CR 86-210

RULES CERTIFICATE

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STATE OF WISCONSIN)) DEPT. OF INDUSTRY,) LABOR & HUMAN RELATIONS)

NOV 1 8 1988 Rev fatutes Bureau

TO ALL TO WHOM THESE PRESENTS SHALL COME, GREETINGS:

SS

I,John T. Coughlin	, Secretary of the Department of
Industry, Labor and Human Relations, and c	custodian of the official records
of said department, do hereby certify that	t the annexed rule(s) relating to
the Uniform Dwelling Code	were duly
(Subject) approved and adopted by this department or	$\frac{\text{November 18, 1988}}{(Date)}$

I further certify that said copy has been compared by me with the original on file in this department and that the same is a true copy thereof, and of the whole of such original.

> IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the official seal of the department at 9:00 a.m. in the city of Madison, 1854s 18th day of November A.D. 19 88.

Secretary

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ORDER OF ADOPTION

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Revisor of Statutes Bureau

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Pursuant to authority vested in the Department of Industry, Labor and
Human Relations by section(s) <u>101.02 (1), 101.63 (1), 101.64 (3) & 101.73 (1) to</u> ,
Stats., the Department of Industry, Labor and Human Relations \mathbf{x} creates; (3)
X amends; X repeals and recreates; X repeals and adopts rules of Wisconsin
Administrative Code chapter (s):
ILHR 20 - 25 Uniform Dwelling Code (Number) (Title)
The attached rules shall take effect on <u>the first day of the month</u>
following publication in the Wisconsin Administrative pursuant to section
227.22, Stats. Register

Adopted at Madison, Wisconsin, this

date: November 18, 1988

DEPARTMENT OF INDUSTRY, LABOR AND HUMAN RELATIONS

-21 <u>____</u> Secretary

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State of Wisconsin \ Department of Industry, Labor and Human Relations

RULES in **FINAL** DRAFT FORM

Rule: Chapter ILHR 20-25 Relating to: Uniform Dwelling code

Clearinghouse Rule No.: ______

The Wisconsin Department of Industry, Labor and Human Relations proposes an order to repeal ILHR 20.02 (6), ILHR 20.05 (9), ILHR 20.07 (18), ILHR 20.07 (53), ILHR 20.24 (2n), ILHR 21.03 (1) (b), ILHR 20.18 (3) (a) 2., ILHR 21.31, ILHR 22.03 (1m) to (4), ILHR 22.03 (5), ILHR 22.03 (6) and (7), ILHR 22.03 (8) and (9), ILHR 22.03 (10), ILHR 23.04 (4) and ILHR 23.11 (3);

to renumber ILHR 21.03 (1) (a), ILHR 21.04 (3) (f), ILHR 21.16 (intro.), ILHR 21.16 (1) (a) to (c), ILHR 22.18 (3) (a) 1., Table 21.22-A, Table 21.22-D, ILHR 21.22 (8) (d), ILHR 22.03 (1), ILHR 22.03 (4m), ILHR 22.03 (5m), ILHR 22.03 (7m), ILHR 22.03 (7r), ILHR 22.03 (9m), Figures 23.01-A to C, Figure 23.045, Table 23.045-B and Table 23.045-C;

to renumber and amend ILHR 20.07 (26), ILHR 21.16 (1) (d), ILHR 21.22 (8) (c), Table 23.045-D, ILHR 23.045 (5), Table 23.045-E, and ILHR 23.15 (2) (d);

to amend ILHR 20.03, ILHR 20.05 (5), ILHR 20.07 (8), ILHR 20.07 (22), ILHR 20.07 (36m), ILHR 20.07 (50), ILHR 20.07 (58), ILHR 20.07 (62), ILHR 20.07 (74), ILHR 20.09 (4) (b), ILHR 20.09 (5) (b) 1., ILHR 20.24 (intro.), (1) and (2k), ILHR 20.24 (4), ILHR 21.02 (3) (a) 1.a., ILHR 21.02 (3) (a) 1.b., ILHR 21.02 (3) (a) (Note #1), ILHR 21.03 (2), ILHR 21.03 (7), ILHR 21.03 (8), ILHR 21.02 (3) (a) (Note #1), ILHR 21.03 (2), ILHR 21.03 (7), ILHR 21.03 (8), ILHR 21.04 (intro.), ILHR 21.05 (4), ILHR 21.08 (2) and Table 21.08, ILHR 21.08 (5) (c), ILHR 21.10 (1) (b)and (3), ILHR 21.11 (1) (b), ILHR 21.15 (1) (a), ILHR 21.16 (1) (d), ILHR 21.17 (2) (f), ILHR 21.20, ILHR 21.22 (3), Table 21.25-B, Table 21.25-E, ILHR 21.26 (9) (b), ILHR 21.27 (3) (intro.) and (a), ILHR 21.28 (7) (a), ILHR 21.29 (6) (title), Table 21.29-1, ILHR 21.32 (3) and Table 21.32-1, ILHR 22.05 (1), ILHR 23.045 (1), ILHR 23.045 (3) (a) 1., ILHR 23.045 (4) (b), ILHR 23.045 (6) (a), ILHR 23.045 (6) (b) 2., ILHR 23.045 (8) (intro.), ILHR 23.045 (9) (a), ILHR 23.06 (intro.), ILHR 23.05 (1) (a), ILHR 23.05 (2) (a), ILHR 23.05 (2), Table 23.15-A (title), and Table 23.15-C;

to repeal and recreate ILHR 20.07 (38), ILHR 21.03 (5) and (6), ILHR 21.04 (1) (c), Tables 21.18-C and D, Table 21.22-B, Table 21.22-C, ILHR 21.25 (3) (b), Table 21.28-A, ILHR 23.045 (6) (b) 1., ILHR 23.16 (2), ILHR 23.16 (3), and ILHR 23.16 (4) (a);

and to create ILHR 20.04 (3), ILHR 20.07 (34k), ILHR 20.07 (38m), ILHR 20.07 (40m), ILHR 20.07 (59m), ILHR 20.07 (65m), ILHR 20.10 (1) (b) 2.f., ILHR 20.19 (1) (note), ILHR 20.19 (2) (note), ILHR 20.24 (2p) and (2s), ILHR 20.24 (3m), ILHR 21.03 (6m), ILHR 21.03 (10), ILHR 21.03 (11), ILHR 21.03 (12), ILHR 21.042 (intro.), ILHR 20.045, ILHR 21.08 (1m), ILHR 21.16 (2) (e), ILHR 21.205, ILHR 21.28 (2) (c) to (e), Table 21.22-A2, ILHR 21.22 (8) (c), Table 21.22-D, ILHR 21.32 (1) (a) and (b), ch. 22 Subchapter II (title) (note), ILHR 23.045 (2) (c), ILHR 23.045 (3) (b) to (e), Table 23.045-E, Figure 23.045-B, ILHR 23.045 (8) (e), ILHR 23.08 (2) (b), ILHR 23.08 (10), and ILHR 23.156; relating to the Uniform Dwelling Code.

ANALYSIS OF RULES

Statutory authority: ss. 101.02 (1), 101.63 (1), 101.64 (3), and 101.73 (1) to (3), Stats. Statutes interpreted: ss. 101.63 (1), 101.64 (3), and 101.73 (1) to (3), Stats.

This set of proposed changes of the Uniform Dwelling Code is the first of regular updates of the code. The proposed changes are based upon suggestions submitted by users of the code, state enforcement and inspection staff and local building inspectors. The following is a summary of the major changes included in the proposal:

1. Unclear wording concerning licensing of contractors by municipalities is deleted. Current s. ILHR 20.02 (6) provides that municipalities may license persons for performing work on a dwelling in which the person has no legal or equitable interest. This rule has caused some confusion in the past because it is silent concerning the licensing of homeowners. Section 101.63 (2), Stats., on which the rule is based is also silent on the subject of licensing homeowners who build their own homes, it provides, in part:

.. The department may not adopt any rule which prohibits any city, village, town or county from licensing persons for performing work on a dwelling in which the licensed person has no legal or equitable interest.

Clearly, under the statute municipalities may not adopt a rule to require homeowners to be licensed to do work on their own property. Since the current rule is confusing and unnecessary, it is proposed that the rule be repealed and s. 101.63 (2), Stats., be allowed to stand alone.

- 2. A provision informing owners of historic buildings of the option of using the Historic Building Code is added.
- 3. The way to measure fire separation between accessory buildings and dwellings is clarified and corrected.
- 4. Definitions which are written in an old format are updated to the current format.
- 5. Definitions of basement, groundfloor and loft levels are amended, definition of a first floor is added.
- 6. Language is added to clarify that a municipality may not require plans to be stamped by an engineer or architect as a prerequisite for issuance of a permit. Municipalities are not consistent in determining the complexity of plans which necessitate stamps. Prohibition of the requirement assures statewide uniformity in the application of the code.

- 7. A two year time limit for the completion of a dwelling's exterior has been placed on uniform building permits
- 8. The 1986 editions of the National Design Specification for Wood Construction, the Design Values for Wood Construction Supplement and the 1987 edition of Technical Report No. 7, The Permanent Wood Foundation System, are proposed to be incorporated.
 - 9. The American Wood Preservers Association (AWPA) standards are proposed to be incorporated in place of the currently adopted American Wood Preservers Bureau (AWPB) standards because the AWPA standards are more universal. The AWPB standard for ground contact use is retained.
 - 10. The load duration factor for snow loads on rafters is changed so that it is 15% for rafters of any spacing.
- 11. The rules which concern the use of plywood have been updated as suggested by the American Plywood Association so that they are consistent with updated product standards.
- 12. Requirements for the installation of windows as a means of exiting from the first floor have been repealed. Under the proposed rules, windows may be used as an optional second exit for second floor and basement bedrooms.
- 13. Stairway requirements have been amended and ramp and balcony requirements have been added. Under the proposed rules, balconies used as exits may be no more than 10 feet above grade.
- 14. Exemptions to stair landing requirements have been amended.
- 15. A provision is added to require removal of organic material from crawl space floors.
- 16. The interpretation which is used to allow envelope home construction is proposed to be codified.
- 17. Continuous footing requirements have been amended to allow lintels to be used when there is a change in footing elevation.
- 18. Drain tile requirements have been amended. Basement drain tiles have been added to the list of required inspections.
- 19. Requirements for pilastered and reinforced 10-inch and 12-inch masonry walls have been added.
- 20. Wood basement floors are required to be constructed in accordance with adopted standards. Municipalities may prohibit the use of wood basement floors by ordinance.
- 21. A table to specify the maximum column spacing for beams which support one floor has been added.

- 22. Header support requirements have been rewritten for clarity. Support requirements are reduced for span over 6 feet when 2 x 6 framining is used.
- 23. Rules concerning the installation of factory-built fireplaces have been added to alert installers and inspectors to potentially hazardous situations so that they may be avoided.
- 24. Hearth extension requirements for masonry fireplaces have been clarified.
- 25. Different code sections concerning solid-fuel-burning appliances have been consolidated to eliminate duplications and conflicts.
- 26. Requirements for all solid-fuel-burning appliances to be tested and listed by an approved testing agency have been added.
- 27. Solid fuel burning appliances are no longer allowed to be installed in garages unless specifically designed and listed for that purpose.
- 28. Factory built chimneys are required to be tested to 2100°F to insure that they have been tested under conditions likely to occur during a chimney fire.
- 29. Installation requirements for appliances which get combustion air from inside dwellings, via infiltration, are changed to allow for increasing tightness in construction and it is specified that combustion air may not be taken from garages or from attic spaces unless the intake is adequately protected.
- 30. Rules which allow under-floor plenums which are constructed according to the NFPA Standard 90-B are proposed.
- 31. Gas piping is required to be installed in compliance with the National Fuel Gas Code.
- 32. Changes are made to appendices to the Code for clarification and to bring them up to date with new administrative forms.

 SECTION 1. ILHR 20.02 (6) is repealed.

SECTION 2. ILHR 20.03 is amended to read:

ILHR 20.03 EFFECTIVE DATE. The effective date of ch. ILHR 22 of this code is December 1, 1978. Chapters The effective date of chs. ILHR 20, 21, 23, 24 and 25 shall/become/effective/g/months/after/the/date/of/publication of this code is June 1, 1980.

SECTION 3. ILHR 20.04 (3) is created to read:

ILHR 20.04 (3) HISTORIC BUILDINGS. The owner of a historic building which is subject to the provisions of this chapter, may elect to be subject to either ch. ILHR 70, Historic Building Code or to ch. 20 to 25, Uniform welling Code. The elected code shall be used in its entirety.

SECTION 4. ILHR 20.05 (5) is amended to read:

ILHR 20.05 (5) ACCESSORY BUILDINGS. With the exception of s. ILHR 21.08 (5), The the provisions of this code do not apply to detached garages or any accessory buildings b/dT/dT/g/s detached from the dwelling.

SECTION 5. ILHR 20.05 (9) is repealed.

SECTION 6. ILHR 20.07 (8) is amended to read:

ILHR 20.07 (8) "Basement" means that portion of a dwelling between flødf/dnd/deiling/whidh/is/beløw/øf/baftly/beløw/dnd/paftly/dbøve/gfdde/but sø/løddted/that/the/veftidal/distande/frøm/the/gfdde/tø/the/flødf/beløw/is nøre/than/the/veftidal/distande/frøm/gfdde/tø/deiling below the first floor or groundfloor with its entire floor below grade.

SECTION 7. ILHR 20.07 (18) is repealed.

SECTION 8. ILHR 20.07 (22) is amended to read:

(22) "Degree day's day" are/figured/as/the/humber/of/degrees means a unit of temperature and time which may be used to determine heating requirements for buildings. A degree day accrues for every degree the mean outdoor temperature for a 24 hour period deviates/from falls below 65° each/day/daring/the/heating/season.

(Note to Revisor: the note is retained)

SECTION 9. ILHR 20.07 (26) is renumbered 20.07 (29m) and is amended to read:

ILHR 20.07 (29m) An/YeXisting/dweYYingY/is <u>"Existing dwelling"</u> means a dwelling erected prior to the effective date of this code, one for which a valid permit exists, or one for which lawful construction has commenced prior to the effective date of this code.

Note: See s. ILHR 20.03 for the effective date of this code.

SECTION 10. ILHR 20.07 (34k) is created to read:

ILHR 20.07 (34k) "First floor" means the first floor level above any groundfloor or basement or, in the absence of a groundfloor or basement, means the lowest floor level in the dwelling.

SECTION 11. ILHR 20.07 (36m) is amended to read:

ILHR 20.07 (36m) "Groundfloor" means that level of a dwelling, below the first floor, located on a site with a sloping <u>or multilevel</u> grade and which has a portion of its floor line at grade.

SECTION 12. ILHR 20.07 (38) is repealed and recreated to read:

ILHR 20.07 (38) "Hearth" means the floor area within the fire chamber of a fireplace.

SECTION 13. ILHR 20.07 (38m) is created to read:

ILHR 20.08 (38m) "Hearth Extension" means the surfacing applied to the floor area extending in front of and at the sides of the fireplace opening.

SECTION 14. ILHR 20.07 (40m) is created to read:

ILHR 20.07 (40m) "Hollow unit" means a masonry unit which has a net cross-sectional area parallel to the bearing face which is less than 75% of the gross cross-sectional area.

SECTION 15. ILHR 20.07 (50) is amended to read:

ILHR 20.07 (50) "Loft" means an upper room or floor which *is* has at least 50 percent of the common wall open to the floor below. The opening may be infringed upon by an open guardrail constructed in compliance with s. ILHR 21.04 (2), but not by a window or half-wall guardrail. All habitable rooms of lofts are open to the floor below.

SECTION 16. ILHR 20.07 (53) is repealed.

SECTION 17. ILHR 20.07 (58) is amended to read:

ILHR 20.07 (58) "Perm" is/the/designation/for/the means a unit of permeance which is a/substitute/for/the/unit//one/grain measured in grains per (hour) (square foot) (inch of mercury vapor pressure difference).

Note: The lower the perm rating of a material is, the more difficult it is for water vapor to pass through it.

SECTION 18. ILHR 20.07 (59m) is created to read:

ILHR 20.07 (59m) "Porch" means an unenclosed exterior structure at or near grade attached or adjacent to the exterior wall of any building, and having a roof and floor.

SECTION 19. ILHR 20.07 (62) is amended to read:

Note: The higher the R-value of a material, the more difficult it is for heat to be transmitted through the material.

SECTION 20. ILHR 20.07 (65m) is created to read:

ILHR 20.07 (65m) "Solid unit" means a masonry unit which has a net cross-sectional area parallel to the bearing face which is 75% or more of the gross cross-sectional area.

SECTION 21. ILHR 20.07 (74) is amended to read:

ILHR 20.07 (74) "Thermal /transmittance" or "U" 1\$/the/doeffidient/of/heat/transmittance/lair/to air)/expressed/in/units/of/Btu/per/Khour)/Ksquare/foot)/Kdegree/F}//It/1 means the time rate of heat flow through a body or assembly which is located in between two different environments, expressed in Btu per (hour) (square foot) (°F). The U-value applies to combinations of different materials used in series along the heat flow path and also to single materials that comprise a building section, and includes cavity air spaces and air films on both sides. The/Yower/the/b/value/of/a/material//the/more/difficult/it/is/for heat/to/flow/through/the/material/

Note #1: The lower the U-value of a material, the more difficult it is for heat to be transmitted through the material.

Note #2: The thermal transmittance is also referred to as the coefficient of heat transfer or the coefficient of heat transmission.

SECTION 22. ILHR 20.09 (4) (b) is amended to read:

(b) Data required. All required plans submitted for approval shall be accompanied by sufficient data, calculations and information to determine if the dwelling will meet the requirements of this code. The data and information for determining compliance with the energy conservation standards shall be submitted on forms provided by the department or other approved forms. A municipality exercising jurisdiction may accept plans or calculations which are stamped by an architect or engineer but may not require plans or calculations to be stamped by an architect or engineer.

SECTION 23 ILHR 20.09 (5) (b) 1. is amended to read:

ILHR 20.09 (5) (b) 1. UNIFORM BUILDING PERMIT. The Wisconsin uniform building permit shall be issued if the requirements for filing and fees are satisfied and the plans have been conditionally approved. The permit shall expire 24 months after issuance if ddn dt dt dd dt dd dt dd dt dd dt dd dtdwelling exterior has not been completed. The municipality issuing theWisconsin uniform bulding permit shall send a copy of the application to thedepartment.

SECTION 24. ILHR 20.10 (1) (b) 2. f. is created to read:

ILHR 20.1 (1) (b) 2. f. Basement drain tiles.

SECTION 25. A note is created at the end of ILHR 20.19 (1) to read:

Note: A copy of the Rule Variance Application form (SBD-6070) is contained in the Appendix.

SECTION 26. A note is created at the end of ILHR 20.19 (2) to read:

Note: A copy of the Municipal Recommendation form (SBD-6071) is contained in the Appendix.

SECTION 27. ILHR 20.24 (intro.), (1) and (2k) are amended to read:

ILHR 20.24 ADOPTION OF STANDARDS. All dwellings shall be required to be designed by the method of structural analysis or the method of accepted practice outlined in chpts. ILHR 20 to 25. Dwellings designed by the method of structural analysis shall comply with the standards and manuals listed in subs. (1) to (5). Pursuant to $s.227/\sqrt{928}$ 227.21 (2), Stats., the attorney general and the revisor of statutes have consented to the incorporation by reference of the following standards. Copies of the standards are on file in the offices of the department, the secretary of state, and the revisor of statutes. Copies for personal use may be obtained, at a reasonable cost, from the organizations listed.

(1) American Institute of Steel Construction. 1221/AMenue/of/the Americation for design, fabrication and erection of structrual steel for buildings with commentary, November 1, 1978. (2k) American Society for Testing and Materials (ASTM), 1916 Race Street, Philadelphia, PA 19103, STANDARD SPECIFICATION FOR MORTAR FOR UNIT MASONRY, ASTM Designation C270-82; STANDARD PRACTICE FOR MEASURING AIR LEAKAGE BY THE FAN PRESSURIZATION METHOD, ASTM Designation 2799/87 E779-81.

SECTION 28. ILHR 20.24 (2n) is repealed.

SECTION 29. ILHR 20.24 (2p) and (2s) are is created to read:

ILHR 20.24 (2p) American Wood Preservers Association (AWPA), P.O. Box 849, Stevensville, Maryland 21666, STANDARD FOR COAL TAR CREOSOTE FOR LAND AND FRESH WATER USE, P1-78; STANDARD FOR CREOSOTE AND CREOSOTE SOLUTIONS. P2-85; STANDARD FOR CREOSOTE-PETROLEUM OIL SOLUTION, P3-67; STANDARDS FOR WATERBORNE PRESERVATIVES, P5-86; STANDARDS FOR OIL-BORNE PRESERVATIVES, P8-77; STANDARDS FOR SOLVENTS AND FORMULATIONS FOR ORGANIC PRESERVATIVE SYSTEMS. P9-84; STANDARD FOR CREOSOTE-PENTACHLOROPHENOL WOOD PRESERVATIVE SOLUTION. P11-70: ALL TIMBER PRODUCTS - PRESERVATIVE TREATMENT BY PRESSURE PROCESSES. C1-86; LUMBER, TIMBERS, BRIDGE TIES AND MINE TIES - PRESERVATIVE TREATMENT BY PRESSURE PROCESSES, C2-85; PILES - PRESERVATIVE TREATMENT BY PRESSURE PROCESSES, C3-86; POLES - PRESERVATIVE TREATMENT BY PRESSURE PROCESSES, C4-86; PLYWOOD - PRESERVATIVE TREATMENT BY PRESSURE PROCESSES, C9-85; STANDARD FOR PRESSURE TREATED MATERIAL IN MARINE CONSTRUCTION, C18-86; ROUND POLES AND POSTS USED IN BUILDING CONSTRUCTION - PRESERVATIVE TREATMENT BY PRESSURE PROCESSES, C23-84; SAWN TIMBER PILES USED FOR RESIDENTIAL AND COMMERCIAL BUILDING, C24-86; STANDARD FOR PRESERVATIVE TREATMENT OF STRUCTURAL GLUED LAMINATED MEMBERS AND LAMINATIONS BEFORE GLUING OF SOUTHERN PINE, PACIFIC COAST DOUGLAS FIR, HEMFIR AND WESTERN HEMLOCK BY PRESSURE PROCESSES. C28-85: and STANDARD FOR THE CARE OF PRESERVATIVE-TREATED WOOD PRODUCTS, M4-84.

(2s) American Wood Preservers Bureau (AWPB), 2772 S. Randolph St. P.O. Box 6085, Arlington, Virginia 22206. STANDARD FOR SOFTWOOD LUMBER, TIMBER AND PLYWOOD PRESSURE TREATED WITH WATER-BORNE PRESERVATIVES FOR GROUND CONTACT USE, AWPB STANDARD LB-22, 1980; QUALITY CONTROL PROGRAM FOR SOFTWOOD LUMBER, 3IMBER AND PLYWOOD PRESSURE TREATED WITH WATER-BORNE PRESERVATIVES FOR GROUND CONTACT USE IN RESIDENTIAL AND LIGHT COMMERCIAL FOUNDATIONS, AWPB Standard19DN, 1980.

SECTION 30. ILHR 20.24 (3m) is created to read:

ILHR 20.24 (3m) National Fire Protection Association, Batterymarch Park, Quincy, Mass. 02269, NATIONAL FUEL GAS CODE, NFPA No. 54-1984.

SECTION 31. ILHR 20.24 (4) is amended to read:

ILHR 20.24 (4) National Forest Products Association, YØYØ MággádMúgétts 1250 Connecticut Avenue, N.W., Washington D.C. 20036, NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION, YØØZ 1986 edition, except for gédtión/2/2/8/3//ánd section 4.1.7., including DESIGN VALUES FOR WOOD CONSTRUCTION, Márdh//YØØZ 1986, supplement; THE AKK/WEATHER PERMANENT WOOD FOUNDATION SYSTEM, Basic Requirements, Technical Report No. 7, Márdh//YØØZ January, 1987, except for gédtióng section 3.3.1. ánd Ø/7/ SECTION 32. ILHR 21.02 (3) (a) 1. a. is amended to read:

ILHR 21.02 (3) (a) 1. a. Section 2. 2. 5. 3. The cumulative effects of short-time loads, such as snow, shall be considered in determining duration of load. For snow load, no greater duration of load factor than $\chi/08$ <u>1.15</u> shall be used.

Nøtel//Subpatagtapn/al/is/appiicabie/oniy/wnen/tne/spaeing/øf/tne/føbf faftefs/exceeds/24/inches/on/centefl

SECTION 33. ILHR 21.02 (3) (a) 1. b. is amended to read:

ILHR 21.02 (3) (a) 1. b. Section 4. 1. 7. The provisions of this section shall apply to reused lumber. Reused *limber* shall be considered to have a duration of load factor of 0.90.

SECTION 34. ILHR 21.02 (3) (a) (Note #1) is amended to read:

Note #1: The department will accept designs and installations in conformance with the following: (1) "Plywood Design Specification" including Supplement No. 1, "Design <u>and Fabrication</u> of Plywood Curved Panels"; Supplement No. 2, "Design <u>and Fabrication</u> of Plywood-<u>Lumber</u> Beams"; Supplement No. 3, "Design and Fabrication of Flat Plywood Stressed-Skin Panels"; and Supplement No. 4, "Design and Fabrication of Plat Plywood Sandwich Panels"; and Supplement No. 5, "Design and Fabrication of All-Plywood Beams"; (2) "Plywood Diaphragm Construction"; (3) Laboratory Report 121, "Plywood Folded Plate Design and Details"; <u>and</u> (4) Laboratory Report 93, "Load-Bearing gonsonents//gp8//BB/8//SS/8//SP/BX//PP/62//PW/BXY (above publications available from the American Plywood Association, XXX9/A/Street, P.O. Box 11700. Tacoma, Washington Ø8407 98411); (8) (5) Design Guide HP-SG-71, Structural Design Guide for Hardwood Plywood" (available from the Hardwood Plywood Manufacturers Association, 2310 S. Walter Reed Drive, Arlington, Virginia 22206); (7) (6) U.S. Product Standard PS I-7# 83 for Softwood Plywood Construction and Industrial (available from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402); (8) (7) **TPI/78** TPI-85, "Design Specification for Metal Plate Connected Wood Trusses" (available from Truss Plate Institute, Inc., 7477/Riggs/Røzd/ Hyatttswille,/Maryland/20783 583 D'Onofrio Dr., Madison, Wisconsin 53719); (9) (8) "Wood Structural Design Data," 1978 1986 edition (available from National Forest Products Association, 1819/MassackMasetts 1250 Connecticut Ave., NW, Washington, D.C. 20036).

SECTION 35. ILHR 21.03 (1) (b) is repealed. SECTION 36. ILHR 21.03 (1) (a) is renumbered 21.03 (1). SECTION 37. ILHR 21.03 (2) is amended to read:

1LHR 21.03 (2) EXITS FROM THE SECOND FLOOR. (a) General. At least 2 exits shall be provided from the second floor. One of the exits shall be a stairway or ramp and lead to the first floor or discharge to grade. The second exit may be $\frac{dn}{dx}\frac{dx}{dy}\frac{dy}{dx}\frac$

(b) Exit windows. Except as provided in par. (c), windows which comply with sub. (6m) may be provided in each second floor bedroom in lieu of the second exit from the floor.

(c) Exception. Where the second floor is the lowest floor level in a dwelling unit, as in an up-and-down duplex, windows may not be provided as the second exit from the floor.

SECTION 38. ILHR 21.03 (5) and (6) are repealed and recreated to read:

ILHR 21.03 (5) EXITS FROM BASEMENTS. (a) Basements which are not used for sleeping shall be provided with at least one exit. The exit shall be a stairway or ramp which leads to the floor level above or discharges to grade.

(b) Basements which include spaces used for sleeping shall be provided with at least 2 exits. The 2 exits shall not be accessed by the same stairway or ramp and shall be located as far apart as practical. One exit shall be a stairway or ramp which leads to grade or a door located at the basement level which leads to grade via an exterior stairs. The second exit may be via a stairway or ramp which leads to the floor level above the basement. Windows which comply with sub. (6m) may be provided in each basement bedroom in lieu of the second exit from the basement.

(6) EXITS FROM GROUND FLOORS. (a) Ground floors which are not used for sleeping shall be provided with at least one exit. The exit may be a swing door or a sliding glass door which discharges directly to grade or may be via a stairway which leads to the first floor.

(b) Ground floors which include spaces used for sleeping shall be provided with at least 2 exits. The 2 exits shall not be accessed by the same stairway or ramp and shall be located as far apart as practical. One exit shall discharge to grade. The second exit may be via a stairway or ramp which leads to the first floor. Windows which comply with sub. (6m) may be provided in each ground floor bedroom in lieu of the second exit from the ground floor.

SECTION 39. ILHR 21.03 (6m) is created to read:

ILHR 21.03 (6m) WINDOWS USED FOR EXITING. Windows which are installed for exit purposes shall comply with the requirements of this subsection.

(a) The window shall be openable from the inside without the use of tools or the removal of a sash. If equipped with a storm or screen, it shall be openable from the inside.

(b) 1. 'Opening Size'. The nominal size of the net clear window opening shall be at least 20 inches in width by 24 inches in height. Nominal dimensions shall be determined by rounding up fractions of inches if they are 1/2-inch or greater or rounding down fractions of inches if they are less than 1/2-inch.

2. 'Determination of Opening Size'. Except as provided in 3., no portion of the window, including stops, stools, meeting rails and operator arms of awning windows, shall infringe on the required opening.

3. 'Casement windows'. The movable sash of casement windows may infringe on the required opening width. The net clear opening width of casement windows shall be measured between the stops.

(c) The area and dimension requirements of pars. (b) and KeN may be $\frac{1}{12}$ -16 -33 infringed on by a storm window.

(d) The sill height shall not be more than 46 inches above the floor or the top of a permanent platform, with or without steps, installed below the window. The platform and steps, if provided, shall be as wide as the actual egress opening and have a minimum tread depth of 9 inches and maximum riser height of 8 inches.

(e) If a window which is provided as an exit is located below grade, then an areaway shall be provided. The width of the areaway shall be at least equal to the width of the exit window. The bottom of the areaway shall not be more than 46 inches below grade. The areaway shall be a minimum of 3 feet measured perpendicular from the wall. The areaway shall be constructed to prevent rainfall flowing into the areaway from entering the dwelling.

SECTION 40. ILHR 21.03 (7) is amended to read:

ILHR 21.03 (7) DOORS. One of the required exit doors from a dwelling unit shall be a swing type door at least 3 feet wide by 6 feet 8 inches high. All other required exterior exit doors shall be at least 2 feet 8 inches wide by 6 feet 8 inches high. Where double doors are provided as a required exit, the width of each door leaf shall be at least 2 feet 6 inches///INE/double and the doors shall not have an intermediate mullion.

SECTION 41. ILHR 21.03 (8) is amended to read:

ILHR 21.03 (8) INTERIOR CIRCULATION. All passageway doors to at least 50% of the bedrooms, at least one full bathroom, and the common use areas such as kitchens, dining rooms, living rooms, basements, and family rooms shall be at least 2 feet 8 inches wide by 6 feet 8 inches high. Where cased or uncased openings are provided in lieu of doors, the clear width of the bassageway openings shall be at least 2 feet 6 inches wide.

SECTION 42. ILHR 21.03 (10) is created to read:

ILHR 21.03 (10) BALCONIES USED FOR EXIT PURPOSES. Balconies which are required for exit purposes shall comply with all of the following requirements:

(a) The balcony shall be made of treated or naturally decay-resistive wood, concrete or metal materials;

(b) The balcony shall have a guardrail located at least 36 inches, but not more than 46 inches above the floor level of the balcony. The guardrail supports shall be provided with intermediate rails or an ornamental pattern to prevent the passage of a sphere with a diameter larger than 9 inches. The guardrail and its supports shall not infringe on the dimensions of the exit from the dwelling.

(c) The floor level of the balcony shall be no more than 15 feet above the grade below.

(d) The floor of the balcony shall have minimum dimensions of 3 feet by 3 feet. The guardrail and its supports may infringe on the dimensions of the required area.

SECTION 43. ILHR 21.03 (11) is created to read:

ILHR 21.03 (11) SPLIT LEVEL DWELLINGS. In determining the exit requirements in a split level dwelling, levels within 5 feet of each other may be considered to be a single story.

SECTION 44. ILHR 21.03 (12) is created to read:

ILHR 21.03 (12) TWO-FAMILY DWELLINGS. In a 2-family dwelling, each dwelling unit shall be provided with exits in compliance with this section.

SECTION 45. ILHR 21.04 (intro.) is amended to read:

ILHR 21.04 STAIRS. Every exterior or interior stairs, except those leading to attics or crawl spaces or similar non-habitable spaces, shall conform to the requirements of this section.

SECTION 46. ILHR 21.04 (1) (c) is repealed and recreated to read:

ILHR 21.04 (1) (c) <u>Doors at landings</u>. Except as provided in subds. 1 to 4, level landings shall be provided on each side of any door located at the foot or head of a stairway, regardless of the door swing. In the application of the exceptions given in subds. 1 to 4, stairways to attached garages or porches are considered to be interior stairways.

1. 'Exception'. A landing shall not be required between the door and the head of interior stairs, provided the door does not swing over the stairs.

2. 'Exception'. A landing shall not be required between the door and the head of an interior stairway of 2 or fewer risers, regardless of the doorswing.

3. 'Exception'. A landing shall not be required between a sliding glass door and the head of an exterior stairway of 3 or fewer risers.

4. 'Exception'. The exterior landing, platform or sidewalk at an exterior doorway shall be located not more than 8 inches below the interior floor elevation. The landing platform shall have a length at least equal to the width of the door.

SECTION 47. ILHR 21.04 (3) (f) is renumbered 21.042.

SECTION 48. ILHR 21.042 (intro.) is created to read:

ILHR 21.042 LADDERS. Ladders which are used as part of a required exit shall conform to this section.

(a) Vertical walls which form any air passageway shall be lined with gypsum wall board or other material to provide a 15 minute thermal barrier.

(b) At least 3 smoke detectors shall be placed in the air passageways. A smoke detector shall be placed in the ceiling passageway and in two opposite walls or the smoke detectors shall be placed as far apart as practical. The smoke detectors shall be a hardwired type. The alarm of the detector shall be audible in the occupied areas of the dwelling, when actuated.

Note: Also see s. ILHR 23.08 (10), Air Passageways of Envelope Dwellings.

SECTION 52. ILHR 21.08 (2) and Table 21.08 are amended to read:

ILHR 21.08 (2) FIRESTOPPING MATERIALS. Firestopping shall consist of 2-inches nominal lumber or two thicknesses of one inch nominal lumber or one thickness of 3/4/ind 23/32-inch plywood with joints backed by 3/4/ind 23/32-inch plywood. Oriented strand board, particle board and waferboard may be used in place of plywood. Gypsum wall board, mineral wool insulation or other noncombustible material may also be used for firestopping.

Note: Any non-rigid material used as firestopping, such as batt insulation, must completely fill the opening and be tightly packed or otherwise secured to maintain a permanent installation.

TA	BL	E.	21	80

Perpendicular Distance from Dwelling Wall to the Closest Garage Wall or Accessory Building Wall Fire-rated Construction

0 to 5 feet

3/4-hour

3/4-hour

5 to 10 feet with windows in either wall

5 to 10 feet *with* without windows in either wall

No requirements

10 feet or more

No requirements

SECTION 49. ILHR 21.045 is created to read:

<u>ILHR 21.045 RAMPS</u>. Every exterior or interior ramp which leads to or from a required exit shall comply with the requirements of this section.

(1) SLOPE. Ramps shall not have a gradient greater than 1 in 8 or one foot of rise in 8 feet of run. Walkways with gradients less than 1 in 20 or one foot of rise in 20 feet of run are not considered to be ramps.

(2) SURFACE AND WIDTH. Ramps shall have a slip resistant surface and shall have a minimum width of 36 inches measured between handrails.

(3) HANDRAILS. Every ramp which overcomes a change in elevation of more than 24 inches shall be provided with at least one handrail and with handrails on all open sides of ramps.

(a) Ramps which have a gradient greater than 8.33% or 1:12 or one foot rise in 12 feet of run and which overcome a change in elevation of more than 24 inches, shall be provided with handrails on both sides.

(b) Handrails shall be mounted so that the top of the handrail is located between 30 to 34 inches above the ramp surface.

(c) Open-sided ramps shall have the area below the handrail protected by intermediate rails or an ornamental pattern to prevent the passage of a sphere with a diameter larger than 9 inches.

(d) The clear space between the handrail and any adjoining wall shall be at least 1-1/2 inches.

(4) LANDINGS. A level landing shall be provided at the top, at the foot and at any change in direction of the ramp. The landing shall be at least as wide as the ramp and shall measure at least 3 feet in the direction of travel.

SECTION 50. ILHR 21.05 (4) is amended to read:

ILHR 21.05 (4) CRAWL Space venting. Crawl spaces shall be vented in accordance with either s. ILHR 22.05 (3) (b) or s. ILHR 22.11 (3) (b). Unheated crawlspaces shall be provided with a concrete slab, roll roofing or plastic film vapor barrior. <u>All decayable organic material shall be removed</u> from crawl space floors. The decayable organic material shall be removed prior to the placement of a floor covering, if any.

SECTION 51. ILHR 21.08 (1m) is created to read:

ILHR 21.08 (1m) EQUIVALENT FIRESTOPPING REQUIREMENTS FOR ENVELOPE DWELLINGS. Fire stopping for envelope-type dwellings shall comply with this subsection. SECTION 53. ILHR 21.08 (5) (c) is amended to read:

ILHR 21.08 (5) (c) Garage floors shall be constructed of noncombustible materials. <u>Concrete garage floors shall be at least 4 inches thick placed over at least 4 inches of granular fill.</u> The garage floor shall slope toward the exterior garage opening or shall slope to an interior drain.

Note: See s. ILHR 82.34 (4) (b), Uniform Plumbing Code, for floor drain requirements.

SECTION 54. ILHR 21.10 (1) (b) and (3) are amended to read:

ILHR 21.10 (1) (b) Sills which rest on concrete or masonry walls or floors which are less than 8 inches from exposed earth.

SECTION 55. ILHR 21.11 (1) (b) is amended to read:

ILHR 21.11 (1) (b) <u>Roofs</u>. Roof coverings may be applied over foam plastic insulation where the interior of the dwelling is separated from the foam plastic insulation by plywood sheathing <u>oriented strand board</u>, <u>particle board</u> or <u>waferboard</u> at least $\frac{1/2}{\frac{1}{2}\frac{1}{10}\frac{1}{10}\frac{1}{10}\frac{1}{10}}$ in thickness or other approved materials having a minimum 15-minute finish rating.

Section 56. ILHR 21.15 (1) (a) is amended to read:

ILHR 21.15 (1) (a) <u>Continuous footings</u>. The minimum width of the footing on each side of the foundation wall shall measure at least 4 inches wider than the wall. The footing depth shall be at elast 8 inches nominal. Footing placed in unstable soil shall be formed. <u>Lintels may be used in place of</u> continuous footings when there is a change in footing elevation.

SECTION 57. ILHR 21.16 (into.) is renumbered 21.16 (1).

SECTION 58. ILHR 21.16 (1) (a) to (c) are renumbered 21.16 (2) (a) to (c).

SECTION 59. ILHR 21.16 (1) (d) is renumbered 21.16 (2) (d) and, as renumbered, is amended to read:

ILHR 21.16 (2) (d) Footings or foundations may bear directly on rock located less than #2 $\underline{48}$ inches below grade. Prior to placement, the rock shall be cleaned of all earth. All clay in the crevices of the rock shall be removed to the level of frost penetration or 1-1/2 times the width of the rock crevice. Provisions shall be taken at grade to prevent rain water from collecting along the foundation wall of the building.

SECTION 60. ILHR 21.16 (2) (e) is created to read:

ILHR 21.16 (2) (e) Portions of footings or foundations which are located directly below window areaways which are required to be installed in accordance with s. ILHR 21.03 (6m), are exempt from the requirements of sub. (1).

SECTION 61. ILHR 21.17 (2) (f) is amended to read:

ILHR 21.17 (2) (f) The drain tiles or pipe <u>which lead from the footing</u> <u>tiles to the sump pit</u> shall be laid at a grade of not less than 1/8 inch per foot leading to the sump pit. <u>The remaining drain tiles or pipe shall be</u> level or graded downward to the line which leads to the sump.

SECTION 62. ILHR 21.18 (2) (c) to (e) are created to read:

ILHR 21.18 (2) (c) Lateral support such as floor slabs or framing shall be provided at the base and top of the wall.

(d) The depth below grade, wall height, and pilaster or reinforcement spacing may exceed the maximum values indicated in Tables 21.18-B, -C or -D if the design is based on engineering analysis.

(e) Subsurface drainage shall be provided if required by s. ILHR 21.17.

SECTION 63. Tables 21.18-C and 21.18-D are repealed and recreated to read:

Nominal Wall Thickness (inches)	Type of Masonry (Load Bearing) 	Type of Filll	Minimum Nominal Pilaster ² Width x depth (inches)	Maximum Pilaster Spacing o.c. (feet)	Maximum Height of Fill ³ (feet)	Maximum Wall Height ⁴ (feet)
8 8 8 10 10 10 10 12 12 12	Hollow Hollow Solid Solid Hollow Hollow Solid Hollow Hollow Hollow Solid	Granular Other Granular Granular Other Granular Other Granular Other Granular	16 x 12 16 x 14 16 x 16 16 x 16 16 x 16	20 10 20 12 18 15 30 22 30 20 30	6.5 6.0 7.0 6.5 8.0 7.0 8.0 7.0 8.0 8.0 8.0 8.0	7.5 7.5 7.5 8.0 8.0 8.0 8.0 8.0 8.0 8.0 8.0 8.0 8.0

Table 21.18-C MAXIMUM DEPTH BELOW GRADE (HEIGHT OF FILL) FOR CONCRETE MASONRY FOUNDATION WALLS WITH PILASTERS

¹Granular fill is sand, sand and gravel or washed gravel. See "Other" for all other fill types or soils which are not well drained.

 $^2\mbox{All}$ cells of hollow units used to construct pilasters shall be filled with grout.

 3 The height of fill equals the vertical distance between the finished exterior grade and the basement floor or inside grade.

⁴The wall height equals the clear height between floors providing lateral support.

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Wall Construction Nominal Thickness and Type of Unit	Total Maximum Wall Height (feet - inches) 	Minimum Reinforcement Size and Maximum Spacing Center to Center	Maximum I Below Gra (feet - ind Fill Type	ade ² chgs) for
8-inch Hollow Load Bearing	8-4 8-4 8-4 8-4 8-4	#5 bars @ 8 ft. #6 bars @ 8 ft. #7 bars @ 8 ft. #8 bars @ 8 ft.	Granular 6-6 7-6 8-0 8-6	0ther 5-6 6-6 7-0 7-6
10-inch Hollow Load Bearing	8-4 8-4 8-4 8-4	#5 bars @ 8 ft. #6 bars @ 8 ft. #7 bars @ 8 ft. #8 bars @ 8 ft. 	7-0 7-6 8-0 8-4	6-6 7-0 7-6 8-0
12-inch Hollow Load Bearing	8-4 8-4 8-4 8-4	#4 bars @ 8 ft. #5 bars @ 8 ft. #6 bars @ 8 ft. #7 bars @ 8 ft.	6-6 7-6 8-0 8-4	6-0 6-6 7-6 8-0

TABLE 21.18-D MAXIMUM DEPTH BELOW GRADE FOR PARTIALLY REINFORCED MASONRY WALLS

¹The height of the wall equals the clear height between floors providing lateral support.

 2 Depth below grade equals the vertical distance between the finished exterior grade and the basement floor or inside grade.

 3 Granular fill is sand, sand and Gravel or washed Gravel. See "Other" for all other fill types or soils which are not well drained.

SECTION 64. ILHR 21.20 is amended to read:

ILHR 21.20 CONCRETE FLOORS. When concrete floors are provided, the thickness of the concrete floor shall measure at least three inches. In clay soils, a 4-inch thick base course of clean graded sand, gravel or crushed stone. The base course may be ommitted in sand or gravel soils. Basements shall/be/bfodided/with/a/concrete/of/similar/type/floof/

SECTION 64A. s. ILHR 21.205 is created to read:

ILRH 21.205 WOOD FLOORS IN CONTACT WITH GROUND. Wood may be used for floors in contact with ground unless prohibited by ordinance by the municipality exercising jurisdiction in accordance with s. ILHR 20.20. The floor shall conform to the standards specified in s. ILHR 20.24 (4).

SECTION 65. ILHR 21.18 (3) (a) 1. is renumbered 21.18 (3) (a).

SECTION 66. ILHR 21.18 (3) (a) 2. is repealed.

SECTION 67. ILHR 21.22 (3) is amended to read:

ILHR 21.22 (3) GIRDERS AND BEAMS. Girders and beams shall be selected from Table 21/22/4 21.22-Al or Table 21.22-A2 or shall be designed through structural analysis.

SECTION 68. Table 21.22-A is renumbered Table 21.22-A1.

SECTION 69. Table 21.22-A2 is created to read:

TABLE 21.22-A2

COLUMN SPACING FOR BUILT UP WOOD BEAMS IN BASEMENT AND CRAWL SPACES SUPPORTING ONE FLOOR ONLY

SIZE OF BUILT UP BEAM^{3,4,5}

	SUPPORTED		SIZE	OF BUIL	I UP BEAN	4 ~, , , ~	
STRENGTH PROPERTIES SPECIES AND GRADE	JOIST LENGTH ² (ft)	3-2 x 8	4-2 x 8	3-2 x10	4-2 x10	3-2 x12	4-2 x 12
Fb=800 @ E=1,000,000 (Examples: BALASAM FIR #2, EASTERN SPRUCE #2, EASTERN WHI PINE #2, NORTHERN PINE #2, SPRUCE-PINE-FIR #2, and WHITE WOODS OR WESTERN WOO	14 16	7-8 6-11 6-3 5-10 5-4 5-1	8-11 7-11 7-3 6-8 6-3 5-11	9-11 8-10 8-1 7-5 7-0 6-6	11-4 10-2 9-4 8-7 8-1 7-6	12-0 10-9 9-9 8-5 7-11	13-10 11-5 11-3 10-5 9-9 9-2
Fb=1,000 @ E=1,200,000 (Examples: HEM-FIR #2, EASTERN SPRUCE #1, EASTERN WHITE PINE #1, BALSAM FIR #1, and SPRUCE-PINE-FIR #1)	8 10 12 14 16 18	8-7 7-8 7-1 6-6 6-1 5-9	9-11 8-11 8-2 7-6 7-1 6-7	11-1 9-11 9-0 8-4 7-9 7-4	12-8 11-4 10-4 9-8 8-11 8-6	13-5 12-0 10-11 10-1 9-6 8-11	15-7 13-11 12-7 11-8 11-0 10-4
Fb=1,200 @ E=1,400,000 (Examples: HEM-FIR #1, NORTHERN PINE #1, SOUTHERN PINE #2, and DOUGLAS FIR-LARCH #2)	8 10 12 14 16 18	9-4 8-5 7-8 7-2 6-8 6-3	10-11 9-9 8-11 8-3 7-8 6-9	12-1 10-10 9-11 9-1 8-7 8-1	13-11 12-6 11-5 10-6 9-10 9-4	14-8 13-2 12-0 11-1 10-4 9-9	17-0 15-2 13-11 12-10 12-0 11-4
Fb=1,400 @ E=1,600,000 (Examples: DOUGLAS FIR-LARCH #1, and SOUTHERN PINE 19% m.c. #1)	8 10 12 14 16 18	10-2 9-1 8-4 7-8 7-3 6-9	11-10 10-7 9-8 8-11 8-4 7-10	13-1 11-8 10-8 9-11 9-2 8-8	15-0 13-6 12-4 11-4 10-8 10-0 	15-10 14-3 12-11 10-11 11-1 10-7 	18-4 16-5 15-0 13-10 12-11 12-4

¹This table provides maximum allowable spans in feet and inches for main beams or girders which are built up from nominal 2-in. members in the species, sizes and grades indicated.

 $^2 \mathrm{Supported}$ joist length means 1/2 of the sum of the joist spans on both sides of the beam.

³The 2-in. members shall be laid on edge and fastened together with a double row of common nails not less than 3-1/2 in. in length. Nails shall be spaced not more than 18 in. apart in each row with the end nails placed 4 inches to 6 inches from the end of each piece.

⁴Where built-up wood beams are employed over a single span, the length of each individual piece used to fabricate the beam shall equal the length of the beam.

⁵Where built-up wood beams are continued over more than one span and where lengths of individual pieces are less than the total length of the complete beam, butt joints shall be located over supports or within 6 in. of the quarter points of the clear span. Where located near the quarter points, the joints in built-up beams shall be separated by at least one lamination and shall not exceed half the beam width.

SECTION 70. Table 21.22-B is repealed and recreated to read:

Table 21.22-B

	TO SUPPORTS	
Span Rating ²	Plywood Thickness (in inches)	Maximum span ³ (in inches)
32/16 40/20 48/24	15/32, 1/2, 5/8 19/32, 5/8, 3/4, 7/8 23/32, 3/4, 7/8	16 ⁵ 20 ⁴ ,5 24

ALLOWABLE SPANS FOR PLYWOOD FLOOR SHEATHING CONTINUOUS OVER TWO OR MORE SPANS AND FACE GRAIN PERPENDICULAR TO SUPPORTS¹

 These values apply to C-D, C-C, and Structural I and II grades only. Spans shall be limited to values shown because of possible effect of concentrated loads.

2. Span Rating appears on all panels in the construction grades listed in footnote 1.

- 3. Plywood edges shall have approved tongue and groove joints or shall be supported with blocking, unless 1/4-inch minimum thickness underlayment or 1-1/2 inches of approved cellular or lightweight concrete is installed or finished floor is 25/32-inch wood strip. Allowable uniform load based on deflection of 1/360 of span is 165 pounds per square foot.
- For joists spaced 24 inches on center, plywood sheathing with Span Rating 40/20 or greater can be used for subfloors when supporting 1-1/2 inches lightweight concrete.
- 5. May be 24 inches if 25/32-inch wood strip flooring is installed at right angles to joists.

SECTION 71. Table 21.22-C is repealed and recreated to read:

Plywood Grades and Species Group	Application	Minimum Plywood Thickness (inches)
Groups 1, 2, 3, 4, 5 APA UNDERLAYMENT INT (with interior	Over Smooth Subfloor	1/4
or exterior glue) APA UNDERLAYMENT EXT APA C-C Plugged EXT	Over Lumber Subfloor or Other Uneven Surfaces	11/32
Same Grades as Above But Group I Only	Over Lumber Floor Up to 4" Wide. Face Grain Must Be Perpendicular to Boards	1/4
APA UNDERLAYMENT Sanded Exterior Grade	Over 16" Joist Spacing, 19/32 Subfloor, Under Tile With Organic Adhesive	11/32
	 Over 16" Joist Spacing, 19/32 Subfloor, Under Tile With Epoxy Mortar 	15/32 ²

TABLE 21.22-C MINIMUM THICKNESS FOR PLYWOOD UNDERLAYMENT

¹ Place face grain across supports and end joints over framing.

Leave 1/4" space at panel ends and edges, trim panels as necessary to maintain end spacing and panel support on framing. Fill joints with epoxy mortar. With single layer floors, use solid lumber backing or framing under all panel and edge joints, including T & G joints. SECTION 72. ILHR 21.22 (8) (c) is renumbered 21.22 (8) (d) and, as renumbered, is amended to read:

ILHR 21.22 (8) (d) Floor boards. Where wood boards are used for floor sheathing, the boards shall comply with the minimum thicknesses shown in Table 21/22+10 21.22-E.

SECTION 73. Table 21.22-D is renumbered Table 21.22-E.

SECTION 74. ILHR 21.22 (8) (d) is renumbered 21.22 (8) (e).

SECTION 75. ILHR 21.22 (8) (c) is created to read:

ILHR 21.22 (8) (c) <u>Combination subfloor - underlayment</u>. Combination subfloor-underlayment shall be installed in accordance with Table 21.22-D.

SECTION 76. Table 21.22-D is created to read:

TABLE 21.22-D MINIMUM THICKNESS FOR PLYWOOD COMBINATION SUBFLOOR-UNDERLAYMENT. PLYWOOD CONTINUOUS OVER TWO OR MORE SPANS AND FACE GRAIN PERPENDICULAR TO SUPPORTS¹,²

Plywood Grade	Plywood Species Group	Ma 16" o.c. Panel Thickness (inches)	aximum Suppor 20" o.c. Panel Thickness (inches)	rt Spacing ³ 24" o.c. Panel Thickness (inches)
Sanded exterior type	1	 1/2 5/8	5/8 3/4	3/4 7/8
	4	3/4	7/8	
Underlayment C-C Plugged Sturd-I-Floor ⁴	All Groups 	Sturd-I-F1	 Sheathing and oor shall be with their ra	installed

¹Spans shall be limited to values shown, based on possible effect of concentrated loads.

 $^2 Unsupported edges shall be tongue and groove or blocked except where 1/4-inch underlayment or 25/32-inch finish floor is used.$

 3 Underlayment, C-C Plugged, sanded exterior type: allowable uniform load based on deflection of L/360 span for spans 24 inches or less is 125 psf; and for spans 48 inches, 65 psf.

⁴The department will accept subfloor underlayment panels such as Sturd-I-Floor which meet the requirements of APA manufacturing specifications for Sturd-I-Floor panels.

SECTION 77. ILHR 21.25 (3) (b) is repealed and recreated to read:

ILHR 21.25 (3) (b) Header Support. Headers in bearing walls shall be supported in accordance with subd. 1. or 2. or 3.

1. Headers 3 feet or less in length shall be directly supported on each end by either:

a. the single common stud and a shoulder stud; or

b. the single common stud with a framing anchor attached.

2. Headers greater than 3 feet but less than or equal to 6 feet in length shall be directly supported on each end by the single common stud and a shoulder stud.

3. Headers greater than 6 feet in length shall be directly supported on each end by the single common stud and 2 shoulder studs. Where 2×6 framing is used in bearing walls, the number of shoulder studs may be reduced to one.

SECTION 78. Table 21.25-B is amended to read:

Hous Widt (fee	h Tw	o 2x4s	Тwo	2x6s	Тwo	2x8s	Two 2	x10s	Two	2x12s
-		Zone 1	Zone 2	Zone 1	Zone 2	2 Zone 1	Zone 2	Zone 1	Zone	2 Zone 1
24	2.5	2.5	4	4	5	5	. 7	6	9	8
26	2.5	2	4	3	5	5	7	6	8	7
28	2.5	2	4	3	4 5	\$ 4	6	6	8	7
30	2.5	2	4	3	4 5	\$ 4	6	6	8	7
32	2	2	3	3	4 5	\$ 4	6	5	8	7

TABLE 21.25-B ALLOWABLE SPANS (FEET) FOR HEADERS SUPPORTING ROOF/CEILING ASSEMBLIES*

SECTION 79. Table 21.25-E is amended to read:

Minimum Thickness ¹	Minimum No. of Plys	Stud Spacing (Inches Plywood Siding Applied Direct to Studs or Over Sheathing
3/8"	3	16 ²
1/2"	4	24

TABLE 21.25-E EXPOSED PLYWOOD PANEL SIDING

¹Thickness of grooved panels is measured at bottom of grooves.

 2 May be 24 inches if plywood siding applied with face grain perpendicular to studs or over one of the following: (a) one-inch board sheathing; (b) 1/2-inch or 15/32-inch plywood sheathing; (c) 3/8-inch plywood sheathing with face grain of sheathing perpendicular to studs.

SECTION 80. ILHR 21.26 (9) (b) is amended to read:

ILHR 21.26 (9) (b) <u>Continuous loads</u>. Joists, trusses and beams other than wood, spaced 4 feet or <u>more less</u> on center and 40 feet <u>or less</u> in length, slabs or other members causing continuous loads shall be transmitted to masonry with a minimum bearing of 3 inches upon solid masonry at least 2-1/2 inches in height, or as indicated for concentrated loads.

SECTION 81. ILHR 21.27 (3) (intro.) and (a) are amended to read:

ILHR 21.27 (3) WATER. All roofs shall be designed and ddntrudtdd constructed to assure drainage of water.

(a) <u>Roofing</u>. Roofing shall be installed to shed water. Underlayment of <u>15-pound asphalt-impregnated felt paper or equivalent</u> shall be provided under shingles. Fasteners shall be corrosion-resistant.

SECTION 82. ILHR 21.28 (7) (a) is amended to read:

ILHR 21.28 (7) (a) Plywood Sheathing. Plywood sheathing and similar sheathing materials which are rated by the American Plywood Association shall be grade marked and stamped and limited to the allowable loads and spans indicated in tables/21/22/8/and Table 21.28-A.

SECTION 83. Table 21.28-A is repealed and recreated to read:

TABLE 21.28-A ALLOWABLE LOADS AND SPANS FOR PLYWOOD ROOF SHEATHING CONTINUOUS OVER TWO OR MORE SPANS AND FACE GRAIN PERPENDICULAR TO SUPPORTS1,2,3

Panel Span Rating	Plywood Thickness (inches)	Maximum Span (inches)		Load (in pounds) per square foot)	
		Edges Blocked	Edges Unblocked	Total Load	Live ⁴ Load
12/0	5/16	12	12	40	30
16/0	5/16, 3/8	16	16	40	30
20/0	5/16, 3/8	20	20	40	30
24/0	3/8	24	20	40	30 [°]
24/16	7/16, 1/2	24	24	50	40
32/16	15/32, 1/2, 5/8	32	28	40	30
40/20	19/32, 5/8, 3/4, 7/8	40	32	40	30
48/24	23/32, 3/4, 7/8	48	36	45	35

¹Spans shall be limited to values shown, based on possible effect of concentrated loads.

 2 Underlayment, C-C Plugged, sanded exterior type: allowable uniform load based on deflection of L/360 span for spans 24 inches or less is 125 psf; and for spans 48 inches, 65 psf.

³Plywood sheathing may be installed with face grain parallel to supports in accordance with the "APA Design/Construction Guide", American Plywood Association, P.O. Box 11700, Tacoma, WA 98411.

⁴Assumes 10 psf dead load.

SECTION 84. ILHR 21.29 (6) (title) is amended to read:

ILHR 21.29 (6) HEARTH AND HEARTH EXTENSION. Where the fireplace hearth or hearth extension is an integral part of the floor, there shall be a minimum of 4 inches of reinforced concrete under the hearth or hearth extension surface. The hearth extension shall be of noncombustible material. The minimum dimension of the hearth extension shall be based on the size of the fireplace opening as specified in Table 21.29-1.

SECTION 85. Table 21.29-1 is amended to read:

Fireplace Opening	Extension from Fireblace Opening (inches)			
(Sq. Ft.)	Side	Front		
Less than 6	8	16		
6 or Greater	12	20		

TABLE 21.29-1 HEARTH EXTENSION DIMENSIONS

SECTION 86. ILHR 21.31 is repealed.

SECTION 87. ILHR 21.32 (1) (a) and (b) are created to read:

ILHR 21.32 (1) (a) All joints between the wall or decorative facing material and the fireplace unit shall be completely sealed, firestopped or draft-stopped with a noncombustible caulk or equivalent.

(b) Doors installed on factory built fireplaces shall conform with the terms of the listing and the manufacturers installation instructions for the fireplace unit.

SECTION 88. ILHR 21.32 (3) and Table 21.32-1 are amended to read:

ILHR 21.32 (3) HEARTH EXTENSIONS. Hearth extensions of not less than 3/8-inch thick hollow metal, stone, tile or other approved noncombustible material shall be provided. The minimum dimensions of the hearth extension shall be based upon the size of the fireplace opening as specified in Table 21.32-1.

TABLE 21.32-1 HEARTH EXTENSION DIMENSIONS

Fireplace Opening (sq. ft.)	Extension from Ø1réøøx Side	<u>Fireplace Opening</u> (inches) Front
less than 6	8	16
6 or Greater	12	20

SECTION 89. A note is created after subchapter II (title) to read:

Note: The definitions which apply to chapter 22, and all chapters of this code, are located in s. ILHR 20.07.

SECTION 90. ILHR 22.03 (1) is renumbered 20.07 (4m).

SECTION 91. ILHR 22.03 (1m) to (4) are repealed.

SECTION 92. ILHR 22.03 (4m) is renumbered 20.07 (28m)

SECTION 93. ILHR 22.03 (5) is repealed.

SECTION 94. ILHR 22.03 (5m) is renumbered 20.07 (28r).

SECTION 95. ILHR 22.03 (6) and (7) are repealed.

SECTION 96. ILHR 22.03 (7m) is renumbered 20.07 (41m).

SECTION 97. ILHR 22.03 (7r) is renumbered 20.07 (56m).

SECTION 98. ILHR 22.03 (8) and (9) are repealed.

SECTION 99. ILHR 22.03 (9m) is renumbered 20.07 (73m).

SECTION 100. ILHR 22.03 (10) is repealed.

SECTION 101. ILHR 22.05 (1) is amended to read:

ILHR 22.05 (1) VAPOR BARRIERS. Where thermal insulation is used, a vapor barrier shall be installed. The vapor barrier shall be installed on the interior side of the insulation, facing the heated interior, and behind the interior finish at the wall, ceiling and roof/ceiling assemblies. The vapor barrier shall cover the exposed insulation and interior face of studs, joists and rafters. Vapor barriers shall also be provided in crawl spaces winder slab floors, and around the exterior insulation installed around ducts in unheated areas. The transmission rate shall not exceed one perm.

SECTION 102. ILHR 22.06 (9) is amended to read:

ILHR 22.06 (9) SYSTEM DESIGN. The overall *transmittance* or Uo *through* for any one component (such as wall, roof/ceiling or floor) may be increased and the *U/VATVE* Uo for other components decreased provided that the overall heat loss for the entire building enclosure does not exceed the total heat loss resulting from complying with subs. (1) through (8).

SECTION 103. ILHR 22.13 (4) (a) is amended to read:

SECTION 104. ILHR 23.02 (1) is amended to read:

ILHR 23.02 (1) HEATING AND COOLING SYSTEM DESIGN. Indoor and outdoor design temperatures shall be selected from s. ILHR 22.04 or s. ILHR 22.10. The heating and cooling systems shall be designed to maintain the indoor design temperature at outdoor design conditions. When requested, room-by-room heat loss and heat gain calculations shall be furnished

SECTION 105. ILHR 23.04 and Table 23.04-A are amended to read:

ILHR 23.04 TYPES OF EQUIPMENT. Heating and cooling appliances shall be listed by a recognized testing agency acceptable to the department. The clearances from combustible materials in tables 23.04-A and 23.04-B shall apply unless otherwise shown on listed appliances.

Note: The following agencies are acceptable to the Department: The American Gas Association (AGA), Underwriter's Laboratories (UL), and PFS corporation.

TABLE 23.04-A STANDARD INSTALLATION CLEARANCES (INCHES) FOR HEAT-PRODUCING APPLIANCES

		Appliance				
Residential Type Appliances for Installation in Rooms Which are Large (See Note 2)	Арр	Above Top of Casing or oliance	From Top and Sides of Warm- Air Bonnet or Plenum	From Front See Note 3	From Back	From Sides
Boilers and Water Heaters Steam Boilers - 15 psi Water Boilers 250°F	Automatic Oil or Comb. Gas-Oil	6	_	24	6	6
Water Heaters - 200°F All Water Walls or Jacketed	Automatic Gas \$Ø¥fø//////// Electric	6 /////ø///// 6		18 /////¥&///// 18	6 /////ø///// 6	6 /////ø 6
Furnaces - Central Gravity, Upflow, Downflow. Horizontal and Duct.	Automatic Oil or Comb. Gas-Oil	64	6 ⁴	24	6	6
Warm-Air - 250°F	Automatic Gas \$Ø J1 ¢//////// Electric	6 ⁴ //// 185 /// 6 ⁴	64 ///// 18 5///// 6 ⁴	18 ///// 18 ////// 18	6 ////////////////////////////////////	6 ////////#8 6
Furnaces - Floor For Mounting in	Automatic Oil or	36	· -	12	12	12
Combustible Floors	Comb. Gas-Oil Automatic Gas	36	-	12	12	12
	Electric	36		12	12	12
Heat Exchanger Steam 15 psi Max. Hot Water - 250°F Max.						

(Continued)

Room Heaters	0:1 11/01V31	26		04	10	10
Circulating Type	0i1 ør/\$øx#d	36 36	-	24 24	12	12
Vented or Unvented	Gas Oil ør/\$ø11ø	36	-	24 36	12 36	12 36
Radiant or Other Type Vented or Unvented	Gas	36	-	36	18	36 18
vented of onvented	Gas with dbl	50	-	20	10	10
	metal or	36	_	36	12	18
	ceramic back	50	_	50	12	10
Radiators Steam or Hot Water	Gas	36	-	6	6	6
		See Note 🛿 <u>5</u>			Fir	ing Opp. Side Side
Ranges - Cooking Stoves	0i1	30	-	-		24 18
Vented or Unvented	Gas	30	-	➡ į	6	6 6
· · · · · · · · · · · · · · · · · · ·	Søyid/+/Qydy					
	YINEA/FIYEPOL/// SoYId/Vn	///////////////////////////////////////	///////////////////////////////////////	///////////////////////////////////////	//////24////	/24/////////////
		///////////////////////////////////////	///////////////////////////////////////		//////36////	/36/////////////
	Electric	30			6	6
Clothes Dryers	Gas	6	_	24	6	6
Types	Electric	6	-	24	0	0
Incinerators		See Note 7 6				
Residential Types		36		48	36	36

(Continued)

1 Standard clearances may be reduced by affording protection to combustible material in accordance with Table 23.04-B.

2 Rooms which are large in comparison to the size of the appliance are those having a volume equal to at least 12 times the total volume of a furnace and at least 16 times the total volume of a boiler. If the actual ceiling height of a room is greater than 8 feet, the volume of a room should be figured on the basis of a ceiling height of 8 feet.

3 The minimum dimension should be that necessary for servicing the appliance including access for cleaning and normal care, tube removal, etc.

4 For a listed oil, combination gas-oil, gas, or electric furnace this dimension may be 2 inches if the furnace limit control cannot be set higher than 250°F or this dimension may be one inch if the limit control cannot be set higher than 200°F.

B/INE/dInensign/nay/be/b/inches/fg//an/autonatically/stoker/fired/fgrced/warn/air/furnace/equipped/with/28097/Iinit cgntrgI/and/with/bargnetric/draft/cgntrgI/gperated/by/draft/intensity/and/pernanently/set/tg/linit/draft/tg/a/d intensity/gf/0[13/in//water/gauge/

 \emptyset 5 To combustible material or metal cabinets. If the underside of such combustible material or metal cabinet is protected with asbestos millboard at least 1/4-inch thick covered with sheet metal of not less than No. 28 gauge, the distance may be not less than 24 inches.

7 6 Clearance above charging door should be not less than 48 inches.

SECTION 106. ILHR 23.04 (4) is repealed.

SECTION 107. Figures 23.01-A to C are renumbered 23.045-C to E.

SECTION 108. ILHR 23.045 (1) is amended to read:

ILHR 23.045 (1) GENERAL. Solid-fuel-burning appliances shall be installed as specified in this section///TM@/installednss. dddordand@/with/th@/appliand@/wanufadtur@rys/installation/instructions/if unless the manufacturer or listing specifies the use of indreased protection or greater clearances other than those specified in this section. All solid-fuel-burning appliances and factory manufactured fireplaces shall be tested and listed by an accepted testing agency.

SECTION 109. ILHR 23.045 (2) (c) is created to read:

ILHR 23.045 (2) (c) <u>Garages</u>. Solid-fuel-burning appliances shall not be installed in a garage unless listed for such use.

SECTION 110. ILHR 23.045 (3) (a) 1. is amended to read:

ILHR 23.045 (3) (a) 1. 'Factory built chimneys or vents.' A listed residential type and building heating appliance chimney or "building heating appliance only" chimney may be used with solid-fuel-burning appliances Where/flue/flue/gas/temperature/does/not/exceed/1000/P/continuous14//and/does not/exceed/1/400/P/for/infrequent/brief/periods/of/forced/firing if the chimneys have been tested 3 times to a minimum flue gas temperature exposure of 2100°F, under the conditions specified by the listing agency, for at least 10 minutes each time.

SECTION 111. ILHR 23.045 (3) (b) to (e) are created to read:

ILHR 23.045 (3) (b) Wood-burning equipment shall not be connected to a flue serving a fireplace or other equipment.

(c) The chimney shall be designed to create a natural draft to carry away the products of combustion or provision shall be made for mechanically maintaining constant updraft during equipment operation.

(d) A cleanout opening shall be provided.

(e) A listed, multifuel appliance may be vented into a single flue.

SECTION 112. ILHR 23.045 (4) (b) is amended to read:

ILHR 23.045 (4) (b) The required clearance to combustibles for chimney connectors shall be 18 inches. This clearance \cancel{an} may be reduced in accordance with Table $\cancel{23}/\cancel{045}/\cancel{0}$ $\cancel{23.045-B}$. The specified protection shall be applied and cover all combustible material as specified in Figure $\cancel{23}/\cancel{045}$ $\cancel{23.045-A}$.

SECTION 113. ILHR 23.045 (5) (a) is renumbered 23.045 (5) and as renumbered, is amended to read:

ILHR 23.045 (5) MOUNTING ON FLOORS. Appliances shall be placed on surfaces as described in Table 23/045/16 23.045-C. Solid fuel burning appliances listed specifically for installation on a floor constructed of combustible material may be installed in accordance with the terms of the listing and the manufacturers instructions.

SECTION 114. Table 23.045-B is renumbered 23.045-C.

SECTION 115. ILHR 23.045 (6) (a) is amended to read:

ILHR 23.045 (6) (a) Solid-fuel-burning $\notin d \not a \not a p p liances$ shall be installed with clearances not less than specified in Table 23/043/0 23.045-D.

SECTION 116. ILHR 23.045 (6) (b) 1. is repealed and recreated to read:

ILHR 23.045 (6) (b) 1. 'Listed appliances exception.' Listed appliances shall be installed in accordance with the terms of their listing if greater clearances other than those specified by Table 23.045-D are required in accordance with the listing.

SECTION 117. ILHR 23.045 (6) (b) 2. is amended to read:

SECTION 118. Table 23.045-C is renumbered 23.045-D.

SECTION 119. Table 23.045-D is renumbered 23.045-B and, as renumbered, is amended to read:

CONNECTOR CLEARANCES WITH SPECIFIED FORMS OF PROTECTION 1,2,3,4/8/0

•	Minimum Required	Connector	Ciearances før!
		inches	
	Rangess/Røøn/Heaters		Residentiai
Type of Protection	F1YEPIACE/Stoves,	Phynaces	Køø712ndes
	Qombinations		BOTTEYS

0.013 in. (28 gage) sheet metal spaced out a minimum of one inch.	78	9	2
3-1/2 in. thick masonry wall spaced out a minimum of one inch and adequately tied to the wall being protected (see Note 4).	78	9	2
0.027 in. (22 gage) sheet metal on one-inch mineral wool batts reinforced with wire or equivalent spaced out a minimum of one inch.	72	3	2

1 Spacers and ties shall be noncombustible material.

- 2 All methods of protection require adequate ventilation between protective material and adjacent combustible walls and ceilings.
- 3 Mineral wool batts blanket or board shall have a minimum density of 8 pounds per cubic foot and a minimum melting point of 1550°F.
- 4 If a single wall connector passes through the masoary wall there shall be at least 1/2 inch of open ventilated air space between the connector and the masonry.
- B/THEYE/SHATT/BE/AL/TEASL/BHE/INCH/BELWEEN/LHE/APPTIANCE/AND/LHE/PYBLECLOF/
- 3/QIEAYANCEE/IN/FYONZ/OF/ZNE/AOPIIANCEE/SNAII/NOZ/BE/YEANCEA/FYON/ZNESE/IN TABIE/23/048/QL

SECTION 120. Table 23.045-E and Figure 23.045-B are created to read:

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TABLE 23.045-E

MINIMUM ALLOWABLE APPLIANCE CLEARANCE WITH PROTECTION 1,2,3,4,5,6

Type of

Protection		Unprotected Clearances (inches)							
Unprotected		For Ceilings				For Walls			
	6	18	30	36	6	18	_24_	36	• • 48
3 1/2 in. thick masonry wall without ventilated air space.	-	~	-	-	4	12	16	24	32
<pre>1/2 in. thick noncombustible insulation board over 1 in. glass fiber or mineral wool batts without ventilated air space.</pre>	4	12	20	24	3	9	12	18	24
0.024 in. (24 gage) sheet metal over 1 in. glass fiber or mineral wool batts reinforced with wire, or equivalent, on rear face with ventilated air $s_{\rm Fuce}$	3	9	15	18	2	6	8	12	16
3 1/2 in. thick masonry wall with ventilated air space	-	-	-	·	2	6	8	12	16
0.024 in. (24 gage) sheet metal with ventilated air space.	3	9	15	18	2	6	8	12	16
<pre>1/2 in. thick noncombustible insulation board with ventilated air space</pre>	3	9	15	18	2	6	8	12	16
0.024 in. (24 gage) sheet metal with ventilated air space over 0.024 in. (24 gage) sheet metal with ventilated air space.	3	9	15	18	2	6	8	12	16
1 in. glass fiber or mineral wool batts sandwiched between two shee 0.024 in. (24 gage) sheet metal with ventilated air space.		9	15	18	2	6	8	12	16

¹Spacers and ties shall be of noncombustible material. No spacers or ties shall be used directly behind appliance or conductor.

²With all clearance reduction systems using a ventilated air space, at least two sides of the protection shall be open to provide adequate air circulation. There shall be at least one inch between the clearance reduction system and combustible walls and ceilings.

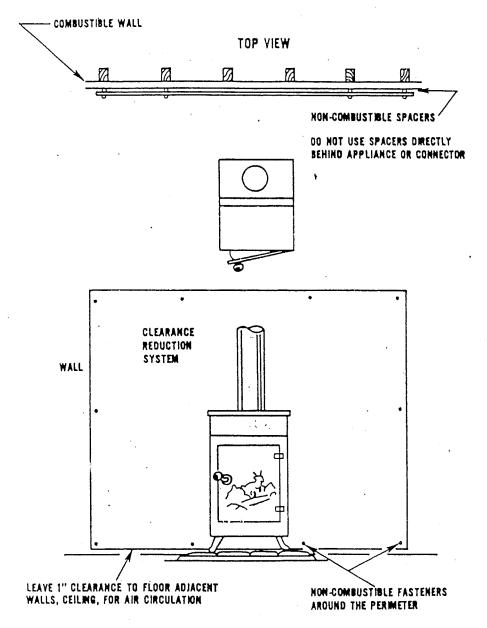
³Mineral wool batts, blanket or board shall have a minimum density of 8 lb. per cubic foot and have a minimum melting point of 1,500°F.

⁴Insulation material used as part of a clearance reduction system shall have a thermal conductivity (k) of One (Btu) (in)/(Sq. ft.) (Hr.) (°F) or less. Insulation board shall be formed of noncombustible material.

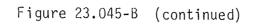
 5 If a single wall connector passes through a masonry wall used as a wall shield, there shall be at least 1/2 inch of open, ventilated space between the connector and the masonry.

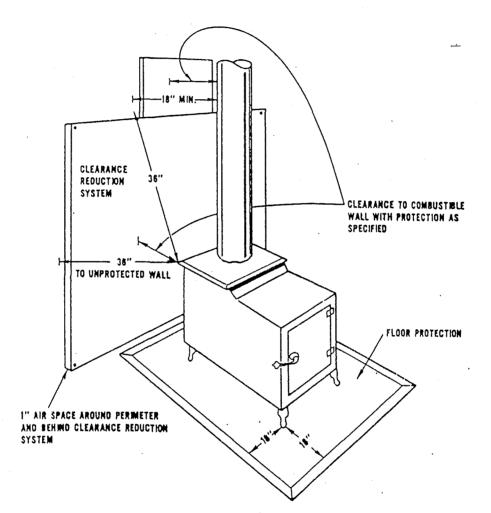
⁶Clearances in front of the loading door or ash removal door of the appliance shall not be reduced.











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SECTION 121. Figure 23.045 is renumbered 23.045-A.

SECTION 122. ILHR 23.045 (8) (intro.) is amended to read:

ILHR 23.045 (8) SUPPLEMENTAL UNITS. Supplemental solid fuel-burning units connected to a furnace shall be connected to the warm air side of the furnace 4nd/8nd11/conform/to/the/follow1ng/prov1sions as illustrated in rigures 23.045-C to E.

SECTION 123. ILHR 23.045 (8) (e) is created to read:

ILHR 23.045 (8) (e) Supplemental solid-fuel-burning units shall be installed to maintain a 3-foot clearance between the unit and the furnace or shall be installed in accordance with the listings of both the supplemental unit and the furnace if such an installation is specifically covered by the listings.

SECTION 124. ILHR 23.045 (9) (a) is amended to read:

ILHR 23.045 (9) (a) <u>Horizontal ducts</u>. The clearance from combustibles for horizontal ducts shall be as specified in Table 23.045/agenumber 23.045-F.

SECTION 125. Table 23.045-E is renumbered Table 23.045-F and as renumbered is amended to read:

Distance of Ducts From	Clearance to Combustibles ¹
Bonnet or Plenum	Required
(inches)	(inches)
0 to 36	18
over 36 to 72	6
over 72	1

TABLE 23.045-F

¹Clearance can be reduced in accordance with Table 23/04B/0 23.045-B.

SECTION 126. ILHR 23.06 (intro.) is amended to read:

ILHR 23.06 COMBUSTION AIR. All fuel-burning heating equipment, except sealed combustion appliances, cooking appliances, refrigerators and clothes dryers, shall be provided with a supply of air for fuel combustion. Combustion air shall not be taken from a garage. If combustion air is taken from the attic, provisions shall be made to prevent insulation from blocking the combustion air intake and the attic vents. SECTION 127. ILHR 23.06 (1) (a) is amended to read:

ILHR 23.06 (1) (a) <u>Infiltration</u>. Combustion air may be provided by means of infiltration where the volume of the room (measured in cubic feet) in which the burner is located is greater than 1/20 <u>1/10</u> of the maximum input β t/ rating of the burner(s), in Btu per hour.

SECTION 128. ILHR 23.06 (2) (a) is amended to read:

ILHR 23.06 (2) (a) <u>Air from inside the dwelling</u>. Two openings_shall be provided to the equipment enclosure. One opening shall be located within 12 inches from the floor and one opening shall be located within 24 inches from the top of the room. Each opening shall provide a minimum area of one square inch per 1,000 Btu per hour input. <u>The volume, in cubic feet, of the floor level to which the enclosure is vented shall not be less than 1/10 of the</u> maximum input rating of the burner(s), in Btu per hour.

SECTION 129. ILHR 23.08 (2) (b) is created to read:

ILHR 23.08 (2) (b) <u>Under-floor plenums</u>. An under-floor space may be used as a plenum in a single dwelling unit in accordance with this section.

1. The use of the under-floor space shall be limited to buildings not more than two stories in height. Except for the floor immediately above the under-floor plenum, supply ducts shall be provided extending from the plenum to registers or other floor levels.

2. The under-floor spaces shall not be used for storage, shall be cleaned of all loose scrap material and shall be tightly and substantially enclosed.

3. The enclosing material of the under-floor space, including the side wall insulation and vapor barriers, shall not be more flammable than l-inch (nominal) wood boards (flame spread classification of 200).

4. Access shall be through an opening in the floor which shall be 18 inches by 24 inches.

5. The furnace supplying warm air to the under-floor space shall be equipped with an automatic control which will start the air circulating fan when the air in the furnace bonnet reaches a temperature not higher than 150 degrees F. Such control shall be one that cannot be set higher than 150 degrees F.

6. The furnace supplying warm air to the under-floor space shall be equipped with an approved temperature limit control that will limit outlet air temperature to 200 degrees F. 7. A noncombustible receptacle shall be placed below each floor opening into the air chamber. The receptacle shall be securely suspended from the floor members and shall be not more than 18 inches below the floor opening. The area of the receptacle shall extend 3 inches beyond the opening on all sides. The perimeter of the receptacle shall have a vertical lip at least 1 inch high at the open sides if it is at the level of the bottom of the joist, or 3 inches high if the receptacle is suspended.

8. Floor registers shall be designed for easy removal to permit access for cleaning the receptacles.

9. Exterior walls and interior stud partitions shall be firestopped at the floor.

10. Each wall register shall be connected to the air chamber by a register box or boot.

11. A duct conforming to par. (a) shall extend from the furnace supply outlet at least 6 inches below combustible framing.

12. The entire ground surface and enclosing exterior walls of the under floor space shall be covered with a vapor barrier having a vapor permeability rating of 1 perm or less and a flame spread rating of 200 or less.

13. Fuel gas lines may not be located within the under-floor space.

14. A smoke detector shall be placed in the under-floor space. The alarm and low-battery signal of the smoke detector shall be audible in the occupied areas of the dwelling, when actuated.

15. The exterior walls of the under-floor spaces shall be insulated in accordance with s. ILHR 22.06 (6) or 22.12 (1). The insulation may not be omitted under the provisions of s. ILHR 22.06 (9) or 22.12 (2).

16. Electrical wiring installed in the plenum shall be in conformance with the Wisconsin Administrative Electrical Code Volume 2.

SECTION 130. ILHR 23.08 (10) is created to read:

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ILHR 23.08 (10) AIR PASSAGEWAYS OF ENVELOPE DWELLINGS. The air passageways of envelope type dwellings shall comply with this subsection.

(a) No heating equipment shall be placed in the air passageways.

(b) Wood exposed to the air passageways shall be of at least 2 inches nominal thick.

(c) Finishes and insulation exposed to the air passageway shall have a flame spread rating of 25 or less and a smoke development rating of 50 or less.

(d) A vapor barrier shall be installed on the warm side of insulation which forms a part of the thermal envelope of the dwelling. In the roof-ceiling air passageway, a vapor barrier for the insulation of the ceiling may be omitted if heated air is circulated on both sides of the ceiling insulation. The insulation on the roof side of the air passageway shall be provided with a vapor barrier on the warm side of the insulation. Any vapor barrier exposed to circulating air shall have a flame spread rating of 25 or loss and a smoke development rating of 50 or less.

Note: Also see s. ILHR 21.08 (1m), Equivalent Firestopping Requirements for Envelope Dwellings.

SECTION 131. ILHR 23.11 (3) is repealed.

SECTION 132. ILHR 23.15 (2) (intro.) is amended to read:

ILHR 23.15 (2) (intro.) CONSTRUCTION AND INSTALLATION. The construction and installation of chimney connectors of solid-fuel-burning appliances shall comply with s. ILHR 23.045 (4). The chimney connectors of all other fuel-fired appliances shall conform with the following requirements:

SECTION 133. ILHR 23.15 (2) (d) is renumbered 23.155 and, as renumbered, is amended to read:

<u>ILHR 23.155</u> MULTIPLE APPLIANCE VENTING. (1) GENERAL \mathcal{J} (\mathcal{J}) \mathcal{J} (\mathcal{J}) \mathcal{J} (\mathcal{J}), two or more listed appliances using the same type of fuel may be connected to a common gravity-type flue provided the appliances are equipped with listed primary safety controls and listed shutoff devices and comply with the following requirements.

1. The appliances shall be located in the same story, except for engineered venting systems.

2. The appliances shall be joined at a manifold or Y-type fitting as close to the chimney as possible, unless the connector from each appliance enters a separate chimney inlet and the inlets are offset $\frac{1}{4}\frac{d}{d}\frac$

3. The chimney connector and chimney flue shall be sized to accommodate the total volume of flue gases. For gas-burning appliances the venting area shall be at least equal to the size of the largest vent connectors plus at least 50% of the area of the other vent connectors.

(2) EXCEPTION. Any chimney serving a fireplace or a solid-fuel-burning appliance shall not be used to vent any other equipment or appliance.

SECTION 134. ILHR 23.15 (2) (g) is amended to read:

ILHR 23.15 (2) (g) <u>Materials and thickness</u>. Chimney or vent connectors serving liquid dnd/ddldd fuel or gas appliances shall conform to the type of material and thickness indicated in Tables 23.15-A or 23.15-B.

SECTION 135. Table 23.15-A (title) is amended to read:

TABLE 23.15-A

MINIMUM CHIMNEY CONNECTOR GAGES FOR OIL // WØØØ/AMØ/ØØAV-FIRED APPLIANCES

SECTION 136. Table 23.15-C is amended to read:

TABLE 23.15-C

CHIMNEY CONNECTOR AND VENT CONNECTOR CLEARANCES FROM COMBUSTIBLE MATERIALS (See Note 4)

Description of Appliance	Minimum Clearance Inches (See Note 1)
Single-Wall Metal Pipe Connectors	
Gas Appliances Without Draft Hoods	18 .
Electric, Gas, and Oil Incinerators	18
Oil And/Sølla/Fuel Appliances	18
Unlisted Gas Appliances with Draft Hoods	9
Boilers and Farnaces Equipped With Listed Gas Burners and	
With Draft Hoods	9
Oil Appliances Listed as Suitable for Use With Type L	5
Venting Systems, but only when connected to chimneys	9
Listed Gas Appliances With Draft Hoods. See Note 3.	6
Type L Vent Piping Connectors	`
Gas Appliances Without Draft Hoods	9
Electric, Gas, and Oil Incinerators	9
Oil And/Sølld/Fuel Appliances	9
Unlisted Gas Appliances With Draft Hoods	6
Boilers and Furnaces Equipped With Listed Gas Burners and	Ŭ
With Draft Hoods	6
Oil Appliances Listed as Suitable for Use with Type L Vents	(See Note 2)
Listed Gas Appliances With Draft Hoods	(See Note 3)
Type B Gas Vent Piping Connectors	
Listed Gas Appliances With Draft Hoods	(See Note 3)

¹These clearances apply except if the listing of an appliance specifies different clearance, in which case the listed clearance takes precedence.

 2 If listed type L venting system piping is used, the clearance may be in accordance with the venting system listing.

 3 If listed type B or type L venting system piping is used, the clearance may be in accordance with the venting system listing.

⁴The clearances from connectors to combustible materials may be reduced if the combustible material is protected in accordance with Table 23.04-B.

SECTION 137. ILHR 23.156 is created to read:

ILHR 23.156 CONDENSATE DRAINS. Provisions shall be made so that condensate from heating equipment drains into the sanitary drain system.

SECTION 138. ILHR 23.16 (2) is repealed and recreated to read:

ILHR 23 16 (2) OIL STORAGE TANKS. (a) Except as provided in parts. (b) and (c) oil storage tanks shall be installed in accordance with ch. Ind 8, Flammable and Combustible Liquids.

(b) The total storage capacity inside any dwelling unit shall be limited to 550 gallons in one tank, or not more than 275 gallons in each of two tanks cross-connected to a single burner.

(c) Oil storage tanks on the inside of any dwelling shall be located at the same level as the burner it serves.

SECTION 139. ILHR 23.16 (3) is repealed and recreated to read:

ILHR 23.16 (3) GAS PIPING SYSTEMS. Gas piping systems, extending from the point of delivery to the connection with each gas-fired appliance or device, shall be installed to conform with NFPA 54, National Fuel Gas Code.

SECTION 140. ILHR 23.16 (4) (a) is repealed and recreated to read:

ILHR 23.16 (4) (a) Any oil-fired appliance or device connected to a fuel piping system shall have an accessible, approved manual shutoff valve installed upstream of any connector.

SECTION 141. The copies of the Wisconsin Uniform Building Permit Application and the Wisconsin Uniform Building Permit are repealed from the Appendix and updated forms for the Wisconsin Uniform Building Permit Application, Wisconsin Uniform Building Permit, Rule Variance Application Under Uniform Dwelling Code, and Municipal Recommendation for a Variance Application are inserted in the Appendix.

			-43-	-					
State of Wisconsin Department of Industry, Labor & Human Relations Division of Safety & Buildi Box 7969 *.tadison, WI 5'4707 Wisconsin Statutes 101.60			WISCONSIN U BUILDING F APPLICA (See Instructions on ba	PERMIT TION		APPLICA	TION NO.		
PERMIT REQUES	TED								
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Contractor's Name			Mailing Address			Telephor	ie		
PROJECT LOCAT	ION			% SECTION		т	N	B	E (or)V
Building Address			Subdivision Name	¼, SECTION		Lot No.		Block	lo.
Zoning District	Lot Area	Sq. ft.	Setbacks	Front Rea	ar ft.	Left	ft.	Right	
1a. PROJECT		3. TYPE	6. ELECTRICAL	9. HVAC EQUIP			ERGY S	OURCE	
New Addition	Raze Move	Single Family	Entrance Panel Size: amp	Forced Air Furna Radiant Baseboa		Fuel	Nat. L.P. Gas	Oil Ele	ec. SolidSol
Other		Other	Service:	Heat Pump Boiler		Space Htg. Water Htg.			
Ib. GARAGE		4 CONST TYPE	Overhead 7. FOUNDATION	Central Air Cond Other		* Dwel	ling unit w	ill have 3	s kilowatt o
	ched	Site constructed		10. PLUMBING Sewer Municipal		Infiltration of joints. air infiltrat	Control op Blower tion barrier	tion is: door test	eating equip Full sealing Exterio
		000000000000000000000000000000000000000				13. HE.	AT LOS	S /Color	ilated)
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FOUNDATION			└ const;	hvac;		;C ;		um
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HEAT/VENT/AC			Issued to	ADDRESS CITY, VILLAGE		in the descente		
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OCCUPANCY				PERSON	· · · · · · · · · · · · · · · · · · ·	CERT.		affix u
NOTICE OF NONC	OMPLIA	NCE	Issued by	ISSUINC DATE ISSUED	TELEPHONE NUMBER	NO.		permits (when ap Sea

elec; plumb; C; CERT. affix uniform NO. permit seal here (when applicable) **TELEPHONE** Seal No: NUMBER **COMMENTS:**

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WIS. STATS. 101.63

This Issuing jurisdiction shall notify

the applicant in writing of any violations to be corrected. All cited violations shall be corrected within 30

days after notification, unless

extension of time is granted.

RULE VARIANCE APPLICATION UNDER WISCONSIN UNIFORM DWELLING CODE

Safety & Buildings Division Local Program Services P.O. Box 7969 Madison, Wisconsin 53707 (UV)

		(00)
Owner Name	Owner Street Address	
City	State & Zip Code	Owner Telephone No.
Dwelling Location	Dwelling Street Addres	55
City/Village/Town	County	
Agent (Arch - Engr - Contr)	Agent Street Address	
City	State & Zip Code	Agent Te le phone No.
Municipality Having Jurisdiction		Telephone No.
\$100 STATE FEE required (ILHR 69.15(2)). Appl	ication can only be made by owner.	Submit to the address shown in
the upper right corner. Additional MUNICIPAL	FEE, if any:	
. Rule ILHR of the Uniform	n Dwelling Code cannot be entirely s	satisfied because:
. In lieu of complying exactly with the rule, th	e following alternative is proposed a	as a means of providing an
 In lieu of complying exactly with the rule, th equivalent degree of health, welfare and sat below explain your proposally. 	e following alternative is proposed a fety (submit building plans, calculati	as a means of providing an ions and specifications to
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APPLICATION IS VALID ONLY IF NOTARIZED AND ACCOMPANIED BY REVIEW FEE.

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Wisconsin Department of Industry, Labor and Human Relations

MUNICIPAL RECOMMENDATION FOR A VARIANCE APPLICATION

Safety and Buildings Division Local Program Services P.O. Box 7969 Madison, Wisconsin 53707

Owner Name	Owner	Street Address	
City/Town	State	Zip Code	Owner Telephone No.
Dwelling Location	Dwellin	g Street Address	
City/Town	County		
Agent (Arch - Engr - Contr)	Agents	street Address	
City/Town	State	Zip Code	Agent Telephone No.
1. I have read the application for variance of rule	ILHR		
2. I recommend (check appropriate box): Der	nial 🗌	Approval Co	ond. Appr. 🗌 No Comment
3. Explanation for recommendation:			
		• • • •	
4. I find no conflict with local rules and regu	lations		
I find that the variance is in conflict with le		s and regulations	
Explanation:		-	
	·	•	
5. Inspections completed: None Footi		Rough 🗍 Final	Foundation
Bldg. Const Energy HVA	· _	Electrical	
6. Correction orders issued:			
Municipality exercising jurisdiction:	<u></u>		
Signature of municipal enforcement official:		Date	e signed:
Please submit this completed form along with origi \$100.00 state review fee to Department of Industry shown in the upper right corner.	nal App y, Labor	lication for Variar and Human Relat	nce, Form SBD-6070, and ions at the address

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SECTION 142. An index to the span tables in the appendix is created to read:

INDEX OF							
SPAN TABLES FOR JOIS	TS AND RAFTERS						
(Recommended by National Fore							

TABLE		PAGE
Table J-1 Table J-2 Table J-3 Table J-4 Table J-5 Table J-6 Table R-2 Table R-3 Table R-3	FLOOR JOISTS, 40 lbs/sq.ft. Live Load FLOOR JOISTS, 30 lbs/sq.ft. Live Load CEILING JOISTS, 20 lbs/sq.ft. Live Load, Plaster Ceiling CEILING JOISTS, 20 lbs/sq.ft. Live Load, Drywall Ceiling CEILING JOISTS, 10 lbs/sq.ft. Live Load, Plaster Ceiling CEILING JOISTS, 10 lbs/sq.ft. Live Load, Drywall Ceiling FLAT OR SLOPED RAFTERS, 30 lbs/sq.ft. Live Load, Drywall Ceiling FLAT OR SLOPED RAFTERS, 40 lbs/sq.ft. Live Load, Drywall Ceiling FLAT OR SLOPED RAFTERS, 30 lbs/sq.ft. Live Load, Drywall Ceiling FLAT OR SLOPED RAFTERS, 30 lbs/sq.ft. Live Load, Drywall Ceiling FLAT OR SLOPED RAFTERS, 30 lbs/sq.ft. Live Load, Plaster Ceiling	120 122 124 126 128 130 132 136 140
Table R-6	FLAT OR LOW SLOPED RAFTERS, 40 lbs/sq.ft. Live Load, Plaster Ceiling	144
Table R-8	FLAT OR LOW SLOPED RAFTERS, 30 lbs/sq.ft. Live Load, No Ceiling Load	148
Table R-J	FLAT OR LOW SLOFED RAFTERS, 40 lbs/sq.ft. Live Load, No Ceiling Load	152
Table R-11	MEDIUM OR HIGH SLOPE RAFTERS, 30 lbs/sq.ft. Live Load, No Ceiling Load, Heavy Roof Covering	156
Table R-12	MEDIUM OR HIGH SLOPE RAFTERS, 40 lbs/sq.ft. Live Load, No Ceiling Load, Heavy Roof Covering	160
Table R-14	MEDIUM OR HIGH SLOPE RAFTERS, 30 lbs/sq.ft. Live Load, No Ceiling Load, Light Roof Covering	164
Table R-15	No Ceiling Load, Light Roof Covering	168
	TWO SPAN FLOOR JOISTS, 40 lbs/sq.ft. Live Load TWO SMAN FLOOR JOISTS, 30 lbs/sq.ft. Live Load	172 174

Note to Revisor: the addition is to be made to page 117 of the appendix.

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SECTION 143. The third paragraph under LUMBER DESIGN VALUES on page 118 of the appendix is amended to read:

The "Joists" column in the design value tables provide values for repetitive-member use under normal conditions. The "Rafters" column $\frac{1}{1}$ of the design values for bending for repetitive-member use adjusted for snow-loading.

SECTION 144. A second paragraph under ROOF LOADS on page 118 of the appendix is created to read:

Light roof coverings are defined as those with a weight of 7 psf or less and typically include asphalt and wood shingles. Heavy roof coverings are those which are more than 7 psf, up to 15 psf, and typically include tile and slate roofs.

SECTION 145. The title and subheading of Table J-1 on page 120 of the appendix is amended to read:

TABLE J-1

FLOOR JOISTS 40 Lbs Per Sq. Ft. Live Load (#11/røøms/except/thøse/used/før/sleeping/areas/and/attic/fløørs) (All floors except attic floors)

SECTION 146. The title and subheading of Table J-2 on page 122 of the appendix is amended to read:

TABLE J-2 FLOOR JOISTS 30 Lbs Per Sq. Ft. Live Load {&XX//føøds/used/føf/sXeeping/and/attic/fXøørs} (Optional table for attic floors)

SECTION 147. The title and subheading of Table TSJ-1 on page 172 of the appendix is amended to read:

TABLE TSJ-1 TWO-SPAN FLOOR JOISTS 40 Lbs Per Sq. Ft. Live Load (#XX//føødds/exdept/tfóse/dsed/før/sXeeptAdg/areas/and/attic/fXøøfs) (Ali floors except attic floors) SECTION 148. The title and subheading of Table TSJ-2 on page 174 of the appendix is amended to read:

TABLE TSJ-2 TWO-SPAN FLOOR JOISTS 30 Lbs Per Sq. Ft. Live Load {&XX/føødds/dsed/føf/sXeepidg/and/attic/fiødfs} (Optional table for attic floors)

SECTION 149. Appendix A is repealed and recreated to read:

APPENDIX A

CHAPTER ILHR 22 DETERMINATION OF REQUIRED LEVELS OF INSULATION USING THE ENERGY WORKSHEET

Two methods may be used to determine the level of instalation required by Chapter ILHR 22 for electrically heated and non-electrically heated dwellings. The Component Method (also known as the Accepted Practice Method) can be used with a minimum of calculations and is recommended for standard designs. The System Design Method is more complex and is used for alternate designs. Under the System Design Method, less insulation may be installed in one building component if more insulation is installed in another.

The following illustration demonstrates use of the Energy Worksheet to determine the required levels of insulation. Single copies of the Energy Worksheet are available at no charge upon written request.

Write to:

Department of Industry, Labor and Human Relations Division of Safety and Buildings Post Office Box 7969 Madison, Wisconsin 53707

Portions A and H of the Energy Worksheet must be filled out for the Component Method. Portion: B, C and D of the Energy Worksheet must be filled out to use the System Design Method. Sections B and F are filled out to size the furnace for either method. Section G must be filled out to size the ventilation system for electrically heated homes. Both the Component Method and the System Method will be shown in the illustration, although completion of only one method is sufficient to show compliance with the insulation requirements of Ch. ILHR 22.

SAMPLE DWELLING

Sample dwelling: 1,500 square feet, 186 lineal feet of perimeter building thermal envelope. Gross wall area = 8.13 feet x 186 lineal feet = 1,512.18 square feet Wall window area = 172.67 square feet Box sill area = 0.81 feet x 186 lineal feet = 150.66 square feet Gross exposed foundation wall area = 124.62 square feet Basement window area = 15.65 square feet Door area = 37.82 square feet Ceiling area = 1,500 square feet Dane County location - Zone 3 The dwelling will be electrically heated. The planned construction: Walls Wood bevel 1/2" x 8" siding R = 0.811" Extruded polystrene sheathing R = 5.27R = 19R19 Batt insulation 2 x 6 Framing, 24" 0.C. R = 6.875Drywall 1/2" R = 0.45Ceiling 2 x 6 Framing, 24" 0.C. R = 6.875clown Fiberglass insulation R/inch = 2.5Insulation in 5.5" Cavity R = 13.75Insulation over both Cavity and Framing, 14.5" R = 36.251/2-inch drywall finish R = 0.45Foundation 8" Masonry Block R = 1.722" Extruded polystyrene R = 10.54Windows All triple glazed R = 2.7Doors Insulated. R = 2.12R = 1.00Storm door Total door R value R = 3.12The 1500 square foot basement will be divided into a 575 square foot finished

The 1500 square foot basement will be divided into a 5/5 square foot finished living space and a 925 square foot utility and storage space. The value of all the dead air spaces on both levels (closets, cabinets, interior walls, etc.) equals 2163 cubic feet.

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Estimating Design R-values for Building Materials and Components

R-values listed in Table A-4 of the UDC appendix, ASHRAE manual or manufacturer's specifications may be helpful in determining the designed R-values for building components or materials. The designed R-values which are entered in Part C of the Energy Worksheet should be consistent with the end use or installed condition of the insulation and building materials used. The design R-values should take into account possible effects such as:

- Long term aging effects.
- Settling or other density variations that may occur with blown-in fiberglass and cellulose insulation.
- Moisture effect on wet installations such as exterior foundation insulation.
- Effect of compression on insulating materials subject to loads, such as the case of porous, semi-ridged fiberglass applied to foundation exteriors.

and the presentation

- Orientation of installation effects (horizontal or vertical).

In order to use the design R-value given in the manufacturer's specifications, insulation and building materials must be installed in accordance with the manufacturer's instructions. For example, most four panel insulation modures are required to be protected from exposure to sunlight (ultraviolet light). An opague covering is typically installed to provide that protection.

DILHR Safety and Buildings Division P.O. Box 7969 Madison, WI 53707

ENERGY WORKSHEET UNIFORM DWELLING CODE

PROJECT ADDRESS: SAMPLE

BUILDER:

OWNER:

DATE:

Does dwelling unit have three kilowatts or more input capacity of permanently installed electrical space heating equipment?

IX YES (see below) □ NO

If yes, then indicate infiltration control option:

INSTRUCTIONS: This worksheet is a DILHR-approved method of showing compliance with the energy conservation standards of Chapter ILHR 22 of the Uniform Dwelling Code (UDC) which applies to one- and two-family dwellings built since December 1, 1978. It is recommended that the user purchase a copy of the UDC from State Document Sales, (608) 266-3358.

You have the choice of using the Accepted Practice Method or the System Design Method to show code compliance. For the Accepted Practice Method, which is recommended for standard designs, complete Sections A. and B. and Sections E. through F. and Section H. You will be first calculating component areas, then your dwelling's code-allowed and other heat loss to determine your furnace size, and then comparing your planned insulation levels to the required insulation levels from the Appendix of the UDC.

For the System Design Method, which is recommended for alternative designs, complete Sections A. through F. You will be first calculating component areas, then the code-allowed heat loss, then component U- and R-values and then your calculated heat loss which you will compare to the code-allowed heat loss. You will also be calculating the allowable furnace size.

With either method, you will need to apply the stricter and slightly different standards shown for electrically-heated homes if you answered "YES" to the above question. For electrically heated homes, you must also complete Section G. to determine the required mechanical ventilation capacity.

All "R' and 'U' calculations must be carried to four places after the decimal point, rounded to three places. Linear dimensions must be carried to three places, rounded to two. Area and heat loss calculations may be rounded to the whole number.

Numbers in brackets, [1], refer to the footnotes listed on page 5.

PAGE 1

A. AREA CALCULATIONS

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Source calculations will not be necessary downding on home design and heating fuel. These calculated areas are referenced elsewhere on this worksheet, for example, A.1., A.2....

1. GROSS (INSULATED) ABOVE-FOUND (Including doors, windows and box			OUNDATION WALL AREA space 50° F or warmer)	
1512.18 + 150.66 =				
	<u>1662.84</u> sq. ft.		124.62	sq. fi.
2. WINDOW & PATIO DOOR AREA (sas a. In Above-Foundation b. I Walls	h/door area) n Foundation Walls	5. FOUNDATION WA THREE FEET BEL	ALL AREA BETWEEN GRADE AND OW GRADE	
<u>172.67</u> sq. ft.	15.65 sq. ft.	186 x	3 =	
Total (a. + b.) = <u>188.32</u>			558.0	sq. ft.
3. DOOR AREA IN ABOVE-FOUNDATIC	ON WALLS	6. FOUNDATION WA BELOW GRADE	ALL AREA MORE THAN THREE FEE	ΞT
	<u> </u>		805.38	sq. ft.
7. OPAQUE[1] ABOVE- FOUNDATION WALL AREA (1 2.a 3.)	8. GROSS WALL AREA GRADE (1. + 4.)	ABOVE	9. OPAQUE [1] EXPOSED FOUNE TION WALL AREA (4 2.b.)	DA-
1662.84 - 172.67 - 558.0 =	1662.84 + 124.	62 =	124.62 - 15.65 =	
<u>932.17</u> sq. ft.	,	_ <u>1787.46</u> _sq. f 2.	108.97	_sq. ft.
10. WALL AREA BELOW GRADE (5. + 6.)	11. TOTAL FOUNDATI AREA (4. + 5. + 6.		12. INSULATED ROOF OR CEILIN AREA	IG
558.0 + 805.38 =	124.62 + 558.0	+ 805.38 =		
<u>1363.38</u> sq. ft.		1488.0°sq. ft.		_sq ft.
13. FLOOR AREA OVER UNHEATED SPACES (LESS THAN 50°)	14. SLAB ON GRADE (slab-on-grade be placed outs thermal envelo	ide the	15. BASEMENT FLOOR AREA	
sq. ft.	lineal feet of sl	abperimeter	1500	_sq. ft.

B. CODE-ALLOWED HEAT LOSS

Enter values into table from elsewhere on this worksheel and multiply across by the electric or non-electric code-required U-value. For <u>lines 1 through 5 for walls</u>, complete as follows:

Electrically-heated Homes - Lines 1, 4 & 5.

Non-Electrically Heated Homes - Option A or B.

Option A - Lines 1, 4 & 5 - Suggested if non-foundation and exposed foundation walls are of similar construction. Option B - Lines 2, 3, 4 and 5.

	AREA	REQUIRED U-VALUE			TEMP.	HEAT
COMPONENT	FROM X	NON-ELECTRIC	ELECTRIC		DIFF. + [2]	= LOSS ^{BTU/HR}
1. Gross Wall Above Grade (A.8.)	1787.46	.13	.080		85	12155
2. Gross Above-Foundation Wall (A.1.)		.12	N/A		_	
3.a. Gross Exposed Foundation Wall (A.4.) Max Area of A.4. ÷ A.11. = .25	•	.25	N/A			
b. Gross Exposed Foundation Wall in Excess of Line 3.a.		.12	N/A			
4. Foundation Wall Between Grade And 3 Feet Below Grade (A.5.)	558.0	.11 [3]	.072	[3]	60	2411
5. Foundation Wall More Than Three Feet Below Grade (A.6.)	805.38	.094 [3]	.048	[3]	60	2320
6. Floors Over Unheated Spaces (A. 13.)	0	.09	.055		85	0
7. Roof or Ceiling (A.12.)	1500	.029	.020		85	2550
8. Slab On Grade (A.14.)	0 Lin. ft.	.51 ′F′ [4]	.51 ′F′	[4]	85	0
9. Basement Floor (A.15.)	1500	.025	.025		60	2250
TOTAL CODE - ALLOWED HEAT LOSS						21686

C. SYSTEM DESIGN METHOD - ACTUAL 'U' VALUES OF YOUR HOME

C.1. ABOVE-GRADE COMPONENTS - Enter 'R-values' from Table A-4 of the UDC Appendix, ASHRAE Manual, or manufacturer's specifications. Total them across and then find the 'U' value by taking the reciprocal (1/R) of the total 'R-value'. For components having the same insulation but different interior or exterior finishes, separate calculations are not necessary if the one with the lowest 'R-value' is used in your calculations.

COMPONENT	CAVITY OR SOLID IF APPLI- CABLE	EXT. AIR FILM *	EXT. FINISH	SHEA- THING	INSULA- TION OVER FRAMING	FRAMING, OR SOLID	INSULA- TION OVER CAVITY	INTERIOR FIN- ISH	INT. AIR FILM *	TOTAL 'R- VALUE'	'U' or 1/R
Above-Founda-	Cavity		.81	5.27	0		19	0.45	.68	26 38	0.038
-tion Walls	Solid	.17	.81	5.27	0	6.88		0.45	.68	T	0.070
Exposed	Cavity	.17							.68		
Foundation	Solid	.17			10,54	1.72			.68	13.11	0.076
Roofor	Cavity	.61			36.25		13.75	0.45	.61		0.022
Ceiling	Solid	.61			36.25	6.88		0.45	.61	51.57	0.019
Floor Over Un-	Cavity	.17							.92		
Heated Space	Solid	.17							.92		
			· · ·							+	
				ļ						-	

* Air Film R-Values

		HEAT FLOW DIRECTION	
LOCATION	Upwards	Horizontal	Down.vards
EXTERIOR INTERIOR	.17 .61	.17 .68	.17 .92

C.2. BELOV: GRADE COMPONENTS - Precalculated 'U-values' including air films, wall, inculation and soil. Check box for planned type of construction.

COMPONENT TYPE	GRADE TO THREE FEET BELOW GRADE	MORE THAN THREE FEET BELOW GRADE	
Masonry wall with R-5 insulation board	.113	.063	
Masonry wall with R-10 insulation board or			
R-11 insulation batt and 2x4's	.072	.048	
Basement floor without insulation	.025	.025	
Slab on Grade or within 2 ft of grade		· ·	
without insulation	.81 (F-value) per lineal foot of slab ;	berimater	
☐ Slab on Grade or within 2 ft of grade			
with R-10 insulation board for 48" total		<u> </u>	
horizontal and vertical application	.51 F-value) per lineal foot of slab perimeter		
Other (describe)	Claimed U-value:	Claimed U-value:	

C.3. WINDOWS AND DOORS - See Tables A-5 and A-6 of UDC Appendix for U-values.

D. SYSTEM DESIGN METHOD - CALCULATED ENVELOPE HEAT LOSS OF YOUR HOME

Enter values into table from elsewhere on this worksheet and multiply across to find the actual heat loss of each component. Add component heat loss figures to find total envelope heat loss.

COMPONENT	CAVITY OR SOLID IF APPLICABLE	AREA FROM X SECT. A.	WOOD FRAME FACTOR **	ACTUAL (´U' VALUE X FROM SECT. C.	TEMP. DIFF. [2]	HEAT LOSS BTU/HR
Opaque Above-Foundation	Cavity	932.17	.90	0.038		2710
Wall (A. 7.)	Solid		.10	0.070	85	555
Opague Exposed Foundation Wall (A. 9.)	·····	108.97		0,076	85	704
Foundation Between Grade and Three Feet Below Grade (A. 5.)		- 558.0		0.072	60	2411
Foundation Wall More Than Three Feet Below Grade (A. 6.)		805.38		0.048	60	2319
Windows (A. 2. a. + b.)		188.32		0.370	85	5923
Doors (A.3.)		37.92		0.320	85	1029
Roof or Ceiling	Cavity	1500.0	.93	0.019	85	2253
(A. 12.)	Solid	1500.0	.07	0.023		705
Floor Over ! 'nhested	Cavity			· · · · · ·		
Spaces (A. 13.)	Salid					· · · · · · · · · · · · · · · · · · ·
Basement Floor (A. 15.)						
	······································		•	·		
				· · · · · · · · · · · · · · · · · · ·		
Slab On Grade (A. 14.)		Lin. ft.		F-Val.	· · · · · · · · · · · · · · · · · · ·	
TOTAL CALCULATED ENVELOPE HEAT LOSS - May not exceed Total Code Allowed Heat Loss in Sect. B. by more than 1%					e	18110

** Adjustment Factors For Wood-Framed Components

SPACING OF FRA-	ST	UDS	JOISTS/F	AFTERS
MING MEMBERS	CAVITY	SOLID	CAVITY	SOLID
12″ 15″ 24″	.80 .85 .40	.20 .15 .10	.86 .90 .93	.14 .10 .07

Also see Part C of UDC Appendix Table A-5 for window framing adjustment factors.

E. HEAT LOSS BY AIR INFILTRATION (for furnance sizing)

An air change rate of between 0.25 and 1.00 per hour is recommended depending on tightness of construction.

FLOOR LEVEL	AREA	 Х неіднт ; 	= VOLUME	X CONSTANT	TEMPERA- TURE DIFFERENCE X	AIR CHANGES PER HOUR	HEAT = LOSS BTU/HR
Basement	1500	8	12000	.018	85	0.5	9180
Level 1	1500	8	12000	.018	85	0.5	9180
Level 2				.018			
Level 3				.018			
	Total Dwelli	ng Volume	24000		INFILTRATION H	IEAT LOSS	18360

F. FURNACE SIZING

his section determines the maximum and minimum furnace size in BTU's/HR.	Minimum	Maximum
System Design Method: Calculated Heat Loss from Sect. D. or		
Accepted Practice Method: Code-Allowed Heat Loss from Sect. B.	18110	
Code-Allowed Heat Loss (from Sect. B.)		21686
Infiltration Heat Loss (from Sect. E.)	+ 18360	+ 18360
TOTAL DWELLING HEAT LOSS (total of above)	36470	40046
Allowable Furnace Size Margin Multiplier	X 1.0	X 1.15
ALLOWABLE FURNACE OUTPUT SIZE RANGE	36470	46053
Planned Furnace Output	40	0,000

G. MECHANICAL VENTILATION SIZING

Required for electrically-heated homes only.

1. Dwelling volume from Sect. E.		24,000
2. Less volume of non-living area; area: (925) X height: (8) =		- 7,400
3. Less volume of dead air spaces (cabinets, walls, etc)		- 2,163
4. Net volume of living area (total of above)	=	14,437
5. Cubic feet of air changed per hour (multiply line 4 by 0.5)	=	7,218.5
6. MINIMUM REQUIRED MECHANICAL VENTILATION IN CFM's (multiply line 5 by 0.0167)	=	120.5

Footnotes:

- [1] Opaque wall area is wall area minus opening areas of door; and windows.
- [2] Temperature Difference = Inside design temperature of 70° minus outside design temperature from Table 22.04-B of the UDC. Basement inside temperature may be taken between 50° and 70°. Temperature difference for transmission heat losses of below-grade spaces of basements is inside temperature minus 10°, disregarding outside temperature.
- [3] These below-grade U-values have the insulating value of the soil added to the code-required U-values which apply to the building materials only. See sect. C.2. for typical insulated component U-values.
- [4] These slab-on-grade F-values are derived from the code-required U-values and include the heat loss through the edge and body of the slab. See sect. C.2.

H. ACCEPTED PRACTICE METHOD

For completion of the accepted practice method, please refer to the Appendix Tables A-I, 2 and 3 and E-I, 2 and 3 of the Uniform Dwelling Code (UDC). Complete Subsection H.1. if your home is heated with other than electricity. Complete Subsection H.2. if your home is electrically heated. Area figures should be calculated in Section A. and are referenced below.

SUBSECTION H.1. Non-Electrically Heated Homes Only

WALLS ABOVE FOUNDATION WALL INCLUDING BOXSILL, USE TABLE A-1	MINIMUM Single w/storm MINIMUM Insulated SIDING: Wood (R77) WINDOW Insulated glass DOORS: Solid Wood Alum. (R1.82) GLAZING: Triple pane Uninsulated w/storm Other: R PLANNED INSULATION PERMITTED WINDOW AND DOOR AREA : %
	Glass & Door Area (A.2.a. + A.3.) \div $X 100\% =$ % Gross Wall Area (A.1.) $\%$ Planned Window (A.1.) and Door Area
EXPOSED FOUNDATION WALL, USE	BASEMENT WINDOWS: Single-glazed OR Single w/storm or insulated glass
TABLE A-2	÷ X 100 % = % Exposed Foundation Area 70 Exposed Foundation
	(A.4) (A.11.) (If over 25% exposed foundation, then exposed foundation area equal to 25% of foundation shall have maximum U-Value of .25 and balance of area shall have maximum U-Value of .12.) Percent Window Area Permitted By Table:%
	÷X 100 % =%Basement Window Area (A.2.b)Exposed Fndtn. Wall Area% Planned Window(A.4.)Area
ROOF OR CEILING, USE TABLE A-3	PLANNED INSULATION TYPE:
	REQUIRED THICKNESS: Inches in cavity (R-38) Inches Over Framing (R-19)
FOUNDATION WALL, GRADE TO	PLANNED INSULATION TYPE AND R-VALUE:
3 FEET DOWN	(MINIMUM R-5 INSULATION)

SUBSECTION H.2. Electrically Heated Homes Only

WALLS ABOVE FOUNDATION INCLUDING BOX-	ALL THESE MEA- IN ALL WINDOWS IN EXPOSED FOUNDATION INSULATED SURES REQUIRED: TRIPLE-GLAZED INSULATED TO R-10.54 TO R-8
SILL, USE TABLES E-1 AND F-2	(172.67 + 15.65) ÷ 1787.46 X 100 % = 10.5 % Total Window Area Above Grade Wall Area % Window Area (A.2.a. + b.) (A.8.)
	108.97÷1787.46X 100 % =6.1%Opaque ExposedAbove-Grade Wall% Opaque ExposedFoundation Area (A.9.)Area (A.8.)Foundation WallRequired Above Foundation Wall U-Value (from Table E-1):0.044
	2 x 6, R 19 Batt, Planned Wall Construction: <u>R 5.27 sheathing</u> U-Value from Table E-2: <u>0.044</u>
KOOF OR CEILING, USE TABLE E-3	PLANNED INSULATION TYPE: Bluwn Fiberglass R-VALUE PERINCH: 2.5 REQUIRED THICKNESS FROM TABLE E-3: 20.0 Inches
FOUNDATION WALL	PLANNED INSULATION TYPE AND R-VALUE: 2" Styrofoam, R = 10.5

TABLE A-1

WALL INSULATION GUIDE

(Based on U₀ requirements above the foundation wall for non-electrically heated dwellings)

	MAXIMUM PERCENT WINDOW AND DOOR AREA ALLOWABLE FOR INSULATION TYPE			
	Uo	= .12		
INSULATION TYPE	⁵% inch Plywood Siding	Backed Aluminum Siding		
R-11 Batt R-11 Batt, R-1.22 Fiberboard R-11 Batt, R-5.27 Extruded Polystyrene R-11 Batt, R-10.54 Extruded Polystyrene	6.8 8.7 12.4 14.9	8.4 9.9 13.0 15.3		
R-13 Batt R-13 Batt, R-1.22 Fiberboard R-13 Batt, R-5.27 Extruded Polystyrene R-13 Batt, R-10.54 Extruded Polystyrene	8.3 10.3 13.1 15.3	9.8 11.2 13.6 15.6		
R-19 Batt R-19 Batt, R-1.22 Fiberboard R-19 Batt, R-5.27 Extruded Polystyrene R-19 Batt, R-10.54 Extruded Polystyrene	11.2 12.3 14.7 16.3	12.2 13.1 15.1 16.6		

Note: The following assumptions were used to derive this table:

1. Door area = 2% of wall and box sill area.

2. Doors are used with a U-value of 0.47.

3. Windows are used with a U-value of 0.56.

4. The insulation type is carried down through the box sill.

TABLE A-2

EXPOSED FOUNDATION INSULATION NON-ELECTRICAL' " HEATED DWELLINGS

			Maximum Percent Window Area		
Foundation Exposure	Requirement	Insulation Type	Single glazed	Double glazed	
Less than 25% of foundation exposed	U ₀ = .25	R-5.27	10.4	24.8	
		R-11 batt	15.5	34.2	
		Multi-cell insul. block (R-12.06)	16.0	35.0	
More than 25% of foundation exposed	U ₀ = .13	R-11 batt	3.9	8.7	
iounanion inposos		R-13 batt	4.8	10.6	
		Multi-cell insul. block (R-12.06)	4.5	9.9	
	$U_0 = .12$	R-11 batt	3.0	6.7	
		R-13 batt	3.9	8.5	
		Multi-cell insul. block (R-12.06)	3.5	7.8	

TABLE A-3

INSULATION LEVELS REQUIRED TO MEET CEILING U VALUES FOR NON-ELECTRICALLY HEATED DWELLINGS

		R-Value Required			
U _o Value	Insulation	In Cavity	Over Framing		
.029	Fiber glass batt Fiber glass blown Rock wool Cellulose	R-38 13.6 in. (R-34) 10.9 in. (R-33) 9.5 in. (R-35)	R-19 8.1 in. (R-20) 5.4 in. (R-16) 4.0 in. (R-15)		

Note: The following assumptions are used:

.

1. Fiber glass blown = R-2.5 per inch

2. Rock wool = R-3.0 per inch

3. Cellulose = R-3.7 per inch

TABLE E-1 - DIRECTIONS FOR USE

Table E-1 was formulated with the following assumptions:

The doors have R-values of at least R-8 and form 2% or less of the above-foundation wall.

door area x 100%, in this case = gross wall area + box sill area

Windows with an R-value of at least 2.7 (triple glazed) are used, including the foundation windows.

The exposed foundation area is insulated to a level of R-10.54.

If these assumptions are not valid for your case, the insulation level may be calculated by the method illustrated following Tables E-1 and E-2.

TABLE E-1

MAXIMUM ABOVE FOUNDATION WALL U-VALUES FOR ELECTRICALLY HEATED HOMES PERCENT WINDOW AREA

							~ 0						
		5	6	7	8	9	10	11	12	13	14	15	16
	0	.065	.062	.059	.056	.053	.050	.046	.043	.040	.036	.032	.029
	5	.065	.061	.058	.055	.051	.048	.044	.041	.037	.033	.029	.025
	6	.064	.061	.058	.055	.051	.048	.044	.040	.037	.033	.029	.025
PERCENT	7	.064	.061	.058	.054	.051	.047	.044	.040	.036	.032	.029	.020
	8	.064	.061	.057	.054	.050	.047	.043	.039	.035	.031	.023	
	9	.064	.061	.057	.054	.050	.046	.043	.039	.000	.031	.027	
OPAQUE	10	.064	.060	.057	.053	.050	.046	.042	.038	.034	.050	.026	
• • •	11	.064	.060	.057	.053	.049	.046	.042	.038	.034	.030	.025	
	12	.063	.060	.056	.053	.049	.045	.041	.037	.034			
FOUNDA-	13	.063	.060	.056	.052	.049	.045	.041	.037		.029	.025	
oonon-	14	.063	.059	.056	.052	.043	.045			.033	,028		
	15	.063	.059	.055	.052	.048		.040	.036	.032	.027		
TION	16	.063	.059	.055	.052		.044	.040	.036	.031	:21		
100	17	.062	.059			.047	.043	.039	.035	.031	026		
	18	.062		.055	.051	.047	.043	.039	.034	.030	.025		
AREA			.058	.055	.051	.047	.042	.038	.034	.029			
ARCA	19	.062	.058	.054	.050	.046	.042	.037	.033	.028			
	20	.062	.058	.054	.050	.046	.041	.037	.032	.028			
	21	.061	.057	.053	.049	.045	.041	.036	.032	.027			
	22	.061	.057	.053	.019	.045	.040	.036	.031	.026			
	23	.061	.057	.053	.048	.044	.040	.035	.030	.025			
	24	.061	.057	.052	.048	.044	.039	.034	.029				
	25	.060	.056	.052	.048	.043	.038	.034	.029				

Insulation Type	2 × 4 FRAMING 16" O.C.'	2 × 5 57, AMING 16" O.U.	24" 0.C.2	Double 2 × 4 or 2 × 8 FRAMING 24" O.C.
R-11 Batt R-11 Batt, R1.22 Fiberboard R-11 Batt, R5.27 Polystyrene R-11 Batt, R10.54 Polystyrene R-11 Batt, R7.21 Isocyanurate R-11 Batt, R14.4 Isocyanurate	0.091 0.081 0.060 0.045 0.054 0.038			
R-13 Batt R-13 Batt, R1.22 Fiberboard R-13 Batt, R5.27 Polystyrene R-13 Batt, R10.54 Polystyrene R-13 Batt, R7.21 Isocyanurate R-13 Batt, R14.4 Isocyanurate	0.083 0.074 0.056 0.043 0.050 0.036			
R-19 Batt R-19 Batt, R1.22 Fiberboard R-19 Batt, R5.27 Polystyrene R-19 Batt, R10.54 Polystyrene R-19 Batt, R7.21 Isocyanurate R-19 Batt, R14.4 Isocyanurate		0.060 0.055 0.044 0.036 0.040 0.031	0.058 0.053 0.043 0.035 0.039 0.030	0.056 0.052 0.042 0.034 0.039 0.030
Fwo R-11 Batts Fwo R-11 Batts, R1.22 Fiberboard				0.053 0.049
Fwo R-11 Batts, R5.27 Polystyrene				0.040
I'wo R-11 Batts, R10.54 Polystyrene				0.033
'wo R-11 Batts, R7.21 Isocyanurate 'wo R-11 Batts, R14.4 Isocyanurate				0.029
Two R-13 Batts Two R-13 Batts, R1.22 Fiberboard				0.048 0.045
'wo R-13 Batts, R5.27 Polystyrene				0.037
wo R-13 Batts, R10.54 Polystyrene				0.030
(wo R-13 Batts, R7.21 Isocyanurate				0.034
Fwo R-13 Batts, R14.4 Isocyanurate				0.027

TABLE E-2 FRAME WALL & BOX SILL U-VALUES FROM DIFFERENT BUILDING MATERIALS AND METHODS

¹ Assumes 20% framing, 80% cavity. ² Assumes 17% framing, 83% cavity.

MANUAL CALCULA.ION METHOD

To calculate the required wall U-value without using Tables E-1 and E-2, use the method outlined below:

Step 1: Calculate the above grade wall composition.

```
% Window area = 10.53%
% Door area = 2.12%
% Opaque foundation area = 6.10%
% Opaque wall & box sill area = 82.25%
```

Step 2: Use the following formula to calculate the maximum allowable U-value for the opaque wall and box sill.

$$\frac{Uo - (Uw \times \%w) - (Ud \times \%d) - Uf \times \%f)}{\%wall} = Uwall$$

Where:

Uo	= Required overall above grade wail U-value, use 0.080 for an electrically heated home
U _W	= The U-value of the windows (= 1/R-value)
%₩	= The fraction of window area calculated in Step 1
Ud	= The U-value of the doors (= 1/R-value)
%d	= The fraction of door area calculated in Step 1
^U f	= The U-Value of the insulated foundation
[%] f	= The fraction of exposed foundation calculated in Step 1
[%] wa]]	= The fraction of opaque wall and box sill area as calculated in Step 1
U _{wall}	= The maximum U-value of the opaque

In our example:

The window R-value = R-2.78U = 1/2.78 = 0.341The door R-value = R-8.85U = 1/8.85 = 0.113The foundation R-value = R-12.4U - 1/12.4 = 0.080

 $U_{wall} = \frac{0.080 - (0.341 \times 0.1053) - (0.113 \times 0.0212) - (0.080 \times 0.0610)}{0.8225} = 0.045$

In this case, the maximum U-value of the opaque wall and box sill is 0.045 Btu/hr. sq. ft. °F. For compliance, the insulation which is installed in the wall and box sill must provide a U-value which is less than or equal to 0.045. Table E-3 shows the U-values obtainable from different insulation materials and framing types.

TABLE E-3 - DIRECTIONS FOR USE

Table E-3 gives the amount of installed insulation which would be necessary to achieve a required U-value in the ceiling or attic.

Table E-3 was formulated with the following assumptions:

- The loose fill insulation, if used is installed to provide the following R-values: Cellulose R = 3.7/inExpanded perlite R = 2.7/inMineral Fiber (rock, slag, or glass) R = 3.3/inPolystyrene beads R = 2.9/inFiber glass, blown R = 2.5/in
- The insulated area is 90% cavity and 10% 2 x 6 framing
- There are no skylights in the ceiling/attic assembly
- The R-value of the ceiling finish materials plus air films is R-1.2
- The attic hatch is insulated to the same level as the rest of the attic floor, if it is a part of the thermal envelope.

If these assumptions are not valid for your case, you may calculate the required U-value as shown after Table E-3.

Dwelling Fuel Tyl:9	Uo	Insulation Type	Amount Required In Cavity Depth (R-Value)
Electrically Heated	0.020	Fiber glass Batts Cellulose Expanded Pearlite Mineral Fiber Polystyrene Beads Blown Fiber glass	R-54 14.1 in. (R-52) 18.6 in. (R-50) 15.6 in. (R-51) 17.5 in. (R-52) 20.0 in. (R-50)

TABLE E-3 INSULATION LEVELS REQUIRED TO MEET CEILING U₀ VALUES

MANUAL CALCULATION METHOD

To calculate the required ceiling insulation level for ceiling/attic assemblies, use the following method.

Step 1: Calculate the required U-value for the attic floor, U_F , with the following formula.

UF

UF

$$= \frac{UoAo - USAS - UhAh}{AF}$$

Where:

- = The required U-value for the attic floor
- U_0 = The overall U-value set by the code, use 0.020 for an electrically heated dwelling
- A₀ = The overall attic/ceiling area including the attic floor, any skylights and the attic hatch or access panel.
- U_s = The U-value of the skylights including the frame
- A_s = The area of skylights, including the frame (if there are no skylights, set equal to zero)

$$U_h$$
 = The U-value γ the attic hatch or access panel

- The area of the attic hatch or access panel (If the hatch is to be insulated to the same level as the attic floor, add the area to the floor area, AF, and set Ah equal to zero. If the attic hatch or access panel is not a part of the thermal envelope, set Ah equal to zero.)
- AF

Ah

The area of the insulated attic floor, equal to the overall attic/ceiling area minus the attic hatch and skylight areas, if any.

Example: For the attic of an electrically heated dwelling with an overall attic area of 1500 sq. ft. The attic hatch is 14" x 24" and is to be insulated with two R-19 fiber glass batts, the rest of the attic is to be insulated with blown mineral fiber with an R-value of 3.3-R/inch. There are two skylights, each 6 square feet with R-values of 1.8.

The R-value of the attic hatch is the sum of the R-values of the batts plus R-2 for the finish materials and air films.

R = 19 + 19 + 2 = 40

The U-value of the hatch is $U_H = 1/40 = 0.025$

The U-value of the skylights $U_S = 1/1.8 = 0.56$

The area of the hatch = 2 ft x 1.17 ft = 2.3 sq. ft.

The area of the skylights is 12 square feet

The area of the floor is 1500 - 12 - 2.3 = 1486 sq. ft.

$$U_{\rm F} = \frac{(0.020)(1500) - (0.56)(12) - (0.025)(2.3)}{1486} = 0.0156$$

Step #2: To calculate the amount of insulation needed over the framing and cavity areas, d, of the attic floor use the following formula:

$$d = \frac{1}{U_F (R/in)} - \frac{(RW/in)h}{(%C)(RW/in) + (\%W)(R/in)} - \frac{Rfin}{(R/in)} + h$$

Where:

d =	depth of insulation at cavity in inches
UF =	required U-value of floor calculated in Step #1
R/in =	R-value per inch of insulating material obtained from manufacturer or Table A4
h =	height of framing, 5-1/2" for 2 x 6 framing or 7-1/4" for 2 x 3 framing, for example.
.%C =	fraction of floor which is cavity (usually assume 0.9)
%w =	fraction of floor which is framing (usually assume .1)
RW/in =	R-value per inch of wood framing (usually assume 1.25 R/inch)
R _{fin} =	R-value of interior ceiling finish materials, including air films (usually assume R-1.2)

$$d = \frac{1}{(0.0156)(3.3)} + 5.5 - \frac{(1.25)(5.5)}{(0.9)(1.25) + (0.1)(3.3)} - \frac{1.2}{3.3} = 19.59 \text{ inches}$$

The floor of the attic is to be covered with insulation so that the depth in the cavities is equal to 19.59 inches.

-65-

1

COMMON CONSTRUCTION MATERIAL R-VALUES*

Material .	Description	Density (lb per	Per inch thickness	For thick- ness listed
	· · · ·	cu ft)	R-Value	R-Value
BUILDING	Asbestos-cement board	120	0.25	· • · • •
BOARD Boards, panels,	Asbestos-cement board % in.	120	—	0.03
subflooring,	Asbestos-cement	100		
sheathing, woodbased panel	board ¼ in. Gypsum or plaster	120		0.06
products	board	50		0.32
	board	50		0.45
	Plywood ½ in.	34 34	1.25	0.31
	Plywood	34	_	0.47
	Plywood	34		0.62
	panels	34	<u> </u>	0.93
	Insulating board Sheathing, reg.			
	density ½ in.	18		1.32
	25/32 in.	18		2.06
	Sheathing, intermediate density	22		1.22
	Nail-base	05		
	sheathing	25 18	-	$1.14 \\ 0.94$
	Shingle backer 5/16 in.	18		0.78
	Sound deadening board ½ in.	15		1.35
	Tile and lay-in panels,		0	
	plain or acoustic	18 18	2.50	1.25
		18		1.89
	Laminated paperboard	30	2.00	—
	repulsed paper	30	2.00	
	Harchord			
	Medium densily siding	40		0.67
	Other medium density	50	1.37	
	High density, underlay	55 63	1.22 1.00	
	Particleboard			
	Low density Medium density	37 50	1.85 1.06	
	High density	62.5	0.85	
	Underlayment % in.	40		0.82
	Wood subfloor X in.			0.94
BUILDING PAPER	Vapor-permeable felt	-	-	0.06
raren	Vapor-seal, 2 layers of mopped 15 lb. felt			0.12
	Vapor-seal, plastic film			Negl.
ROOF	Preformed, for use above deck			
TABULATION	Approximately ½ in. Approximately 1 in.			1.39 2,78
	Approximately 1¼ in			4.17
	Approximately 2 in.			5.56
	Approximately 2½ in. Approximately 3 in.		<u> </u>	6.67 8.33
	Cellular glass		2.50	
MASONRY	Cement mortar	116	0.20	
MATERIALS	Gypsum-fiber concrete			
Concrete	87½% gypsum, 12½% wood chips		0.60	·
	Lightweight aggregates	120	0.19	
	including expanded shale, clay or slate, expanded	100 80	0.28 0.40	· ·
	slags; cinders; pumice;	60	0.59	_
	vermiculite; also cellular	40 30	0.86 1.11	
	concretes	20	1.11	
	Perlite	. 40	1.08	—
	******		1.41 2.00	
	Sand and gravel or ston	e		
	aggregate (oven dried)	. 140	0.11	—
	Sand and gravel or ston aggregate (not dried)		0.08	• 🗕
	Stucco		0.20	

Material	Description	Density (lb per . cu (t)	Per inch thickness R-Value	For thick- ness listed R-Value
MASONRY	Brick, common	120	0.20	
UNITS	Brick, face	120	0.11	_
	Clay tile, hollow:			•
	1 cell deep 3 in.			0.80
	1 cell deep 4 in.			1 50
	2 ceils deep 6 in. 2 cells deep 8 in.			1.52 1.85
	2 cells deep 10 in.			2.22
	3 cells deep 12 in.			2.50
	Concrete blocks, 3 oval core:			
	Sand & gravel			0.71
	aggregate 4 in. 8 in.			$\begin{array}{c} 0.71 \\ 1.11 \end{array}$
	12 in.			1.28
	Cinder aggregate 3 in.		-	0.86
	4 in.		_	1.11
	8 in.			1.72
	Lightweight 12 in. Lightweight 3 in.			1.89 1.27
	aggregate(expanded 4 in.		_	1.50
	shale, clay, slate 8 in.			2.00
	or slag; pumice) 12 in.		<u> </u>	2.27
	Concrete blocks, rectangular	•		
	core			
	Sand & gravel aggregate			
				1.04
	2 core, 8" 36 lb	-	-	1.04
	Same with filled cores Lightweight	-	,-	1.93
	5 5		:	
	aggregate (expanded shale, clay,		i	
	slate or slag,			
	pumice):			
	3 core, 6" 19 lb		-	1.65
	Same with filled			
	cores		-	9ر
	2 core, 8" 24 1b		-	2.18
	Same with filled			
	cores		-	5.03
	3 core, 12" 38 1b	•• -	-	2.48
	Same with filled			5
	cores		-	5.82
	Stone, lime or sand		0.08	-
	Gypsum partition tile:			1 76
	3 x 12 x 30 in. solid 3 x 12 x 30 in. 4-cell.		-	1.26
	4 x 12 x 30 inc. 3-cell		-	1.55
	4 X 12 X 30 Inc. 3-ceri	•• -	-	1.07
PLASTERING	Coment plaster cond			
MATERIALS	Cement plaster, sand aggregate	. 116	0.20	
MINI MUTIN	Sand aggregate % i			0.08
	Sand aggregate % i	n	••	0.15
	Gypsum plaster:			
	Lightweight	n. 45		0.32
	aggregate ½ i Lightweight	n. 40	_	0.34
	aggregate	n. 45		0.39
	Lightweight			
	aggregate on			
	metal lath ¾ i		0.07	0.47
	Perlite aggregate	45 105	0.67 0 18	_
	Sand aggregate Sand aggregate ½ i		~ ~ ~	0.09
	Sand aggregate % i			0.11
	Sand aggregate on			
	metal lath		0.59	H 1
	Vermiculite aggregate	40	0.09	
ROOFING	Asbestos-cement shingles	120		0.21
	Asphalt roll roofing	70	_	0.15
	Asphalt shingles	70	_	0.44
	Built-up roofing X		_	0.33 0.05
	Slate			0.00

	Material	Description	Density (lb per cu (t)	Per inch thickness R-Value	For thick- ness listed R-Value
	SIDING	Shingles:			
	MATERIALS	Asbestos-cement	120		0.21 0.87
	(On flat surface)	Wood, double, 16" 12"			
		exposure Wood, plus insu-			1.19
		lating backer			• . •
		board 5/16 in. Siding:			1.40
		Asbestos-cement, ½" lapped	_		0.21
		Asphalt roll siding Asphalt insulating siding (%"	<u> </u>		0.15
		bd.)	_	—	1.46
		Wood drop 1 x 8" Wood bevel, ½" x 8"	_	_	0.79
		lapped			0.81
		Wood bevel, ½ x 10" lapped	_		1.05
		Wood plywood %" lapped			0.59
		Aluminum or steel, over sheathing, hollow-backed			0.61
		Insulating-board backed		-	
		nominal ¾" Insulating-board backed			1.82
		nominal 🕉 foil backed			2.96
		Architectural glass			0.10
	FINISH	Carpet and fibrous pad		_	2.08
	FLOORING MATERIALS	Carpet and rubber pad Cork tile			1.23 0.28
		Terrazzo l in	. <u> </u>		0.08
		Tile-asphalt, linoleum, vinyl, rubber			0.05
		Wood, hardwood			
		6nish ¾ in			0.08
	INSULATING MATERIALS Blanket and batt				
		Approx. 2 to 2%" Note 1 Approx. 3 to 3%" Note 1			$\frac{7}{11}$
		Approx. 5½ to			
	•	6¼" Note :	. —	. —	19
	<u></u>	······································	0	2 50	
ard and		lar glass fiber, organic bonded		2.50 4.00	-
		ded rubber (rigid)		4.55	-
	Expan	ded polystyre	ne	4 .00	
	extru Expan	ded, plain ded polystyren		4.00	· •
		ded (R-12 exp.)		5.00	-
	Expan	ded polystyre	ne		
	extru (Thic	ded (R-12 exp kness 1" and greater)	., 3.5	5.26	_
	1.000				
	Expan	ded polystyrene,	_		
	molde	d beads		3.57	-
	molde Expan	d beads ded polyurethane (R-	11	3.57 6.25	-
	molde Expan exp.) Polyu	d beads ded polyurethane (R- rethane, foamed in place.	11 1.5 2.4	6.25 7.8	- -
	molde Expan exp.) Polyu Miner	d beads ded polyurethane (R- rethane, foamed in place. al fiber with resin binder	11 1.5 2.4	6.25	- - -
	molde Expan exp.) Polyu Miner Miner	d beads ded polyurethane (R- rethane, foamed in place.	11 1.5 2.4 15	6.25 7.8	-
	molde Expan exp.) Polyu Miner Miner Cor Aco	d beads ded polyurethane (R- rethane, foamed in place. al fiber with resin binden al fiberboard wet felted e or roof insulation ustical tile	11 1.5 2.4 15 16-17 18	6.25 7.8 3.45 2.94 2.86	-
·	molde Expan exp.) Polyu Miner Miner Cor Aco Aco	d beads ded polyurethane (R- rethane, foamed in place. al fiber with resin binden al fiberboard wet felted e or roof insulation ustical tile	11 1.5 2.4 15 16-17 18	6.25 7.8 3.45 2.94	-
	molde Expan exp.) Polyu Miner Miner Cor Aco Aco	d beads ded polyurethane (R- rethane, foamed in place. al fiber with resin binden al fiberboard wet felted e or roof insulation ustical tile	11 1.5 2.4 15 16-17 18	6.25 7.8 3.45 2.94 2.86	-
	molde Expan exp.) Polyu Miner Miner Cor Aco Aco Miner Aco Wood	d beads ded polyurethane (R- rethane, foamed in place. al fiber with resin binden al fiberboard wet felted e or roof insulation ustical tile al fiberboard wet molded ustical tile or cane fiberboard	11 1.5 2.4 15 16-17 18 21 23	6.25 7.8 3.45 2.94 2.86 2.70	
	molde Expan exp.) Polyu Miner Cor Aco Aco Miner Aco Wood Aco	d beads ded polyurethane (R- rethane, foamed in place. al fiber with resin binden al fiberboard wet felted e or roof insulation ustical tile ustical tile al fiberboard wet molded ustical tile or cane fiberboard ustical tile	11 1.5 2.4 15 16-17 18 21 23 1	6.25 7.8 3.45 2.94 2.86 2.70	- - - - - - - - - - - - - - - - - - -
	molde Expan exp.) Polyu Miner Miner Aco Aco Wood Aco Aco	d beads ded polyurethane (R- rethane, foamed in place. al fiber with resin binden al fiberboard wet felted e or roof insulation ustical tile al fiberboard wet molded ustical tile or cane fiberboard	11 1.5 2.4 15 16-17 18 21 23 	6.25 7.8 3.45 2.94 2.86 2.70	- - - - - - 1.25 1.89 -
	molde Expan exp.) Polyu Miner Cor Aco Aco Wood Aco Inter Insul	d beads	11 1.5 2.4 15 16-17 18 21 23 1 15	6.25 7.8 3.45 2.94 2.86 2.70 2.38 -	1.89
	molde Expan exp.) Polyu Miner Cor Aco Aco Miner Aco Vood Aco Aco Inter Insul App	d beads ded polyurethane (R- rethane, foamed in place. al fiber with resin binden al fiberboard wet felted e or roof insulation ustical tile al fiberboard wet molded ustical tile1/2 in ustical tile	11 1.5 2.4 15 16-17 18 21 23 23 15 15	6.25 7.8 3.45 2.94 2.86 2.70 2.38 -	1.89 - 4.17
	molde Expan exp.) Polyu Miner Cor Aco Aco Miner Aco Wood Aco Inter Insul App App	d beads	11 1.5 2.4 15 16-17 18 21 23 15 15	6.25 7.8 3.45 2.94 2.86 2.70 2.38 - 2.86 -	1.89
	molde Expan exp.) Polyu Miner Cor Aco Aco Miner Aco Wood Aco Inter Insul App App App Wood	d beads ded polyurethane (R- rethane, foamed in place. al fiber with resin binden al fiberboard wet felted e or roof insulation ustical tile ustical tile ustical tile or cane fiberboard ustical tile ior finish (plank, tile) ating roof deck roximately irroximately	11 1.5 2.4 15 16-17 18 21 23 15 15 15	6.25 7.8 3.45 2.94 2.86 2.70 2.38 - 2.86 - - - -	1.89 - 4.17 5.56
	molde Expan exp.) Polyu Miner Cor Aco Aco Niner Aco Wood Aco Inter Insul App App App Wood pre	d beads ded polyurethane (R- rethane, foamed in place. al fiber with resin binden al fiberboard wet felted e or roof insulation ustical tile al fiberboard wet molded ustical tile ustical tile ior cane fiberboard ustical tile ior finish (plank, tile). ating roof deck roximately inroximately	11 1.5 2.4 15 16-17 18 21 23 15 15 15	6.25 7.8 3.45 2.94 2.86 2.70 2.38 - 2.86 -	1.89 - 4.17 5.56
	molde Expan exp.) Polyu Miner Miner Cor Aco Aco Wood Aco Inter Insul App App App Wood pre Foil	d beads ded polyurethane (R- rethane, foamed in place. al fiber with resin binden al fiberboard wet felted e or roof insulation ustical tile ustical tile ustical tile or cane fiberboard ustical tile ior finish (plank, tile) ating roof deck roximately irroximately	11 1.5 2.4 15 16-17 18 21 23 15 15 15	6.25 7.8 3.45 2.94 2.86 2.70 2.38 - 2.86 - - - -	1.89 - 4.17 5.56
	molde Expan exp.) Polyu Miner Cor Aco Aco Wood Aco Inter Insul App App App Wood pre Foil rei	d beads	11 1.5 2.4 15 16-17 18 21 23 1 15 15 15 15 22 2	6.25 7.8 3.45 2.94 2.86 2.70 2.38 - 2.86 - - - -	1.89 - 4.17 5.56 8.33 -
	molde Expan exp.) Polyu Miner Cor Aco Aco Nodd Aco Aco Aco Aco Inter Insul App App App Wood pre Foil rei pol	d beads ded polyurethane (R- rethane, foamed in place. al fiber with resin binden al fiberboard wet felted e or roof insulation ustical tile al fiberboard wet molded ustical tile ustical tile ior cane fiberboard ustical tile ior finish (plank, tile) ating roof deck roximatelyl/2 in roximately shredded (cemented in formed slabs)	11 1.5 2.4 15 16-17 18 21 23 15 15 15 22 22 2	6.25 7.8 3.45 2.94 2.86 2.70 2.38 - - - - 1.67	1.89 - 4.17 5.56

Material	Description	Density (It ver cu (t)	Per inch thickness R-Value	For thick- ness listed R-Value
oose Fill	Cellulose insulation (milled paper or wood		· · · · · ·	•
	pulp)	2.5-3	3.70	-
	Sawdust or shavings	0.8-1.5	2.22	- ;
	Wood fiber, softwoods	2.0-3.5	3.33	
	Perlite, expanded Mineral fiber (rock, slag or glass): Approximately	5.0-8.0	2.70	- '
	3 3/4 to 5 inNote 1 Approximately	0.6-2.0	-	้าา
	6 1/2 to 8 3/4 inNote 1 Approximately	0.6-2.0	-	19
	7 1/2 to 10 inNote 1 Approximately	0.6-2.0		22
	10 1/4 to 13 3/4 in.Note 1		-	30
	Silica aerogell		5.88	-
	Vermiculite (expanded)		2.13	-
	•••••	4.0-6.0	2.27	-
0DS	Maples, oak and similar hardwoods	45	0.91	-
	Fir, pine, and similar			
	-ofiwoods	10	1.25	-
	similar softwoods3/4 in	32	-	0.94
	1 1/2 in	32	-	1.89
	2 1/2 in		-	3.12
	3 1/2 in		-	4.35
	5 1/2 in	32	+	6.90

Note 1: R-value varies with fiber diameter. Insulation is produced by different densities; therefore, there is a wide variation in thickness for the same R-value between various manufacturers. (See Batt and Loose Fill Insulation.)

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TABLE A-5

COEFFICIENTS OF TRANSMISSION (U) OF WINDOWS, SKYLIGHTS, AND LIGHT TRANSMITTING PARTITIONS*

(These values are for heat transfer from air to air.) Btu per (hr) (sq ft) (F Deg)

PART A VERTICAL PANELS (EXTERIOR WINDOWS, SLIDING PATIO DOORS AND PARTITIONS) -- FLAT GLASS, GLASS BLOCK AND PLASTIC SHEET

				_
	Ex	terior ¹		
Description	Winter	Summer	Interior	
				_
Flat Glass				
single glass	1.13	1.06	0.73	
insulating glassdouble ²				
3/16 in. air space	0.69	0.64	0.51	
¼ in. zir space	0.65	0.61	0.49	
½ in. air space	0.58	0.56	0.46	
½ in. air space, low				
emissivity coating ³				
emissivity $= 0.20$	ა.38	0.36	0.32	
emissivity = 0.40	45	0.44	0.38	
emissivity = 0.60	0.52	0.50	0.42	
insulating glass-triple ²				
¼ in. air spaces	0.47	0.45	0.38	
% I. al spaces	0.36	0.35	0.30	
storin windows				
1 in4 in. air space	0.56	0.54	0.44	
Glass Block ⁴				
$6 \times 6 \times 4$ in. thick	0.60	0.57	0.46	
8 x 8 x 4 in. thick	0.56	0.54	0.44	
 —with cavity divider 	0.48	0.46	0.38	
$12 \times 12 \times 4$ in. thick	0.52	0.50	0.41	
-with cavity divider	0.44	0.42	0.36	
$12 \times 12 \times 2$ in. thick	0.60	0.57	0.46	
Single Plastic Sheet	1.09	1.00	0.70	

¹See Part C for adjustment for various window and sliding patio door types. ²Double and triple refer to the number of lights of glass. ³Coating on either glass surface facing air space; all other glass surfaces un-coated. ⁴Dimensions are nominal.

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PART B
HORIZONTAL PANELS (SKYLIGHTS)
FLAT GLASS, GLASS BLOCK AND PLASTIC BUBBLES

.70-

	Ext	erior ¹	
Description	Winter ⁵	Summer ^s	Interior ^s
Flat Glass			
single glass	1.22	0.83	0.96
insulating glass-double ²			
3/16 in. air space	0.75	0.49	0.62
¼ in. air space	0.70	· 0.46	0.59
½ in. air space	0.66	0.44	0.56
½ in. air space, low			
emissivity coating ³			
emissivity = 0.20	0.46	0.31	0.39
emissivity = 0.40	0.53	0.36	0.45
emissivity = 0.60	0.60	0.40	0.50
Glass Block ⁴			
$11 \times 11 \times 3$ in. thick with			
cavity divider	0.53	0.35	0.44
$12 \times 12 \times 4$ in. thick with			
cavity divider	0.51	0.34	0.42
Plastic Bubbles ⁷			
single walled	1.15	0.80	
double walled	0.70	0.46	
······			

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For heat flow up. For heat flow down. Eased on area of opening, not total surface area.

(See following page for Part C of this table.)

\sim	PART C
	ADJUSTMENT FACTORS FOR VARIOUS WINDOW AND
	SLIDING PATIO DOOR TYPES
	(Multiply U values in Parts A and B by these factors)

Description	Single Glass	Double or Triple Glass	Storm Windows
Windows		· · ·	
All Glass [®]	1.00	1.00	1.00
Wood Sash-80% Glass	0.90	0.95	0.90
Wood Sash-60% Glass	0.80	0.85	0.80
Metal Sash-80% Glass	1.00	1.20	1.209
Sliding Patio Doors			
Wood Frame	0.95	1.00	
Metal Frame	1.00	1.10	

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Refers to windows with negligible opaque area. Value becomes 1.00 when storm sash is separated from prime window by a thermal break.

TABLE A-6

COEFFICIENTS OF TRANSMISSION (U) FOR SLAB DOORS* Btu per (br) (sq (t) (F Deg)

		Winter			
Thickness ¹	Solid Wood,	With Storm Door		Summer,	
	No Storm Door	Wood	Metal	No Sterm Door	
1 in. 1¼ in. 1¼ in. 2 in.	0.64 0.55 0.49 0.43	0.30 0.28 0.27 0.24	0.39 0.34 0.33 0.29	0.61 0.53 0.47 0.42	
	Steel Door				
1½ in. A ³ B ⁴ C ⁵	0.59 0.19 0.47	=		0.58 0.18 0.46	

'Nominal thickness.

 $^2\mathrm{Values}$ for wood storm doors are for approximately 50% glass; for metal storm doors values apply for any percent of glass.

 $^{3}A = Mineral fiber core (2 lb/cu ft).$

 ^{4}B = Solid urethane foam core ...th thermal break.

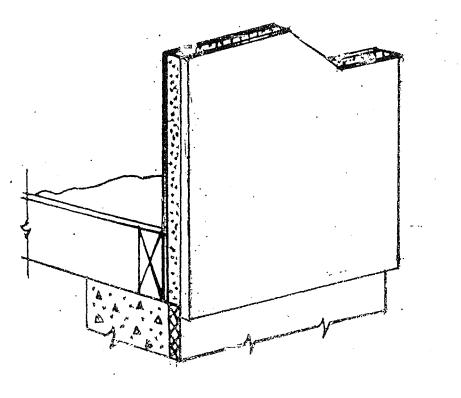
⁵C = Solid polystyrene core with thermal break.

Note: Hollow core doors 1% in. thick - R = 2.17; U = 0.461% in. thick - R = 2.22; U = 0.45

*Reprinted with permission from ... ;HRAE Handbook of Fundamentals.

SECTION 150. Appendix B is repealed.

SECTION 151. An addition is made to Appendix C to read:





Rigid insulation in stress skin panels (Fig. 8) may also be used to insulate walls, ceilings and roofs..

Note to Revisor: The addition is made to the end of the section on "Walls" on pages 214-215.

SECTION 152. An amendment is made in Appendix C to read:

Rigid Insulation

Rigid insulation is available in various sizes and thicknesses made of polystyrene, polyurethane cork, cellular glass, mineral fiber (glass or rock wool), perlite, wood fiberboard, etc. They are used as insulation for masonry construction, as perimeter insulations around concrete slabs, as exterior sheathing under weather barrier, as rigid insulations on top of roof decks, and other applications. Rigid/insulations(/such/as/polystyrene/and polyurethane//are/wapor/barriers/and//in/most/applications//will/most regulre/the/installation/of/a/separate/barrier/

Note to Revisor: Amendment occurs in last paragraph of page 216. SECTION 153. Appendix E is repealed.

(END)

EFFECTIVE DATE

Pursuant to s. 227.22 (2) (intro.), Stats., these rules shall take effect on the first day of the month following publication in the Wisconsin Administrative Register

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State of Wisconsin \ Department of Industry, Labor and Human Relations

November 18, 1988

Gary Poulson Assistant Revisor of Statutes Suite 904 30 West Mifflin Street Madison, Wisconsin 53703 Douglas LaFollette Secretary of State Room 271, GEF-1 201 East Washington Avenue Madison, Wisconsin 53702 Office of the Secretary 201 E. Washington Avenue P.O. Box 7946 Madison, Wisconsin 53707 Telephone 608/266-7552

RECEIVED

NOV 1 8 1988

Revisor of Statutes Bureau

Dear Messrs. Poulson and LaFollette:

TRANSMITTAL OF RULE ADOPTION

CLEARINGHOUSE RULE NO. ____86-210_

RULE NO. Chapters TLHR 20 -25

RELATING TO ______ Uniform Dwelling Code___

Pursuant to section 227.20, Stats., agencies are required to file a certified copy of every rule adopted by the agency with the offices of the Secretary of State and the Revisor of Statutes.

At this time, the following material is being submitted to you:

- 1. Order of Adoption.
- 2. Rules Certificate Form.
- 3. Rules in Final Draft Form.

Pursuant to section 227.114, Stats., a summary of the final regulatory flexibility analysis is also included.

Respectfully submitted,

T. Coughly

John T. Coughlin Secretary

ADM-7239(R.01/87)