
2009 ENERGY TRAINING

Comm. 22 History

- First draft of the energy Code – 1976
- First effective date – June 1, 1978
- First major revision – April 1, 1999
  - First time a computer program was available (for free) to calculate heat loss
  - First standard design package (without filling out form or running computer program
- Major Rewrite of this Chapter
  - New standard design packages
  - Updated RESCheck

Comm. 22 - New Energy Stuff

- New Easy-to-Use Prescriptive tables
- New RESCheck Program
- Manual Forms, HVAC Equipment Company Programs, WISCheck, and *"Rules of Thumbs"* ***All Out -- No Longer an Option !***
- Credits and Benefit Programs
- Geo-thermal, PV, Solar, and *'Magic Stuff'*

A.B.C. Sizing Guide

American Builders and Contractors

INSTRUCTIONS

1. Stand on sidewalk facing residence
   (If no sidewalk is present, then position yourself a minimum of 50 ft but no farther than 200 ft from front of structure)
2. Hold A.B.C. Sizing Guide at arms length and peer through sizing windows
3. Make selection

IMPORTANT NOTICE

For improved accuracy, close one eye when peering thru template

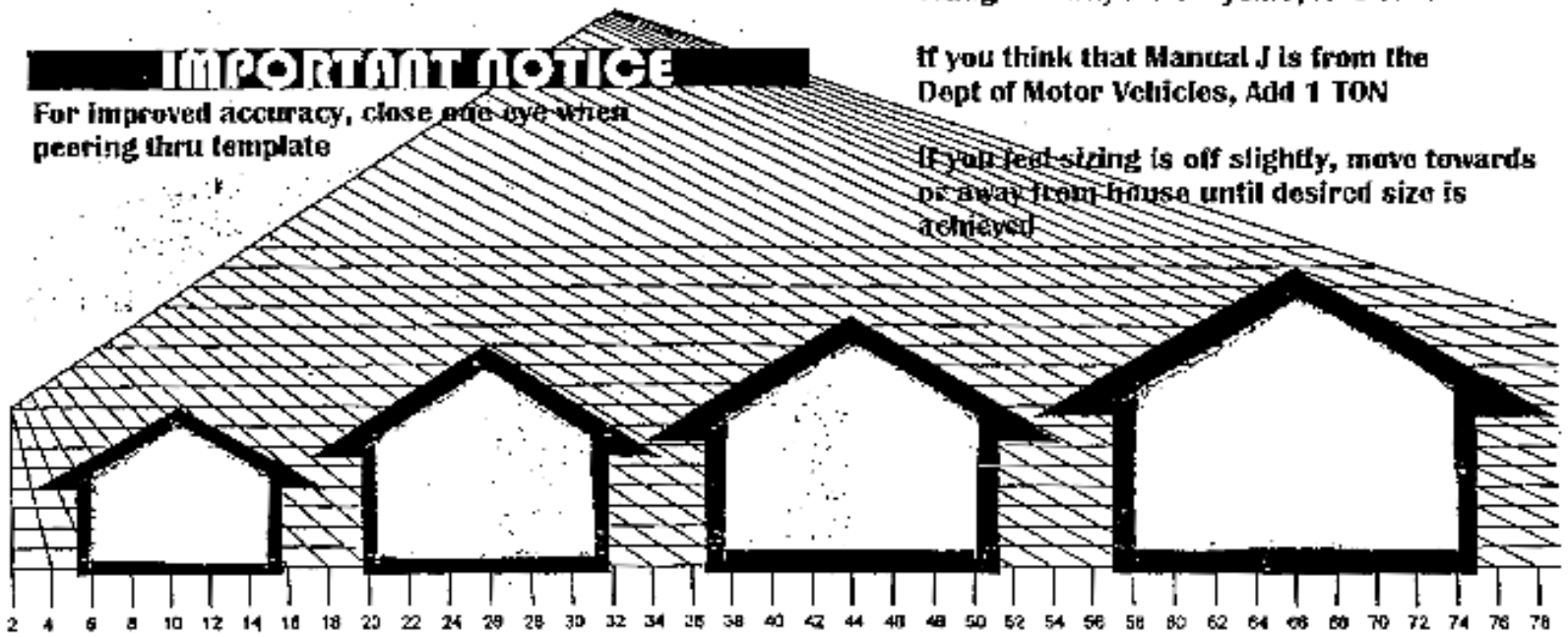
Correction Factors

If you live where it's really, really HOT
Add 1 TON

If your daddy and his daddy have been sizing this way for 50 years, Add 1TON

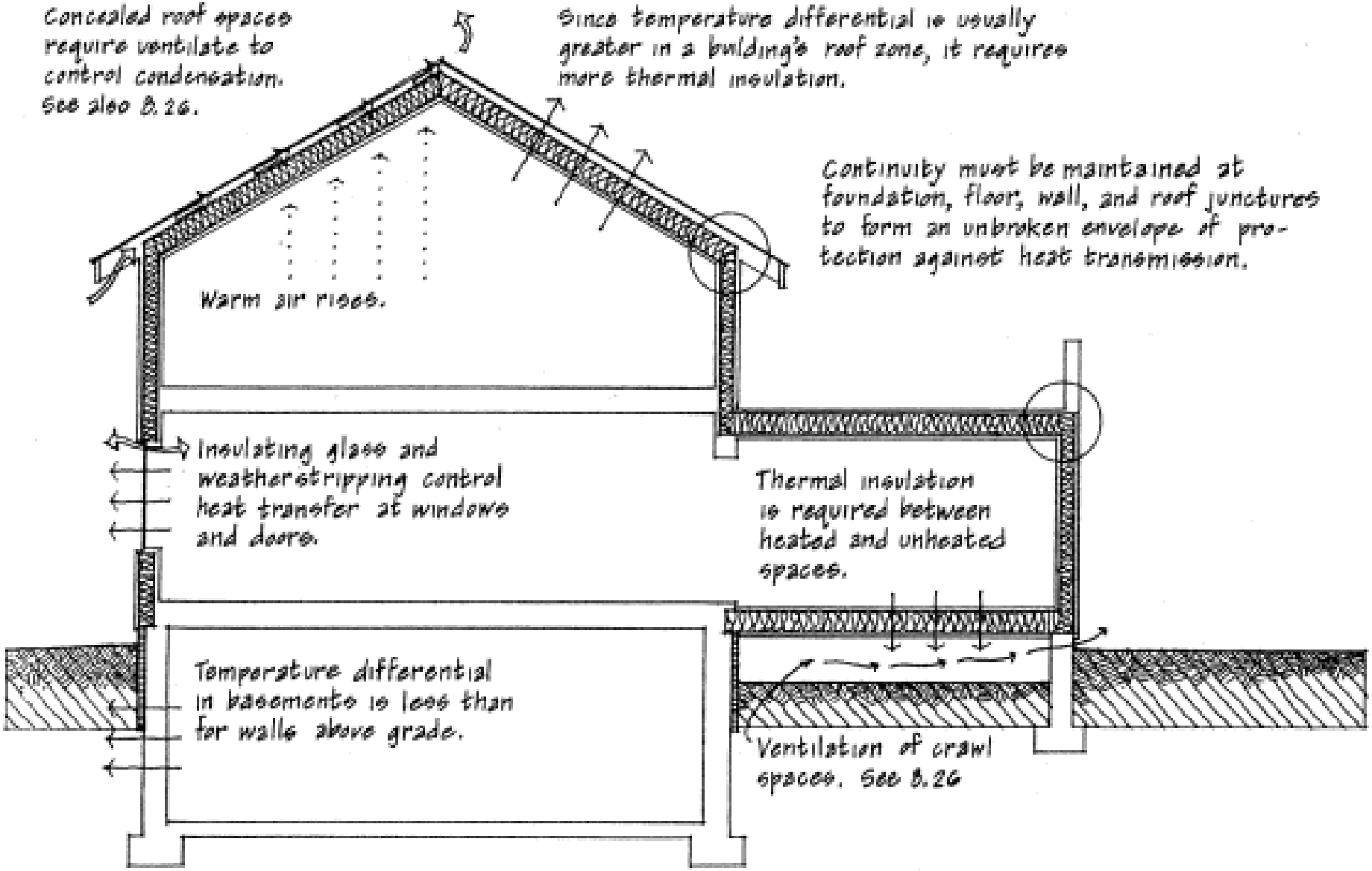
If you think that Manual J is from the Dept of Motor Vehicles, Add 1 TON

If you feel sizing is off slightly, move towards or away from house until desired size is achieved

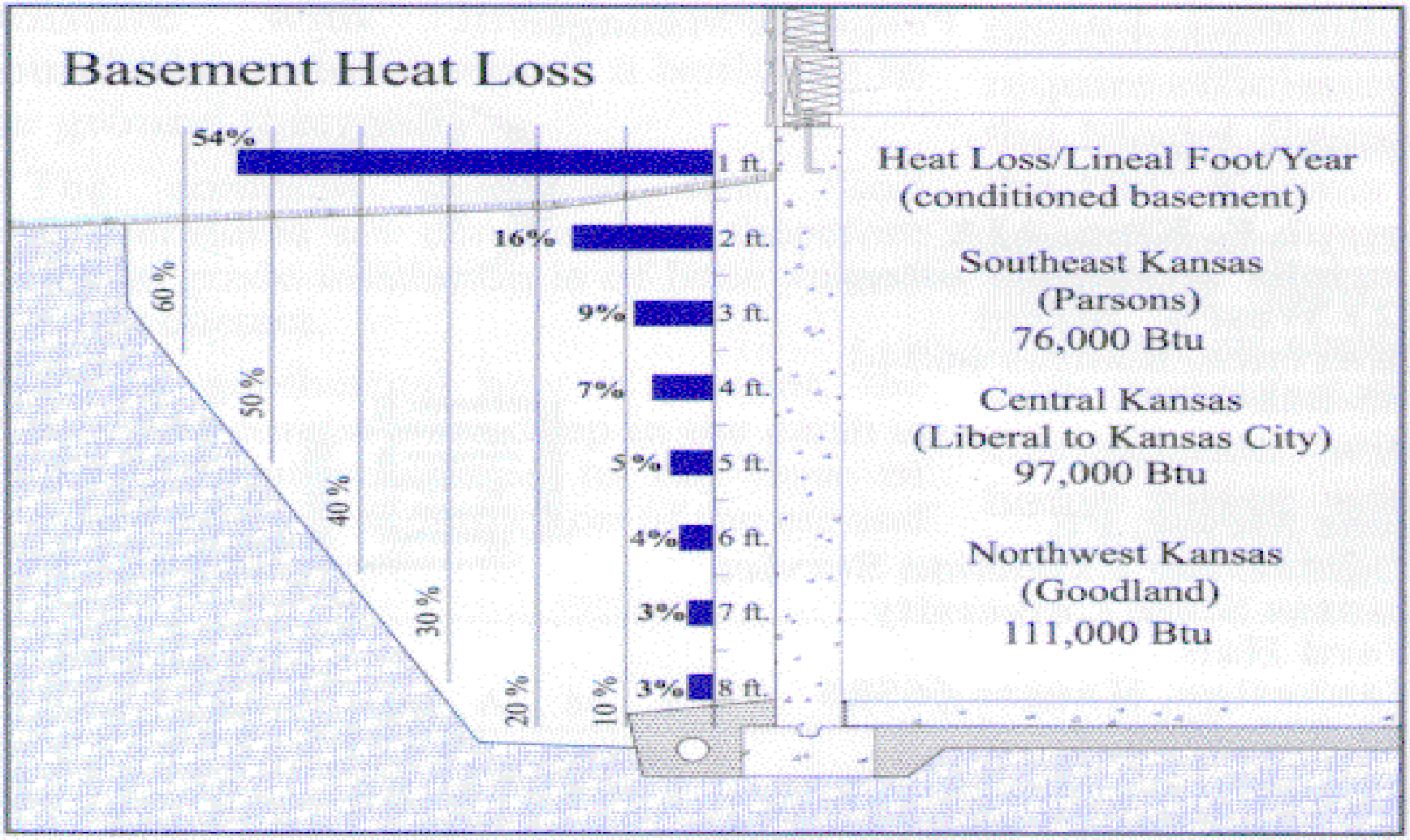


TOTAL P.01

Thermal Resistance in Dwellings



Foundation Heat Loses



Uninsulated Foundations Lose a Lot of Energy

Comm. 22.31 Prescriptive insulation and fenestration criteria

Table 22.31-1
Insulation and Fenestration Requirements by Component [a]

Zone	Fenestration U-Factor	Skylight U-Factor	Ceiling R-Value	Wood Frame Wall R-Value	Mass Wall R-Value	Floor R-Value	Basement or Crawl Space Wall R-Value [b]	Heated Slab R-Value [c]	Frost Protected Slab R-Value [d]
1	0.35	0.60	49[e]	19[f] or 13+5[g]	15	30[h]	10/13	10/15	10
2	0.35	0.60	49[e]	21[f]	19	30[h]	10/13	10/15	10

a. R-values are minimums. U-factors are maximums.

b. The first R-value applies to continuous insulation. The second R-value applies to framing cavity insulation. Either insulation meets the requirement.

c. The first R-value applies under the entire slab, regardless of depth below grade. The second R-value applies to the slab edge.

d. The R-value applies to any slab, the bottom of which is less than 4 feet below adjacent grade. See s. Comm 21.16 for configuration.

e. See s. Comm 22.32 (1) for application and permitted reduced R-value.

f. R-19 and R-21 may be compressed into a 2X6 cavity.

g. "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25% or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25% of the exterior, structural sheathing shall be covered with insulated sheathing of at least R-2.

h. Or insulation sufficient to fill the framing cavity with a minimum of R-19.


NOV 1 2006


Styrofoam
DOW

1 PRODUCT NAME
THERMAX™ Sheathing

2 Manufacturer

The Dow Chemical Company
Building Solutions
200 Larkin
Midland, MI 48674
1-866-583-BLUE (2583)
Fax 1-989-832-1465
www.dowbuildingsolutions.com

3 Product Description

THERMAX™ Sheathing is a non-structural, rigid board insulation consisting of a glass-fiber-reinforced polyisocyanurate foam core laminated between 1.0 mil smooth, reflective aluminum foil facers on both sides. The glass-fiber reinforcement, along with chemical modifications, contributes to improved fire performance and dimensional stability. THERMAX Sheathing can be installed exposed to the interior without a thermal barrier.

BASIC USE

THERMAX™ Sheathing is specially designed to have a Class A fire rating and can be used in a range of concealed and exposed applications, above and below grade. Because of its improved fire performance, THERMAX Sheathing is especially appropriate for hourly rated assemblies. THERMAX Sheathing also has approval in exterior multistory steel stud walls with brick cladding. See IBC Section 2603.5.

SIZES

Width and length:
4' x 8', 4' x 9', 4' x 10'
Edge treatments:
Square edge, shiplap

Product thicknesses and R-values are shown in Table 1. Not all products are available in all parts of the country. Additional product sizes are available by custom order. Consult your Dow representative about other sizes and lead-time requirements.

TABLE 1

THERMAX™ Sheathing R-Values	
Nominal Foam Thickness, in.	Stabilized R-Value[1,2]
0.5	3.3
0.75	5.0
1.0	6.5

4 Technical Data

APPLICABLE STANDARDS

THERMAX™ Sheathing meets ASTM C1289 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board, Type I, Class 2, which includes:

- C203 – Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation
- C209 – Standard Test Methods for Cellulosic Fiber Insulating Board
- C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics
- D2126 – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
- E96 – Standard Test Method

Comm. 22.32 Specific insulation requirements

- CEILINGS WITH ATTIC SPACES = R-38
- CEILINGS WITHOUT ATTIC SPACES = R-49
- MASS WALLS - requirements of table 22.31-1
  - Mass walls that do not meet the specifications under par. (a) for insulation placement shall meet the wood frame wall insulation requirements of table 22.31-1
- STEEL-FRAME CEILINGS, WALLS AND FLOORS - requirements of table 22.32

Steel-Frame Ceiling, Wall & Floor Insulation R-Values

WOOD FRAME *R*-VALUE REQUIREMENT	COLD-FORMED STEEL EQUIVALENT *R*-VALUE [a]
Steel Truss Ceilings [b]	
R-30	R - 38 or R - 30 + 3 or R - 26 + 5
R-38	R - 49 or R - 38 + 3
R-49	R-38+5
Steel Joist Ceilings [b]	
R-30	R - 38 in 2 x 4 or 2 x 6 or 2 x 8 R - 49 in any framing
R-38	R - 49 in 2 x 4 or 2 x 6 or 2 x 8 or 2 x 10
Steel Framed Wall	
R-13	R - 13 + 5 or R - 15 + 4 or R - 21 + 3
R-19	R - 13 + 9 or R - 19 + 8 or R - 25 + 7
R-21	R - 13 + 10 or R - 19 + 9 or R - 25 + 8
Steel Joist Floor	
R-13	R - 19 in 2 x 6 R - 19 + 6 in 2 x 8 or 2 x 10
R-19	R - 19 + 6 in 2 x 6 R - 19 + 12 in 2 x 8 or 2 x 10

Warning: **This facing will burn. Do not leave exposed.** Cover with approved building material in contact with facing. Keep open flames and other heat sources away from facing. See package for warning, fire hazard and installation instructions or call 1-419-248-8234.

Advertencia: **Este revestimiento puede incendiarse. No lo deje expuesto.** Cúbralo con material aprobado para construcciónque esté en contacto con el revestimiento. Manténgalo alejado de llamas y otras fuentes de calor. Vea el paquete para advertencias, peligro de incendio, instrucciones de instalación o llame al 1-419-248-8234.

3½" Fiber Glass Insulation

Appliance Efficiency

(3) APPLIANCE EFFICIENCY. (a) Except as allowed under par. (b) and s. Comm 22.46, oil-fired and gas-fired furnaces and boilers shall meet the minimum efficiency requirements in table 22.31-3.

(b) In new construction, an oil-fired or gas-fired furnace or boiler meeting the federal efficiency standard but not the requirements of table 22.31-3 may be installed if the dwelling thermal envelope requirements of table 22.31-4 are met.

TABLE 22.31-3
WARM AIR FURNACES AND BOILERS, MINIMUM EFFICIENCY REQUIREMENTS

Equipment Type	Minimum Efficiency	Test Procedure
Natural gas and propane furnaces	90% AFUE	DOE 10 CFR Part 430 or ANSI Z21.47
Natural gas and propane hot water boilers	90% AFUE	DOE 10 CFR Part 430
Oil-fired furnaces	83% AFUE	DOE 10 CFR Part 430 or UL 727
Oil-fired hot water boilers	84% AFUE	DOE 10 CFR Part 430

Requirements for Dwellings Using Lower Efficiency Appliances

Table 22.31-4
Component Dwelling Thermal Envelope Requirements for Dwellings Using Lower Efficiency Appliances [a]

Fenestration U-Factor	Skylight U-Factor	Ceiling R-Value	Wood Frame Wall R-Value	Mass Wall R-Value	Floor R-Value	Basement or Crawl Space Wall R-Value [b]	Heated Slab R-Value [c]	Frost Protected Slab R-Value [d]
0.30	0.60	49[e]	21 or 19[f]+5[g]	19	30[h]	15/19[f]	10/20	15
Equivalent U-factors								
0.30	0.60	0.26	0.057	0.057	0.033	0.045	0.033	0.047

a. R-Values are minimums. U-Factors are maximums.
b. The first R-value applies to continuous insulation. The second R-value applies to framing cavity insulation.
c. The first R-value applies under the entire slab, regardless of depth below grade. The second R-value applies to the slab edge.
d. The R-value applies to any slab, the bottom of which is less than 4 feet below adjacent grade. See s. Comm 21.16 for configuration.
e. See s. Comm 22.32 (1) for application and permitted reduced R-value.
e. R-19 may be compressed into a 2X6 cavity.
f. "19+5" means R-19 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25% or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25% of the exterior, structural sheathing shall be covered with insulated sheathing of at least R-2.
g. Or insulation sufficient to fill the framing cavity with a minimum of R-19.

Comm. 22.35
Thermally isolated sunrooms

- **(1) The minimum opaque ceiling insulation R-value shall be R-24. The minimum opaque wall R-value shall be R-13.**
- **(2) The max. fenestration U-factor shall be 0.50 and the maximum skylight U-factor shall be 0.75.**
- **(3) New walls, windows and doors separating a sunroom from conditioned space shall meet the building thermal envelope requirements.**
- **(4) The temperature in the conditioned space shall be controlled as a separate zone or shall use separate heating equipment.**
- **(5) Glazing in a thermally-isolated sunroom is not considered to be in the dwelling thermal envelope.**

Comm. 22.36 Fenestration

(1) AVERAGE U-FACTORS. An area-weighted average of fenestration products may be used to satisfy the U-factor requirements.

(2) MAXIMUM FENESTRATION U-FACTOR. The area weighted average maximum fenestration U-factor permitted using trade offs from s. Comm 22.31 (2) or subchapter VI shall be 0.40 for vertical fenestration, and 0.75 for skylights.

(3) GLAZED FENESTRATION EXEMPTION. Up to 15 square feet of glazed fenestration per dwelling unit may be exempt from U-factor requirements of this chapter.

(4) OPAQUE DOOR EXEMPTION. One opaque door assembly is exempted from the U - factor requirements of this chapter.

(5) REPLACEMENT FENESTRATION. Where an existing fenestration unit is replaced with a new fenestration unit, including sash and glazing, the replacement unit shall meet the U - factor requirements of this chapter.

(6) CERTIFIED PRODUCTS. Except as provided in sub. (7), fenestration rating, certification and labeling of U-factors for windows, doors and skylights shall be in accordance with NFRC 100.


ALL AMERICAN

Comm. 22.38 Vapor retarders

- **(a) *Definition*. Under this section, a vapor retarder is a material with no intrinsic thermal or structural properties that has a rating of 1.0 perm or less when tested in accordance with ASTM standard E 96, Procedure A.**
- **(b) *Continuity*. The vapor retarder shall be continuous. All joints in a vapor retarder consisting of sheet material shall be overlapped 6 inches and taped or sealed. Rips, punctures and voids in the vapor retarder shall be patched with vapor retarder materials and taped or sealed.**

Comm. 22.38 Vapor retarders (cont.)

- Except as provided under par. (c), all frame walls, frame floors and frame ceilings that comprise the thermal envelope, shall have a vapor retarder installed on the warm-in-winter side of the thermal insulation.
- (b) *Coverage*. The vapor retarder shall cover the exposed insulation and the interior face of the framing.

Comm. 22.38 Vapor retarders (cont.)

- **(c) *Exceptions*. 1. Where the vapor retarder is omitted, as allowed under subds. 2. to 4., all sources of air leakage, such as between double top or bottom plates or between double studs, shall be caulked or sealed.**
- **2. No vapor retarder is required in the box sill.**
- **3. No vapor retarder is required where batt insulation is provided with foil or kraft paper backing on the warm-in-winter side and the nailing tabs are tightly fastened to the warm-in-winter face of the framing members.**
- **4. No vapor retarder is required over cavities that are insulated solely with spray-applied foam unless required by the foam manufacturer.**
  - **Note: This requirement does not require the cavity to be completely filled. It only requires that the total required R-value come from the foam, including any exterior foam sheathing, and no other insulation material is present in the cavity.**


TECO
TESTED
EXPOSURE 1
MILL 214
H
172

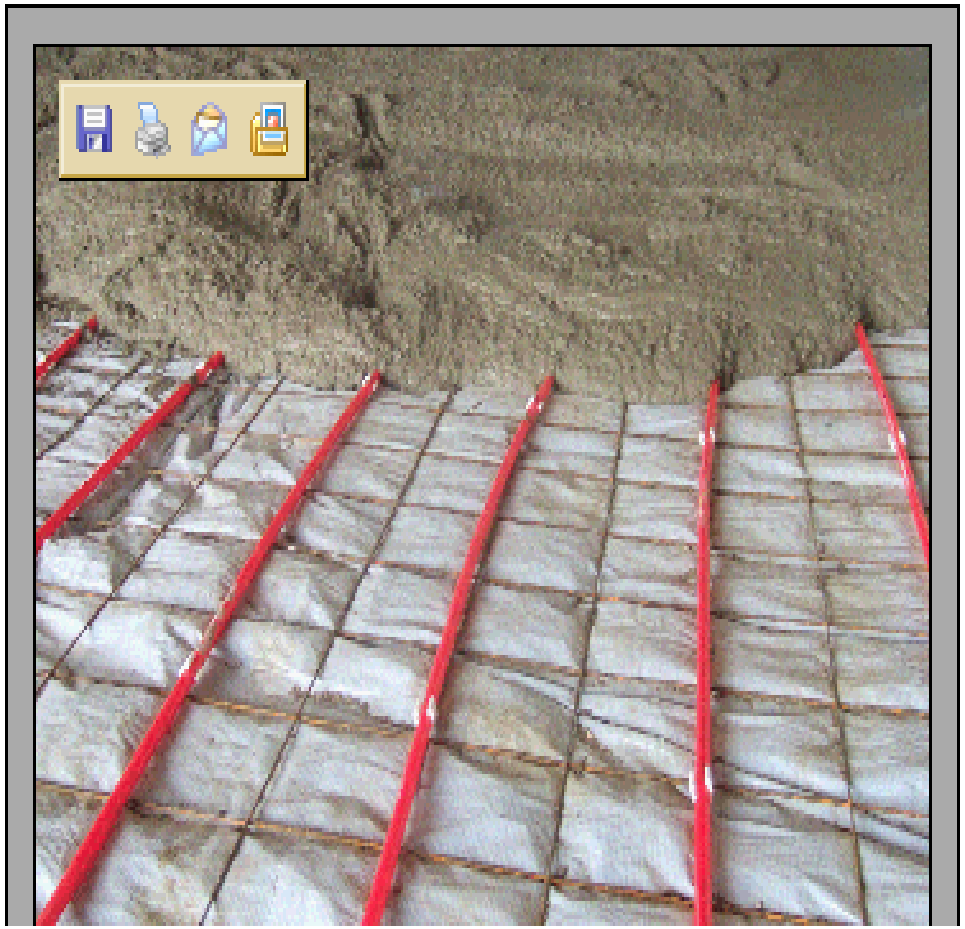
Comm. 22.38 Vapor retarders (cont.)

(3) CONCRETE FLOORS

- **(a) Except as allowed under par. (e), a vapor retarder shall be installed directly under the concrete floor slab or under the base course of concrete floor slabs.**
- **(b) Vapor retarder material shall be at least 6 mils in thickness or shall be a reinforced material.**
- **(c) Joints in the vapor retarder shall be overlapped at least 6 inches and taped or sealed.**
- **(d) The edges of the vapor retarder shall extend up the edges of the slab at least to the top of the slab.**
- **(e) A vapor retarder is not required under the slab of an unconditioned attached garage.**

ABOUT INSUL-TARP®

Insul-Tarp® is a patented revolutionary product like no other on the market today. Its lightweight, Space Age design integrates closed cell foam and reflective technology with a protective poly coating all within three, thin layers. The durable poly coating protects the insulating material from potentially damaging surfaces and is impermeable to moisture. The physical characteristics and overall design of **Insul-Tarp®** make it a very effective product for insulating under concrete slabs in Residential, Commercial and Agricultural radiant heating systems.



ROLL SIZES

12' X 50' = 50lbs.**

12' X 25' = 25lbs.**

6' X 50' = 25lbs.

6' X 25' = 12lbs.

4' X 50' = 16lbs

Comm. 22.38 Vapor retarders (cont.)

- (4) CONCRETE OR MASONRY BASEMENT WALLS. A non-rigid sheet vapor retarder with a perm rating of 0.1 or less **is prohibited** in all of the following locations:
- (a) On a concrete or masonry wall which is below grade to any extent.
- (b) On an insulated frame wall constructed in front of a concrete or masonry wall which is below grade to any extent.

Comm. 22.42 Duct systems

- (1) Supply and return heating ducts, or portions thereof, that are not located completely within the thermal envelope, shall be provided with insulation with a thermal resistance of at least R-8.
- (2) Building framing cavities may not be used as supply ducts.

Comm. 22.42 Duct systems (cont.)

- **(1) Duct systems with joints not located entirely within the conditioned space or with joints located on the unconditioned side of stud bays, joist cavities and similar spaces, shall be sealed in accordance with this section.**
- **(2) Sealing shall be accomplished using welds, gaskets, mastics, mastic-plus-embedded-fabric systems or tapes installed in accordance with the manufacturer's instructions.**
- **(3) Insulation that provides a continuous air barrier may be used in lieu of sealing metal ducts.**
- **(4) Tapes and mastics used with rigid fibrous glass ducts shall be listed and labeled as complying with UL 181A.**
- **(5) Tapes and mastics used with flexible air ducts shall be listed and labeled as complying with UL 181B.**
- **(6) Tapes with rubber-based adhesives may not be used.**


INSTALLED BY:
(REFER TO
ATTIC CARD FOR
INSULATION R VALUE)
20


INSTALLED BY:
(REFER TO
ATTIC CARD FOR
INSULATION R VALUE)
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"Independent Distributor
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800-669-8197


ICC ESR 1153 • CCMC 13132-R • HUD 689
53 • CCMC 13132-R • HUD 689
Silent Floor TJI 230
ICC ESR 1153 • CCMC 13132-R
ICC ESR 115

Comm. 22.45 Air conditioner and heat pump efficiencies

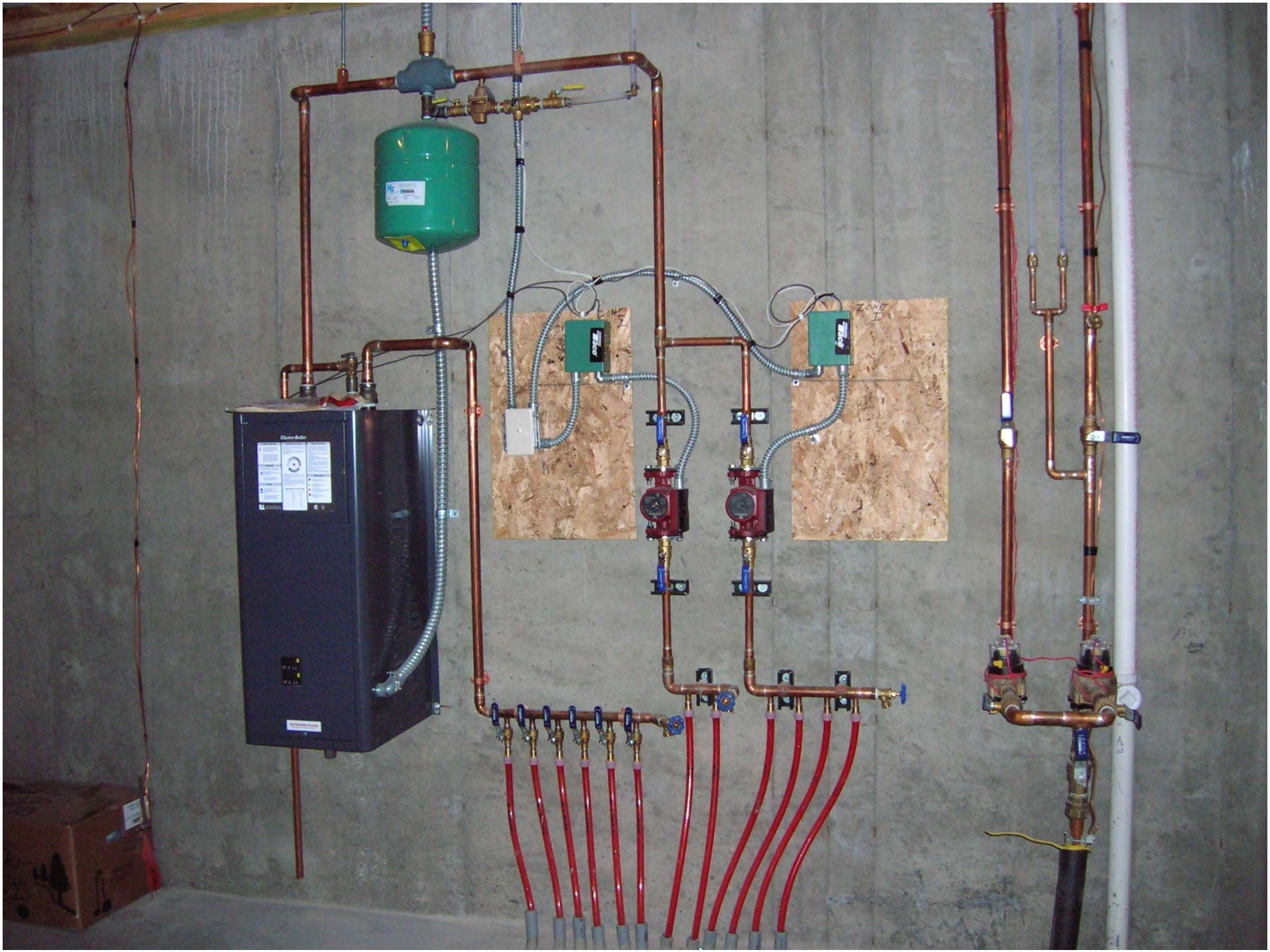
- **(1) Heating and cooling equipment shall meet the minimum efficiency requirements in Table 22.45 when tested and rated in accordance with the applicable test procedure.**
- **(2) The efficiency shall be verified through certification under an approved certification program or, if no certification program exists, the equipment efficiency ratings shall be supported by data furnished by the manufacturer.**
- **(3) Where multiple rating conditions or performance requirements are provided, the equipment shall satisfy all efficiency requirements under this chapter.**


BOERST
BUILDERS


DUPONT
Tyvek
HomeWrap

Comm. 22.46 Replacement furnace and boiler efficiencies

- **(1) A replacement furnace in existing construction may meet only the prevailing federal efficiency standard provided the duct distribution system is sealed including the manufacturer's air handler enclosure, to have air leakage less than ten percent of the furnace manufacturer's rated air flow across the blower at high speed.**
- **(2) A replacement boiler in existing construction may meet only the prevailing federal standard provided there is no installed circulation pump larger than one-twentieth horsepower and no circulation pump runs continuously.**


Electro-Boiler
ZONE 1
ZONE 2


HOT DAWG!
12/08/2008

Comm. 22.44 Pipe insulation

- Heating pipes in unheated spaces shall be insulated with material providing a minimum thermal resistance of R-4 as measured on a flat surface in accordance with ASTM standard C 335 at a mean temperature of 75 °F.


08/23/2008


CENTRAL BOILER
CLASSIC
OUTDOOR WOOD FURNACE

Wood-Fired Heating Brochure

4. INSPECTION – of installation is required.

   a. Solid fuel-fired water-heating appliances shall be inspected by the department or, for one- or 2-family dwellings, in accordance with local ordinance for compliance with Comm 41.49 before the appliance is placed in operation.
   b. Fees for inspection in commercial applications shall be in accordance with Comm 2.04.

5. REPAIRS-must be made in accordance with the manufacturer's recommendations.

TRY THE COMMERCE WEBSITE:

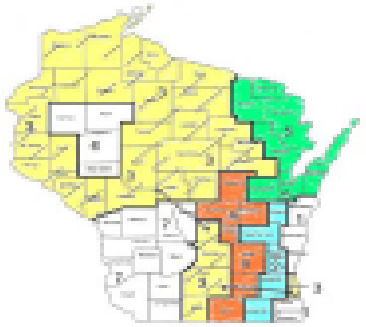
http://www.commerce.wi.gov

Scroll down the left column to click on Safety & Buildings Division to obtain the following for view or print:

- Division Forms, "SBD-6314"
- Boiler Code, "Chapter Comm 41"
- UDC Code, "Chs. Comm 20-25"
- Specific Programs, "UDC" / "Boilers"
- Staff Contact Information
- Individual Credential / License Status
- Inspector District Maps

SBD-10879 (R9-08)

COMMERCIAL INSPECTION DISTRICTS



District 1 David Roman 262-634-1471	District 2 Terence Waldsing 414-302-8575	District 3 Damaris S 608-261-4321
District 4 Joe Wolf 920-723-3032	District 5 James Markiewicz 920-428-9423	District 6 Duane Leetch 715-509-8617
District 7 Dean Voorhaus 608-235-3907	Waukesha Office Michael Verhagen Plan Review 262-548-8617 Fax-548-8614	Madison Office Rick Merkle Supervisor 608-266-3037 Fax-267-9723

* For one- or 2-family dwelling installation, contact local Building Inspection office per Comm 23.04(4) & 41.16(1) b 2.

For further questions or details on the requirements of solid fuel-fired water-heating appliances contact district inspector or staff.

Waukesha office:
Mike Verhagen 262-548-8617

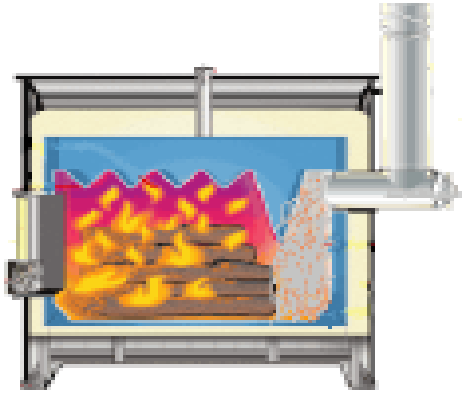
Madison office:
Joe Hertel, Program Manager 608-266-8049
Rick Merkle, Supervisor 608-266-3037

commerce.wi.gov

Wisconsin Department of Commerce

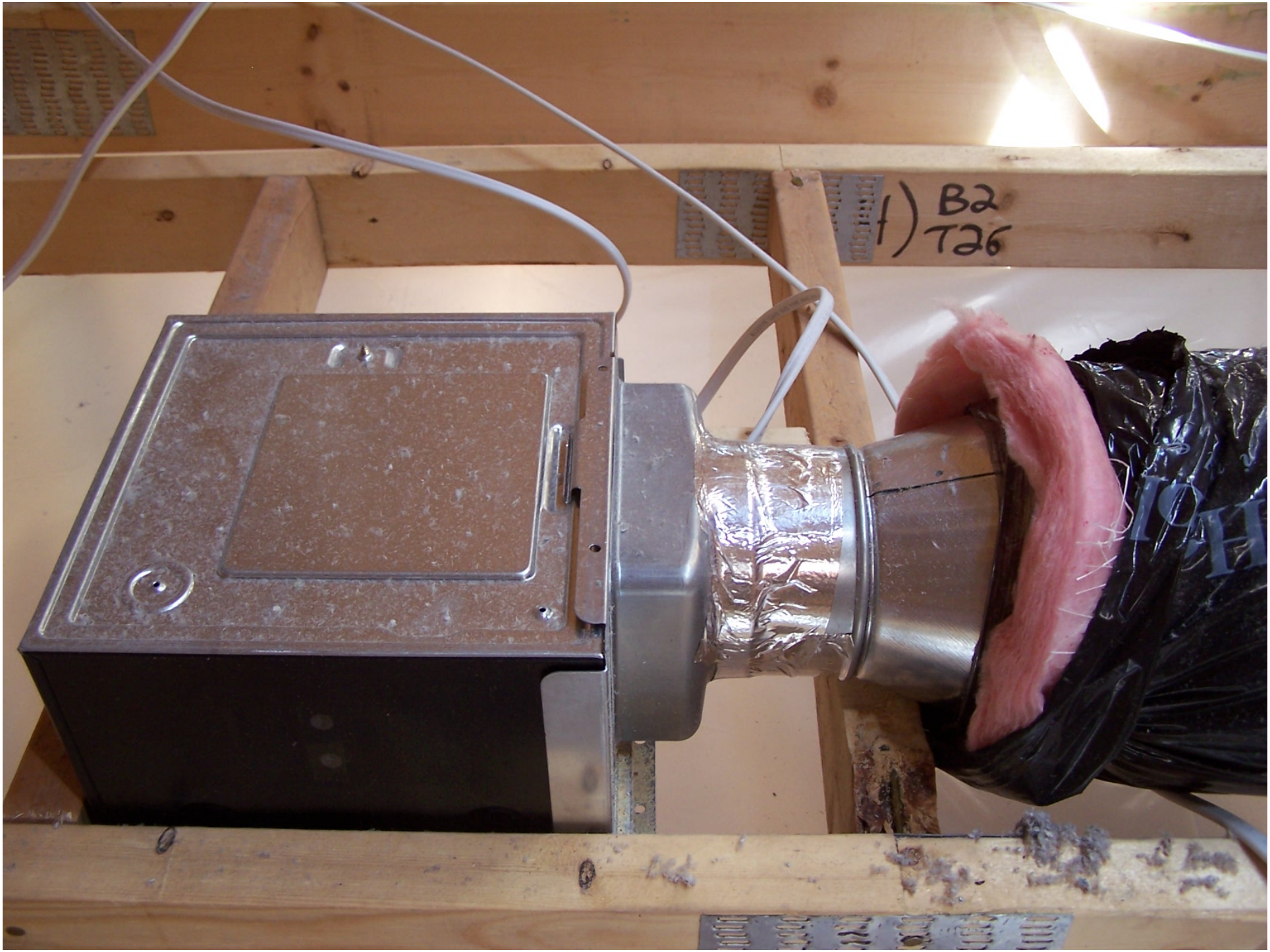
SOLID FUEL-FIRED WATER-HEATING APPLIANCES

Safety & Buildings Division
201 W Washington Avenue, 4th Floor
Madison, WI 53703



Comm. 23.02 (3) (d) Rooms with toilets, tubs or showers

- 1. Except as provided under subd. 2., any room with a toilet, tub or shower shall be provided with exhaust ventilation capable of exhausting 50 cubic feet per minute on an intermittent basis or 20 cubic feet on a continuous basis.
- 2. For dwellings with no electrical service, any room with a toilet, tub or shower shall be provided with an operable window.


1) B2
T26


LOFLO
BALOMETER
ALNOR


QUIET-VENT
CENTRAL EXHAUST VENTILATION SYSTEM
WARNING
2nd Floor
BATH

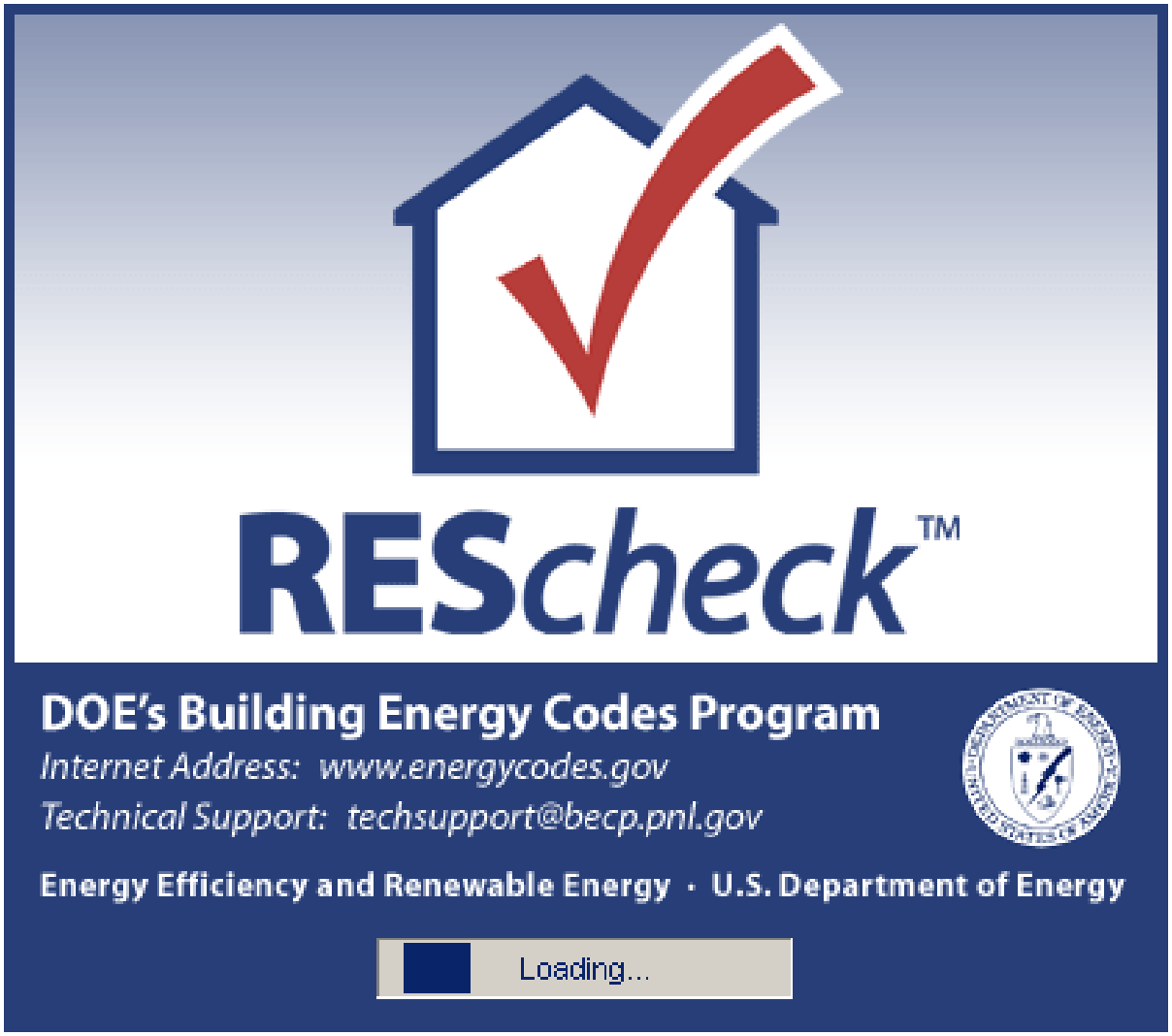

UP
HAUT

Comm. 23.04 (5) WATER HEATERS USED FOR SPACE HEATING

- **1. Water heaters used for space heating shall be listed for such use.**
- **2. The data plate shall indicate that the unit is suitable for simultaneous water heating and space heating.**
  - **Note: ANSI Z21.10.1 or ANSI Z 21.10.3 are acceptable listing standards for dual use water heaters.**
- **(b) *Sizing.* A dual use water heater shall be sized to provide sufficient hot water to supply both the daily and hourly peak loads of the dwelling.**
- **(c) *Installation.* Dual use water heaters shall be installed to provide both space heating and potable water.**
  - **Note: The Wisconsin Uniform Plumbing Code requires dual use water heaters to be installed by a licensed plumber when installed in a new, not-yet-occupied dwelling. The plumbing code also requires that a floor drain be provided, if the water heater is installed on the lowest floor level and that all piping be suitable for potable water.**
- **(d) *Heat exchanger*. A single-wall heat exchanger may not be used with a toxic heat transfer fluid.**


Rheem
RHEEMGAS
FURY
DANGER

RESCheck 4.3


REScheck™
DOE's Building Energy Codes Program
Internet Address: www.energycodes.gov
Technical Support: techsupport@becp.pnl.gov
Energy Efficiency and Renewable Energy · U.S. Department of Energy
Loading...

REM/Rate Home Energy Rating Tool

Rem/rate version 12.61 - Wisconsin

Uniform Dwelling Code Compliance Option Reports

For more information contact:
Homes Department
Focus on Energy
431 Charmany Dr
Madison, WI 53719
1-800-762-7077