	
No.1		1465	1685	1,200,000	
No.2		1295	1490	1,100,000	
No.3		735	845	1,000,000	
Stud		725	835	1,000,000	
Construction		980	1125	1,000,000	
Standard		545	630	900,000	
Utility		260	300	900,000	
Select Structural	2x6	1945	2235	1,300,000	
No.1		1270	1460	1,200,000	
No.2		1120	1290	1,100,000	
No.3		635	730	1000,000	NELMA
Stud		660	760	1,000,000	NSLB
Select Structural	2x8	1795	2065	1,300,000	WCLIB
No.1		1175	1350	1,200:000	WWPA
No.2		1035	1190	1,100,000	
No.3		585	675	1,000,000	
Select Structural	2x10	1645	1890	1,300,000	
No.1		1075	1235	1,200,000	
No.2		950	1090	1,100,000	
No.3		540	620	1,000,000	
Select Structural	2x12	1495	1720	1,300,000	
No.1		980	1125	1,200,000	
No.2		865	990	1,100,000	
No.3		490	560	1,000,000	

Species and Grade	Size	Design Value in Bending, "Fb"		Modulus of Elasticity "E"	Grading Rules Agency
		Normal Duration	Snow Loading		
Western Cedars					
Select Structural	2x4	1725	1985	1,100,000	WCLIB WWPA
No.1		1250	1440	1,000,000	
No.2		1210	1390	1,000,000	
No.3		690	795	900,000	
Stud		695	800	900,000	
Construction		920	1060	900,000	
Standard		520	595	800,000	
Utility		260	300	800,000	
Select Structural	2x6	1495	1720	1,100,000	
No.1		1085	1245	1,000,000	
No.2		1045	1205	1,000,000	
No.3		600	690	900,000	
Stud		635	725	900,000	
Select Structural	2x8	1380	1585	1,100,000	
No.1		1000	1150	1,000,000	
No.2		965	1110	1,000,000	
No.3		550	635	900,000	
Select Structural	2x10	1265	1455	1,100,000	
No.1		915	1055	1,000,000	
No.2		885	1020	1,000,000	
No.3		505	580	900,000	
Select Structural	2x12	1150	1325	1,100,000	
No.1		835	960	1,000,000	
No.2		805	925	1,000,000	
No.3		460	530	900,000	
Western Woods					
Select Structural	2x4	1510	1735	1,200,000	WCLIB WWPA
No.1		1120	1290	1,100,000	
No.2		1120	1290	1,000,000	
No.3		645	745	900,000	
Stud		635	725	900,000	
Construction		835	960	1,000,000	
Standard		460	530	900,000	
Utility		230	265	800,000	
Select Structural	2x6	1310	1505	1,200,000	
No.1		970	1120	1,100,000	
No.2		970	1120	1,000,000	
No.3		560	645	900,000	
Stud		575	660	900,000	
Select Structural	2x8	1210	1390	1,200,000	
No.1		895	1030	1,100,000	
No.2		895	1030	1,000,000	
No.3		520	595	900,000	
Select Structural	2x10	110	1275	1,200,000	
No.1		820	945	1,100,000	
No.2		820	945	1,000,000	
No.3		475	545	900,000	
Select Structural	2x12	1005	1155	1,200,000	
No.1		750	860	1,100,000	
No.2		750	860	1,000,000	
No.3		430	495	900,000	

Species and Grade	Size	Design Value in Bending, "Fb"		Modulus of Elasticity "E"	Grading Rules Agency
		Normal Duration	Snow Loading		
White Oak					
Select Structural	2x4	2070	2380	1,100,000	
No.1		1510	1735	1,000,000	
No.2		1465	1685	900,000	
No.3		820	940	800,000	
Stud		820	945	800,000	
Construction		1095	1255	900,000	
Standard		605	695	800,000	
Utility		290	330	800,000	
Select Structural	2x6	1795	2065	1,100,000	
No.1		1310	1505	1,000,000	
No.2		1270	1460	900,000	
No.3		710	815	800,000	
Stud		750	860	800,000	NELMA
Select Structural	2x8	1655	1905	1,100,000	
No.1		1210	1390	1,000,000	
No.2		1175	1350	900,000	
No.3		655	755	800,000	
Select Structural	2x10	1520	1745	1,100,000	
No.1		1105	1275	1,000,000	
No.2		1075	1235	900,000	
No.3		600	690	800,000	
Select Structural	2x12	1380	1585	1,100,000	
No.1		1005	1155	1,000,000	
No.2		980	1125	900,000	
No.3		545	630	800,000	
Yellow Poplar					
Select Structural	2x4	1725	1985	1,500,000	
No.1		1250	1440	1,400,000	
No.2		1210	1390	1,300,000	
No.3		690	795	1,200,000	
Stud		695	800	1,200,000	
Construction		920	1060	1,300,000	
Standard		520	595	1,100,000	
Utility		230	265	1,100,000	
Select Structural	2x6	1495	1720	1,500,000	
No.1		1055	1245	1,400,000	
No.2		1045	1205	1,300,000	
No.3		600	690	1,200,000	
Stud		635	725	1,200,000	NSLB
Select Structural	2x8	1380	1585	1,500,000	
No.1		1000	1150	1,400,000	
No.2		965	1110	1,300,000	
No.3		550	635	1,200,000	
Select Structural	2x10	1265	1455	1,500,000	
No.1		915	1055	1,400,000	
No.2		885	1020	1,300,000	
No.3		505	580	1,200,000	
Select Structural	2x12	1150	1325	1,500,000	
No.1		835	960	1,400,000	
No.2		805	925	1,300,000	
No.3		460	530	1,200,000	

21.04 (3) (b) 5.
HANDRAIL SHAPES



Following is an emergency rule that became effective on October 1, 2008 that, among other things, requires carbon monoxide detectors in dwellings covered under the Uniform Dwelling Code and are licensed as tourist rooming cabins by the WI Department of Health Services. We expect to make similar rules permanent sometime in 2009. Additional information is available on our website, www.commerce.wi.gov/sb

DEPARTMENT OF COMMERCE

EMERGENCY RULE RELATING TO CARBON MONOXIDE DETECTORS

Under the nonstatutory provisions of 2007 Wisconsin Act 205, the Department of Commerce is directed to issue emergency rules that implement provisions of the Act. The Act specifically states: "Notwithstanding section 227.24 (1) (a) and (3) of the statutes, neither the department of commerce or the department of health services is required to provide evidence that promulgating rules under this subsection as emergency rules is necessary for the preservation of the public peace, health, safety, or welfare and is not required to provide a finding of emergency for the rules promulgated under this subsection."

The Act mandates the installation and maintenance of carbon monoxide alarms in buildings accommodating certain types of residential occupancies and within which fuel burning appliances are located. Residential occupancies include tourist rooming houses, bed and breakfast establishments, and any public building that is used for sleeping or lodging, such as, hotels, motels, condominiums, apartment buildings, dormitories, fraternities, sororities, convents, seminaries, community based residential facilities, home shelters, but not hospitals and nursing homes. The Act requires the installation of carbon monoxide alarms in new buildings as of October 1, 2008. The owners of existing buildings will have until April 1, 2010 to install the carbon monoxide alarms. The Act also provides for the omission of carbon monoxide alarms in certain instances which are further clarified by the administrative rules.

Pursuant to section 227.24 (1) (c), Stats., this rule is adopted as an emergency rule to take effect on October 1, 2008.

The Wisconsin Department of Commerce adopts an order to renumber Comm 66.0911; to amend Comm 20.24 (1) and (2); and to create s. Comm 21.095, Comm 20.24 Table 20.24−14, Comm 62.1200, Comm 62.3500 (3) (e), Comm 62.3500 (3) Note, Comm 66.0911 (title) and Comm 66.0911 (2), relating to carbon monoxide alarms and affecting small business.

Analysis of Rule

1. Statutes Interpreted

Statutes Interpreted: ss. 101.02 (15) and 101.63 (1), Stats., and s. 101.149, Stats., as created by 2007 Wisconsin Act 205.

2. Statutory Authority

Statutory Authority: ss. 101.02 (1) and (15) (a) and 101.63 (1), Stats., and s. 101.149, Stats., as created by 2007 Wisconsin Act 205.

3. Related Statute or Rule

Statutes: ss. 101.12 (1), Stats.

Administrative Rules: Chapters Comm 60−66, Wisconsin Commercial Building Code
Chapters Comm 20−25, Uniform Dwelling Code

4. Explanation of Agency Authority

Under the statutes cited, the Department of Commerce protects public health, safety, and welfare by promulgating comprehensive requirements for design, construction, use and maintenance of public buildings and places of employment and adopts rules that establish uniform, statewide standards for the construction of 1− and 2−family dwellings. 2007 Wisconsin Act 205 specifically directs the Department to address carbon monoxide alarms involving these types of buildings.

5. Summary of Proposed Rules

The rules establish minimum requirements for the installation and maintenance of carbon monoxide alarms in buildings accommodating residential type occupancies where people sleep or lodge, excluding hospitals and nursing homes, that reflect the statutory mandates of 2007 Wisconsin Act 205. Specifically, the rules would:

For new tourist rooming houses (cabins under the scope of Uniform Dwelling Code) (October 1, 2008), Comm 21.095

- Require the installation of carbon monoxide alarms where any type of fuel burning appliances are installed.
- Require the carbon monoxide alarms to be continuously powered by the building's electrical service with battery backups.

For new commercial buildings: (October 1, 2008),

- Require the installation of carbon monoxide alarms where any type of fuel burning appliances are installed. Comm 62.1200 (2) (a)
- Require the carbon monoxide alarms to be continuously powered by the building's electrical service with battery backups. Comm 62.1200 (2) (c)

For existing commercial buildings (Buildings existing on October 1, 2008 or reviewed and receiving department plan approval under the rules effective prior to October 1, 2008)

- Require the installation of carbon monoxide alarms by April 1, 2010.
- Do not dictate the type of power sources for the carbon monoxide alarms, thereby allowing batteries, electrical outlet plug−ins or wired to the building's electrical service.
- Allow the omission of carbon monoxide alarms provided there are no attached garages and all of the fuel burning appliances are of sealed combustion type either under warranty or annually inspected for carbon monoxide emissions. Comm 62.1200 (2) (a) 4.

The rules require carbon monoxide alarms to be listed and labeled identifying conformance to UL 2034, Underwriters Laboratories Inc, Standard for Safety Single and Multiple Station Carbon Monoxide Alarms.

Under the federal Americans with Disabilities Act, ADA, and the federal Fair Housing Law certain carbon monoxide alarms may be required to have both audible and visual alarm features.

Owners of existing tourist rooming houses will need to install and maintain carbon monoxide alarms in accordance with s. 101.149 (2) and (3), Stats., by April 1, 2010.

6. Summary of, and Comparison with, Existing or Proposed Federal Regulations

An internet−based search of code of federal regulations and the federal register did not indentify any federal requirements for the installation and maintenance of carbon monoxide alarms in residential buildings.

7. Comparison with Rules in Adjacent States

An Internet−based search carbon monoxide alarm regulations for the states of Illinois, Iowa, Michigan and Minnesota found the following:

- Illinois under Public Act 094−0741, the Carbon Monoxide Alarm Detector Act, has required the installation of carbon monoxide alarms in all occupancies and structures which have sleeping rooms since January 1, 2007.
- Iowa requires the installation of carbon monoxide alarms in foster care facilities.
- Michigan has not enacted any carbon monoxide alarm regulations at this time.
- Minnesota statute, 299F.50, requires carbon monoxide alarms in all single family homes and multifamily apartments units; new construction as of January 1, 2007; existing single family homes as of August 1, 2008 and existing multi−family and apartment buildings as of August 1, 2009.

8. Summary of Factual Data and Analytical Methodologies

In developing the rules the Department reviewed the language of 2007 Wisconsin Act 205 in conjunction with the Department's broad authority under ss. 101.02 (15) and 101.63 (1), Stats., to protect public health and safety regarding the construction of public buildings, places of employment and one− and two− family dwellings to be used as tourist rooming houses. The current administrative rules for the installation of fire alarms (smoke detectors) were used as a model for these proposed rules pertaining to carbon monoxide alarms. The Department also analyzed the complexities of compliance under several scenarios where fuel burning appliances are added or replaced during the life of the building, such as residential condominiums.

9. Analysis and Supporting Documents used to Determine Effect on Small Business or in Preparation of Economic Impact Report

The proposed rules implement mandates imposed by 2007 Wisconsin Act 205. The Act affects the owners of commercial buildings where people sleep or lodge and tourist room houses (rental cabins) where fuel burning appliances are installed. The types of commercial buildings affected include apartment buildings, condominiums, hotels, motels, bed and breakfast establishments, fraternities, sororities, dormitories, convents, seminaries, community based residential facilities, and home shelters. The department does not believe that the rules will increase the effect on small businesses over that imposed by the Act. Battery or plug−in type carbon monoxide alarms typically range in cost from $25 to $50. New construction installation costs for a hard−wired type carbon monoxide alarm with battery backup ranges in from $65 to $85 and $90 to $110 if interconnection is involved. Combination carbon monoxide alarms and smoke alarms are also available. Smoke alarms are currently required for residential occupancies. The use of combination carbon monoxide alarms and smoke alarms should result in installation and labor cost savings over that for separate systems.

An economic impact report has not been required to be prepared.

10. Agency Contact.

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SECTION 1. Comm 20.24 (1) and (2) are amended to read:

Comm 20.24 (1) CONSENT. Pursuant to s. 227.21 (2), Stats., the attorney general ~~and the revisor of statutes have~~ has consented to the incorporation by reference of the standards listed in Tables 20.24–1 to ~~20.24–12~~ 20.14–14.

(2) ADOPTION OF STANDARDS. The standards referenced in Tables 20.24–1 to ~~20.24–12~~ 20.14–14 are incorporated by reference into this chapter.

Note: Copies of the adopted standards are on file in the offices of the department and the legislative reference bureau. Copies of the standards may be purchased through the respective organizations listed in Tables 20.24–1 to ~~20.24–12~~ 20.14–14.

SECTION 2. Comm 20.24 Table 20.24–14 is created to read:

Table 20.24–14

UL	Underwriters Laboratories, Inc 333 Pfingsten Road Northbrook, IL 60062–2096
Standard Reference Number	**Title**
2034–2005	Single and Multiple State Carbon Monoxide Alarms

SECTION 3. Comm 21.095 is created to read:

Comm 21.095 Carbon monoxide alarms. (1) (a) Listed and labeled carbon monoxide alarms with battery secondary power supplies shall be installed and maintained in dwellings to be utilized as licensed tourist rooming houses and which contain fuel–burning appliances in accordance with s. 101.149 (2) and (3), Stats.

Note: Section 101.149 (2) and (3), Stats., reads:

(2) INSTALLATION REQUIREMENTS. (a) Except as provided in par. (b), the owner of a residential building shall install a carbon monoxide detector in all of the following places not later than the date specified under par. (c):

1. In the basement of the building if the basement has a fuel–burning appliance.

2. Within 15 feet of each sleeping area of a unit that has a fuel–burning appliance.

3. Within 15 feet of each sleeping area of a unit that is immediately adjacent to a unit that has a fuel–burning appliance.

4. In each room that has a fuel–burning appliance and that is not used as a sleeping area. A carbon monoxide detector shall be installed under this subdivision not more than 75 feet from the fuel–burning appliance.

5. In each hallway leading from a unit that has a fuel–burning appliance, in a location that is within 75 feet from the unit, except that, if there is no electrical outlet within this distance, the owner shall place the carbon monoxide detector at the closest available electrical outlet in the hallway.

(b) If a unit is not part of a multiunit building, the owner of the residential building need not install more than one carbon monoxide detector in the unit.

(c) 1. Except as provided under subd. 2., the owner of a residential building shall comply with the requirements of this subsection before the building is occupied.

2. The owner of a residential building shall comply with the requirements of this subsection not later than April 1, 2010, if construction of the building was initiated before October 1, 2008, or if the department approved the plans for the construction of the building under s. 101.12, Stats., before October 1, 2008.

(d) Any carbon monoxide detector that bears an Underwriters Laboratories, Inc., listing mark or similar mark from an independent product safety certification organization satisfies the requirements of this subsection.

(e) The owner shall install every carbon monoxide detector required by this subsection according to the directions and specifications of the manufacturer of the carbon monoxide detector.

(3) MAINTENANCE REQUIREMENTS. (a) The owner of a residential building shall reasonably maintain every carbon monoxide detector in the residential building in the manner specified in the instructions for the carbon monoxide detector.

(b) An occupant of a unit in a residential building may give the owner of the residential building written notice that a carbon monoxide detector in the residential building is not functional or has been removed by a person other than the occupant. The owner of the residential building shall repair or replace the nonfunctional or missing carbon monoxide detector within 5 days after receipt of the notice.

(c) The owner of a residential building is not liable for damages resulting from any of the following:

1. A false alarm from a carbon monoxide detector if the carbon monoxide detector was reasonably maintained by the owner of the residential building.

2. The failure of a carbon monoxide detector to operate properly if that failure was the result of tampering with, or removal or destruction of, the carbon monoxide detector by a person other than the owner or the result of a faulty alarm that was reasonably maintained by the owner as required under par. (a).

(b) For the purposes of this section:

1. "Fuel–burning appliance" means a device that is permanently installed in a dwelling and burns fossil–fuel or carbon based fuel where carbon monoxide is a combustion by–product, including stoves, ovens, grills, clothes dryers, furnaces, boilers, water heaters, heaters, fireplaces and stoves.

2. "Tourist rooming house" has the meaning as given under s. HFS 195.03 (20).

Note: Section HFS 195.03 (20) reads: "Tourist rooming house" means all lodging places and tourist cabins and cottages, other than hotels and motels, in which sleeping accommodations are offered for pay to tourists or transients. It does not include private boarding or rooming houses not accommodating tourists or transients, or bed and breakfast establishments regulated under ch. HFS 197.

(2) Carbon monoxide alarms shall be wired to the dwelling's electrical service.

(3) Carbon monoxide alarms within a dwelling unit shall be interconnected so that activation of one alarm will cause activation of all alarms within the dwelling unit.

(4) Carbon monoxide alarms shall conform to UL 2034.

(5) Violation of the provisions of this section shall be subject to the penalties provided under s. 101.149 (8), Stats.

Note: Section 101.149 (8), Stats., reads:

(8) PENALTIES. (a) If the department of commerce or the department of health and family services determines after an inspection of a building under this section or s. 254.74 (1g) that the owner of the building has violated sub. (2) or (3), the respective department shall issue an order requiring the person to correct the violation within 5 days or within such shorter period as the respective department determines is necessary to protect public health and safety. If the person does not correct the violation within the time required, he or she shall forfeit $50 for each day of violation occurring after the date on which the respective department finds that the violation was not corrected.

(b) If a person is charged with more than one violation of sub. (2) or (3) arising out of an inspection of a building owned by that person, those violations shall be counted as a single violation for the purpose of determining the amount of a forfeiture under par. (a).

(c) Whoever violates sub. (4) is subject to the following penalties:

1. For a first offense, the person may be fined not more than $10,000 or imprisoned for not more than 9 months, or both.

2. For a 2nd or subsequent offense, the person is guilty of a Class I felony.

(END)

EFFECTIVE DATE

Pursuant to s. 227.24 (1) (c), Stats., this rule shall take effect as an emergency rule on October 1, 2008.

321.125 (3) CONTROL STANDARDS

The following are designs acceptable by the department to achieve compliance with the control standards of acceptable soil loss or percent reduction of sediment load in runoff from a site.

Less than one acre disturbance (regardless of the lot or property size).

A. Mandated practices:

1. A method to prevent or reduce soil from leaving a site via entries or roads**.** This may include a tracking pad or tire washing stand designed and installed to meet DNR Standard 1057. Other means of compliance include a gravel mulch, frozen soil, bedrock or some other physical means to prevent soil from leaving the site on vehicle tires which is equivalent to the tracking pad or tire washing stand.

2. Storm water inlet protection. Inlet protection may be accomplished by using DNR Technical Standard, number 1050, "Storm Drain Inlet Protection for Construction Sites". The protection of stormwater inlets in the code is specific to "on−site" inlets; however an off−site inlet may create a direct conduit to a water of the state, which links any inlet that leads to a water of the state to the #3 mandated practice. In that case, special care should be taken to protect both types of inlets from sediment in runoff from a construction site.

3. Protection of adjoining waters of the state. The installation of practices is necessary if runoff from the disturbance could impact a water of the state. Practices may include channel erosion mats, silt fences, vegetative buffers or any other practices applicable to the specific site.

4. Drainage way protection. Any ditches or drainage ways that flow off−site must be protected with appropriate best management practices (BMPs). This may include but is not limited to ditch checks, channel erosion control mats or riprap.

5. Dewatering activity sediment reduction**.** Any dewatering necessary on the construction site must include measures to reduce the sediment in the water leaving the site. Dewatering BMPs may include filters, fiber rolls or gravel bag berms.

6. Stockpile protection. Any soil stockpiles which are left more than 7 days must be protected by seeding and mulching, erosion mat, silt fencing, covering or other methods. This does not include fill or topsoil piles that are in active use.

B. In addition to mandated practices, the owner/contractor or designer must choose one or more of the following methods in order to achieve compliance with the standards.

1. The Revised Universal Soil Loss Equation may be used to determine the amount of soil lost from a site in order to stay below the 5 tons/acre/year for sand, loamy sand, sandy loam, loam, sandy clay loam, clay loam, sandy clay, silty clay or clay textures or the 7.5 tons/acre/year soil loss for silt, silty clay loam or silt loam textures. The Commerce−accepted version of an Excel worksheet that is used to calculate the soil loss is available at: http://commerce.wi.gov/SB/SB−SoilErosionControlProgram.html.

2. Silt fence may be placed in accordance with the DNR Technical Standard 1056 and remain on the site until the pervious area is stabilized. This practice, in addition to the mandated practices in part "A" is accepted by the Department of Safety and Professional Services as compliant with the 40% reduction in sediment load goal.

3. The site may be seeded and mulched, erosion control mat may be installed or polymers may be applied. The erosion control BMPs must be applied within one week of disturbance. Seeding must be accomplished in accordance with DNR Technical Standard 1059 and mulching with DNR Technical Standard 1058. Erosion control mat must be installed in accordance with DNR Technical Standards 1052 and 1053. Polymer application must be done in accordance with DNR Technical Standard 1051. This method is only acceptable when the maximum slope length is 300 feet and the maximum slope is no more than that specified in Table A−321.125−1 and Table A−321.125−2.

4. Practices may be included in the erosion and sediment control plan for the site that achieve compliance with the 40% reduction in sediment load in the runoff from the site. Table A−321.125−3 lists several erosion and sediment control BMPs and the USEPA (United States Environmental Protection Agency) efficiency rating for that BMP.

5. A unique design may be submitted with the UDC permit application for review.