

# Prescriptive Packages User's Guide

1992 MEC, 1993 MEC, and 1995 MEC

---

## Inside This Guide

- Quick Start
- Step-By-Step Instructions
- Steel-Frame Wall Equivalent R-Values
- Mass Wall Equivalent R-Values
- Compliance Example

---

## Prescriptive Packages Overview

The MECcheck™ Prescriptive Packages were developed to demonstrate compliance with the insulation and window requirements of the Council of American Building Officials (CABO) Model Energy Code (MEC). MECcheck includes prescriptive packages that demonstrate compliance with the 1992, 1993, and 1995 editions of the MEC and the 1998 and 2000 editions of the International Energy Conservation Code (IECC). All illustrations in this chapter are based on packages which demonstrate compliance with the 1995 MEC. However, compliance with the other two editions is achieved similarly.

The prescriptive package approach requires minimal calculations and is the simplest method for demonstrating compliance with the code insulation and window requirements for residential buildings (refer to the *Basic Requirements Guide* for additional requirements that must also be satisfied).

The MECcheck materials include prescriptive packages for both one- and two-family buildings (referred to as single-family buildings) and multifamily buildings (such as apartments, condominiums, townhouses, dormitories, and rowhouses). Multifamily buildings include residential buildings three stories or less in height with three or more attached dwelling units. When applying the prescriptive packages to multifamily buildings, it is recommended that the packages be applied to the entire building (as opposed to individual dwelling units) if allowed by your jurisdiction.

---

## What's In This User's Guide?

A listing of counties by state and their corresponding climate zone number is provided in Appendix E. You will need to know the climate zone of your building in order to use the

prescriptive package approach. *The Prescriptive Package Worksheet* is included with this guide. Refer to this worksheet while reading the following sections.

*Quick Start*, provides brief instructions on using the prescriptive packages. These instructions are designed to get you up and running in no time.

*Step-By-Step Instructions*, provides more detailed instructions for finding your climate zone, selecting a prescriptive package, and documenting compliance using the *Prescriptive Package Worksheet*.

*Steel-Frame Wall Equivalent R-Values* provides equivalent R-value levels for steel-frame walls, and *Mass Wall Equivalent R-Values* provides equivalent R-value levels for mass walls. The prescriptive packages, which were designed for wood-frame walls, can be used for steel-frame or mass walls by substituting the R-values listed in Tables 1-4 for the R-value requirements in the prescriptive packages.

*Compliance Example*, provides a step-by-step example of using the prescriptive package approach to demonstrate compliance of a split-level house.

---

## Quick Start

This section provides quick-and-easy instructions for using the MEC*check* prescriptive packages.

### Find Your Climate Zone

The MEC*check* Prescriptive Packages give requirements for climate zones which fall along county boundaries. You can determine your climate zone from the list of counties given in Appendix E. State maps which indicate climate zones for each county are also available from the Internet or by contacting DOE's BSGP hotline at 1-800-270-CODE. Based on the county in which your building is located, find your climate zone.

### Select a Prescriptive Package

Tables of prescriptive packages may have been included with this guide or may be downloaded separately from the Internet. The packages correspond to one of 19 climate zones. The requirements are different for each code edition, so be sure to use tables that correspond to the code edition being used in your jurisdiction.

Each climate zone has a table of prescriptive packages from which you can select one package. If your building meets the insulation R-value, glazing, and heating and/or cooling equipment efficiency requirements specified for the package you select, then the building complies with the code insulation and window requirements. Refer to the first page of the prescriptive package tables for notes that further clarify the requirements.

### Complete the Prescriptive Package Worksheet

Fill in the *Prescriptive Package Worksheet* to document your building's compliance with the insulation and window requirements of the code. Be sure to include the climate zone number for your building's location, the prescriptive package number for the package you selected, and the code edition applicable to the selected package. Copy the glazing area percentage, R-value, and U-factor requirements specified in your selected package to the corresponding blanks on the right side of the worksheet. Write in the glazing area of your building and your proposed insulation R-values and glazing and door U-factors on the left side of the worksheet. If the package you selected requires high-efficiency heating or cooling equipment, record the efficiency, make, and model number of the equipment you intend to install.

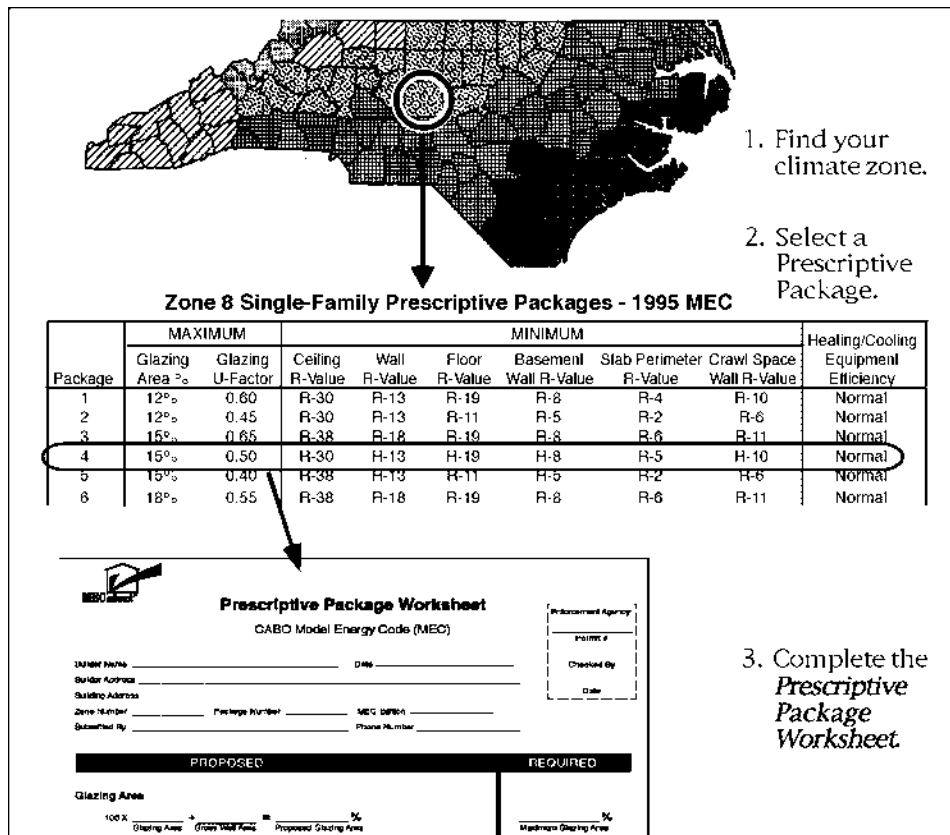


Figure 1. Using the Prescriptive Packages

## Check for Compliance

Your building complies if:

- your glazing area is less than or equal to the required glazing area, and
- all proposed insulation R-values are greater than or equal to all required insulation R-values, and
- all proposed glazing and door U-factors are less than or equal to all required glazing and door U-factors, and
- your heating and cooling equipment meets the requirements specified for the package you selected (see Footnote 9).

## Step-By-Step Instructions

The *Prescriptive Package Worksheet* included with this guide can be used to document compliance with the insulation and window requirements of the code. The following instructions explain how to complete this worksheet. Figure 2 shows an example *Prescriptive Package Worksheet*. The numbers in Figure 2 identify the various locations on this worksheet that correspond to the following steps.

## Step 1: Find Your Climate Zone

The MECcheck Prescriptive Packages give requirements for climate zones which fall along county boundaries. You can determine your climate zone from the list of counties given in Appendix E. State maps which indicate climate zones for each county are also available from the Internet or by contacting DOE's BSGP Hotline at 1-800-270-CODE. Based on the county in which your building is located, find your climate zone.

## Step 2: Select a Prescriptive Package

The tables of prescriptive packages correspond to one of 19 climate zones. The requirements are different for each code edition, so be sure to use tables that correspond to the code edition being used in your jurisdiction. Locate the table of prescriptive packages for the climate zone you identified in Step 1.

Select a package for your building from this table. If your building meets the insulation R-value, glazing, and heating and cooling efficiency requirements specified by the package you select, then the building complies with the code insulation and window requirements. Refer to the first page of the prescriptive packages for notes that further clarify the requirements.

The glazing U-factor and the glazing area percentage listed for each package are the maximum allowed for that package. The area of a glazing assembly is the interior surface area of the entire assembly, including glazing, sash, curbing and other framing elements. The areas of all glazing assemblies (including windows, sliding glass doors, skylights, and windows of conditioned basements) must be included when computing the total glazing area (see Footnote 1).


The nominal area or rough opening is also acceptable for flat windows and doors. The glazing area and window U-factor requirements for any package can be altered by using the *Glazing Area/U-Factor Trade-Off Worksheet* (instructions are given on the worksheet). Use of this worksheet does not alter the insulation R-value and equipment efficiency requirements in the package.

The insulation R-values listed for each package are the minimum allowed for that package. R-value requirements refer to the R-value of the insulation only. Wall and ceiling insulation R-values refer to the sum of the stud cavity insulation plus insulated sheathing (if used). For example, an R-16 wall requirement can be met with R-13 cavity insulation and R-3 sheathing. It is important to select a package consistent with the proposed framing used in the building. For example, it would be impossible to comply with a package specifying R-38 ceiling insulation (approximately 12 in. thick) if the building plans include a cathedral ceiling with 2x8 framing (approximately 7.5 in. thick).

Some of the packages specify high-efficiency heating equipment (*High Heating*), or high-efficiency cooling equipment (*High Cooling*), or a combination of both (*High Heat/Cool*). High-efficiency heating units have an annual fuel utilization efficiency (AFUE) of at least 90% or a heating seasonal performance factor (HSPF) of at least 7.8. High-efficiency cooling units have a seasonal energy efficiency ratio (SEER) of at least 12.0. For example, if you intend to install a 10 SEER air conditioner and a 92% AFUE furnace, the *High Heating* packages would apply to your building, but *High Cooling* and *High Heat/Cool* packages would not. If you plan to install more than one piece of heating equipment or more than one piece of cooling equipment, the equipment with the lowest efficiency must meet or exceed the efficiency required by the selected package. AFUE, HSPF, and SEER ratings can be obtained from manufacturer data sheets or certified product directories.

### Step 3: Complete the General Information Section

Fill in the information at the top of the *Prescriptive Package Worksheet*. Be sure to record your climate zone number, prescriptive package number, and code edition.



## Prescriptive Package Worksheet

CABO Model Energy Code (MEC)

Enforcement Agency:

Permit #

Checked By

Date

Builder Name CAREFUL BUILDERS, INC. Date 12/12/00

Builder Address 120 "W" ST., GREENSBORO, NORTH CAROLINA 27411

Building Address 1010 CONSTRUCTION AVE. GREENSBORO, NORTH CAROLINA

Zone Number 8 Package Number 4 MEC Edition 1995

Submitted By JOHN DOE CAREFUL Phone Number 704-321-9445

Enforcement Agency:

Permit #

Checked By

Date

PROPOSED	REQUIRED																															
<p><b>Glazing Area</b></p> <p style="text-align: center;"> <math>100 \times \frac{288}{1923} = 15.0\%</math> </p> <p style="text-align: center;"> <small>Glazing Area    Gross Wall</small> <span style="font-size: 2em; font-weight: bold;">5</span> <small>Proposed Glazing Area</small> </p>	<p>15 %</p> <p>Maximum Glazing Area</p>																															
<p><b>R-Value</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Description</th> <th>Comments</th> <th>Proposed R-Value</th> </tr> </thead> <tbody> <tr> <td>Ceiling</td> <td></td> <td>R- 30</td> </tr> <tr> <td>Wall</td> <td style="text-align: center;"><span style="font-size: 2em; font-weight: bold;">6</span></td> <td>R- 13</td> </tr> <tr> <td>Floor Over Unconditioned Space</td> <td></td> <td>R- 19</td> </tr> <tr> <td>Floor Over Outside Air</td> <td></td> <td>R- 30</td> </tr> <tr> <td>Basement Wall</td> <td></td> <td>R- N/A</td> </tr> <tr> <td>Slab Floor</td> <td>Unheated, 24" Depth</td> <td>R- 8</td> </tr> <tr> <td>Crawl Space Wall</td> <td></td> <td>R- N/A</td> </tr> </tbody> </table>	Description	Comments	Proposed R-Value	Ceiling		R- 30	Wall	<span style="font-size: 2em; font-weight: bold;">6</span>	R- 13	Floor Over Unconditioned Space		R- 19	Floor Over Outside Air		R- 30	Basement Wall		R- N/A	Slab Floor	Unheated, 24" Depth	R- 8	Crawl Space Wall		R- N/A	<p>Minimum R-Value</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>R- 30</td></tr> <tr><td>R- 13</td></tr> <tr><td>R- 19</td></tr> <tr><td>R- 30</td></tr> <tr><td>R- 8</td></tr> <tr><td>R- 5</td></tr> <tr><td>R- 10</td></tr> </table> <span style="font-size: 2em; font-weight: bold;">4</span>	R- 30	R- 13	R- 19	R- 30	R- 8	R- 5	R- 10
Description	Comments	Proposed R-Value																														
Ceiling		R- 30																														
Wall	<span style="font-size: 2em; font-weight: bold;">6</span>	R- 13																														
Floor Over Unconditioned Space		R- 19																														
Floor Over Outside Air		R- 30																														
Basement Wall		R- N/A																														
Slab Floor	Unheated, 24" Depth	R- 8																														
Crawl Space Wall		R- N/A																														
R- 30																																
R- 13																																
R- 19																																
R- 30																																
R- 8																																
R- 5																																
R- 10																																
<p><b>U-Factor</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Description</th> <th>Comments</th> <th>Proposed U-Factor</th> </tr> </thead> <tbody> <tr> <td>Glazing</td> <td style="text-align: center;"><span style="font-size: 2em; font-weight: bold;">7</span> See back</td> <td>U- 0.50</td> </tr> <tr> <td>Opaque Door</td> <td>Front door exempt</td> <td>U- 0.35</td> </tr> </tbody> </table>	Description	Comments	Proposed U-Factor	Glazing	<span style="font-size: 2em; font-weight: bold;">7</span> See back	U- 0.50	Opaque Door	Front door exempt	U- 0.35	<p>Maximum U-Factor</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>U- 0.50</td></tr> <tr><td>U- 0.35</td></tr> </table>	U- 0.50	U- 0.35																				
Description	Comments	Proposed U-Factor																														
Glazing	<span style="font-size: 2em; font-weight: bold;">7</span> See back	U- 0.50																														
Opaque Door	Front door exempt	U- 0.35																														
U- 0.50																																
U- 0.35																																
<p><b>Equipment Efficiency</b> (This section may be left blank if <i>Normal</i> is selected on the right.)</p> <p>Heating <u>                    </u> AFUE/HSPF <span style="font-size: 2em; font-weight: bold;">8</span></p> <p>Cooling <u>                    </u> SEER <u>                    </u> Make &amp; Model Number <u>                    </u></p>																																
<p><b>Statement of Compliance:</b> The proposed building design represented in these documents is consistent with the building plans, specifications, and other calculations submitted with the permit application. <span style="font-size: 2em; font-weight: bold;">9</span> The proposed building has been designed to meet the requirements of the CABO Model Energy Code.</p>																																
<p><u>John Doe Careful</u></p> <p>Builder/Designer</p>	<p><u>Careful Builders, Inc.</u></p> <p>Company Name</p>	<p><u>12/12/00</u></p> <p>Date</p>																														

Figure 2. *Prescriptive Package Worksheet Step-by-Step* (illustration based on 1995 MEC)

### Step 4: Complete the Required Section

Copy the *Glazing Area* percentage from the prescriptive package you have chosen to the space labeled *Maximum Glazing Area*. Depending on the package you have selected, this percentage will range from 12% to 25% for single-family buildings or 15% to 30% for multifamily buildings.

Copy the insulation R-value and glazing U-factor requirements from the selected prescriptive package to the *Minimum R-Value* and *Maximum U-Factor* sections of the worksheet. The required R-value for floors over outside air is the same as that for ceilings, so copy the ceiling R-value requirement from the selected prescriptive package to the *Minimum R-Value* box for floors over outside air. The slab R-value requirement is for unheated slabs. In all locations except Zone 1, add an additional R-2 if you intend to install a heated slab. A heated slab has ducts or hydronic heating elements in or under the slab.

If high-efficiency heating equipment is specified in the package you have chosen, put an "X" in the box labeled *High Heating*. If high-efficiency cooling equipment is specified in the package you have chosen, put an "X" in the box labeled *High Cooling*. If both are specified, put an "X" in the box labeled *High Heating & Cooling*. If normal heating and cooling efficiency is specified in the package you selected, put an "X" in the box labeled *Normal*.

## Step 5: Complete the Proposed Glazing Area Section

Calculate the total area (ft<sup>2</sup>) of all glazing assemblies (windows, sliding glass doors, skylights, etc.) located in the building envelope. The area of an assembly is the interior surface area of the entire assembly, including glazing, sash, curbing, and other framing elements. The nominal area or rough opening is acceptable for flat windows. The area of windows in the exterior walls of conditioned basements should be included. Windows in unconditioned basements are *NOT* included. Record the total area of all applicable assemblies in the space labeled *Glazing Area*.

Next, calculate the gross wall area (ft<sup>2</sup>) and record this area in the space labeled *Gross Wall Area*. The gross wall area includes the following:

- all above-grade walls enclosing conditioned spaces (including attic kneewalls and skylight shafts)
- the peripheral edges of the floors (the area of the band joist and perimeter framing between floors)
- walls of conditioned basements with an average depth less than 50% below grade (include the entire wall area – even the below-grade portions). For further clarification, refer to the basement wall examples given in Step 6.
- all windows and doors (including windows and doors in conditioned basements).

Divide the glazing area by the gross wall area and multiply by 100 to determine the *Proposed Glazing Area* percentage.

## Step 6: Complete the Proposed R-Value Section

Record the proposed R-value of the insulation to be installed in each applicable ceiling, wall, floor, basement wall, slab-edge, and crawl space wall component in the *Proposed R-Value* column of the worksheet.

**Multiple R-Values and U-Factors** Some components may consist of more than one R-value (e.g., part of the ceiling may be insulated to R-38 and part to R-19). If each component R-value is greater than or equal to the required R-value, record the lowest component R-value. However, if one of the R-values is less than the required R-value, perform an area-weighted average R-value calculation using the *R-Value/U-Factor Weighted Average Worksheet*. If the resulting average R-value is greater than or equal to the required R-value, the component complies and the average R-value should be transferred to the *Prescriptive Package Worksheet*.

Some buildings will use more than one glazing or door U-factor (e.g., windows and sliding glass doors with different U-factors may both be installed). If each U-factor is less than or equal to the required U-factor, record the highest (in value) component U-factor. However, if one of the U-factors exceeds the maximum U-factor requirement, perform an area-weighted average U-factor calculation using the *R-Value/U-Factor Weighted Average Worksheet*. If the resulting average U-factor is less than or equal to the required U-factor, the component complies and the average U-factor should be transferred to the *Prescriptive Package Worksheet*.

**Ceiling R-Value** Proposed R-values for ceilings represent the sum of the cavity insulation plus insulating sheathing (if used). For ventilated ceilings, insulating sheathing must be placed between the conditioned space and the ventilated portion of the roof (typically applied to the trusses or rafters immediately behind the drywall or other ceiling finish material).

The ceiling R-value requirements do not assume a raised or oversized truss construction. If the insulation achieves the full insulation thickness over the plate lines of exterior walls, R-30 insulation may be used to meet an R-38 insulation requirement and R-38 insulation may be used to meet an R-49 insulation requirement (see Footnote 3). If you are taking credit for a raised or oversized truss, note this in the *Comments* section of the worksheet.

**Wall R-Value** R-values for walls represent the sum of the cavity insulation plus insulating sheathing (if used). The wall R-value requirements are for wood-frame walls. However, the packages may be adapted for steel-frame and mass walls by using Tables 1 through 4. The use of steel-frame or mass walls should be noted in the *Comments* section of the worksheet.

**Floor R-Value** Floors over unconditioned space include floors over unconditioned crawl spaces, basements, and garages. Floors over outside air include floor cantilevers, the floor of an elevated building, and floors of overhangs (such as the floor above a recessed entryway or open carport). Floors over outside air must meet the ceiling R-value requirement.

**Basement R-Value** Basement walls that enclose conditioned spaces must be insulated from the top of the basement wall to 10 ft below ground level or to the basement floor, whichever is less. If you intend to install insulation on both the exterior and interior of the wall, provide the sum of both R-values.

1992 1993 Walls of conditioned basements with an average depth 50% or more below grade are considered basement walls; walls over 50% above grade are considered above-grade walls and must meet the wall R-value requirement for the package.

1995 Any individual wall of a conditioned basement with an average depth 50% or more below grade is considered a basement wall; a wall over 50% above grade is considered an above-grade wall and must meet the wall R-value requirement for the package.

The following examples help to clarify the treatment of basements with wood kneewalls, walk-out basements, and basement walls constructed from specialty foundation systems.

*Example 1: Wood Kneewalls*

Assume a basement is to be constructed with 3-ft-high wood kneewalls built on a 5-ft-high concrete foundation. R-13 insulation will be installed in the wood kneewall cavities and R-5 rigid insulation will be installed on the concrete foundation walls. The wood kneewalls are completely above grade and fully insulated. The concrete foundation walls are 4 ft below grade and fully insulated.

Because each basement wall is at least 50% below grade, both the masonry foundation and the wood kneewalls must be insulated to at least the basement R-value requirement specified in the selected prescriptive package. If the basement wall R-value requirement in the selected prescriptive package is R-5 or less, both the wood kneewalls and the concrete foundation walls meet the requirement and you may enter R-5 for the proposed

R-value of the basement walls. If, however, the requirement is greater than R-5, you will have to perform an area-weighted average U-factor calculation using the *R-Value/U-Factor Weighted Average Worksheet* to verify that the average basement wall R-value meets or exceeds the required R-value.

*Example 2: Walk-Out Basement*

Assume an 8-ft basement is to be built on a slope so that the front wall is 7 ft below grade and the rear wall is totally above grade. The ground level along both side walls is sloped so that approximately 50% of each wall is below grade. The rear basement wall will be wood-frame construction with R-19 insulation. The other three walls will be concrete walls with R-10 insulation. All four walls will be fully insulated.

Because the front and side walls are at least 50% below grade, they must be insulated to at least the basement R-value requirement specified in the selected prescriptive package. The rear wall is not 50% below grade, however, and is therefore subject to the above-grade wall requirement. Note that the basement floor along the rear wall should be considered a slab-on-grade component. Slab insulation should be installed along the basement floor for the length of the rear wall. The slab insulation must meet or exceed the slab R-value requirement specified for the selected package.

*Example 3: Specialty Foundation Systems*

Manufacturers of insulating foam concrete form systems and pre-manufactured concrete panels with integrated insulation generally supply R-value ratings for the entire wall, not just the insulation. Where the R-value of the insulation alone is not known, the manufacturer overall wall R-value rating may be used.

**Slab R-Value** The prescriptive package slab R-value requirements are for unheated slabs. Add an additional R-2 for heated slabs, except in Zone 1 which does not require slab insulation. For packages with a slab insulation requirement, the insulation must extend a total linear distance of at least 24 in. in Zones 2-12 and 48 in. in Zones 13-19. In the *Comments* section, indicate whether the slab will be heated or unheated. A heated slab is a slab with ducts or hydronic heating elements in or under the slab.

**Slab Insulation Depth** Slab insulation can be installed using any of several different configurations. Refer to the definition of Slab Insulation for a description and illustration of acceptable configurations.

**Crawl Space Wall R-Value** The crawl space wall R-value requirements are for walls of unventilated crawl spaces (i.e., not directly vented to the outside). The crawl space wall insulation must extend from the top of the wall to the inside finished grade. If the inside finished grade is less than 12 inches (305 mm) below the outside finished grade or the vertical wall insulation stops less than 12 inches below the outside grade, the insulation must instead extend vertically and horizontally a minimum of 24 linear inches (601 mm) from the outside grade level. Figure 3 illustrates the crawl space wall insulation depth requirements.



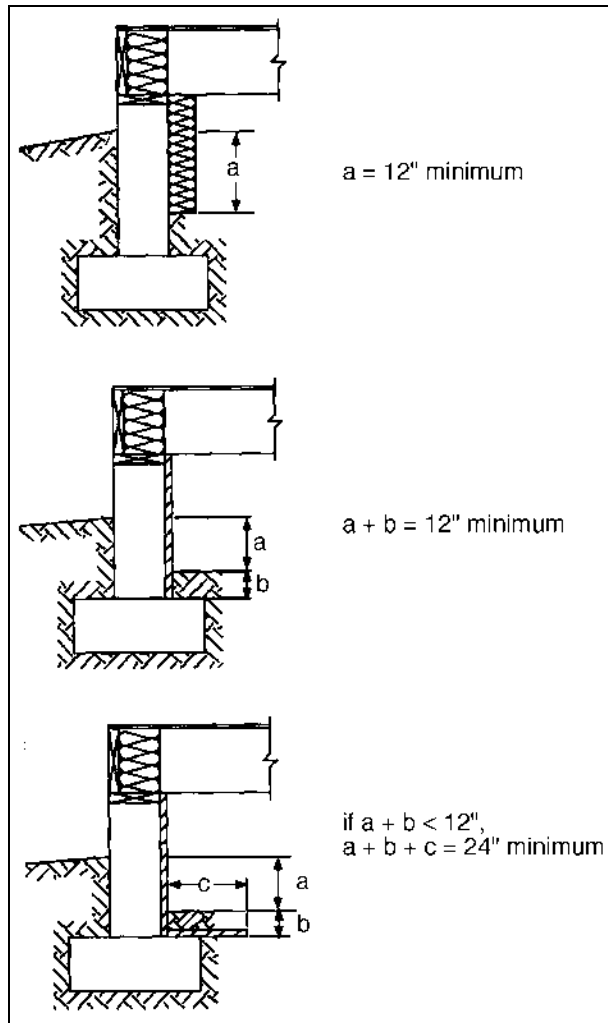


Figure 3. Crawl Space Wall Insulation Depth Requirement

## Step 7: Complete the Proposed U-Factor Section

**Glazing** Record the proposed U-factors for glazing assemblies (such as windows, skylights, and sliding glass doors) in the *Proposed U-Factor* column of the worksheet. Up to 1% of the total allowed glazing area may be excluded from the U-factor requirement.

1992 1993 U-factors for glazing should be tested and documented by the manufacturer in accordance with the NFRC test procedure, taken from Appendix B, or derived from an alternate test procedure or table accepted by your local jurisdiction. Center-of-glass U-factors cannot be used.

1995 U-factors for glazing should be tested and documented by the manufacturer in accordance with the NFRC test procedure or taken from Appendix B. Center-of-glass U-factors cannot be used.

**Doors** In the *Proposed U-Factor* column of the worksheet, record the proposed U-factors for all opaque doors in the building envelope.

1992 1993 U-factors for doors must be based on manufacturer data, taken from Appendix B, or derived from an alternate test procedure or table accepted by your local jurisdiction.

U-factors for doors must be tested and documented by the manufacturer in accordance with the NFRC test procedure or taken from Appendix B.

The U-factor requirement for all doors in the building envelope (regardless of the prescriptive package chosen) is 0.35. The prescriptive package approach allows you to exclude one door from this requirement. If more than one door fails to meet the 0.35 U-factor requirement, perform an area-weighted average U-factor calculation using the *R-Value/U-Factor Weighted Average Worksheet* (one door may also be excluded from this calculation). If a door contains glass and an aggregate U-factor rating for that door is not available, include the glass area of the door with your glazing and use the opaque door U-factor from Appendix B to determine compliance with the door.

## Step 8: Complete Equipment Efficiency Section

If the *Heating/Cooling Equipment Efficiency* column is marked *Normal* for the package you have selected, leave this section blank. If high-efficiency heating or cooling equipment is specified in the package you select, record the proposed equipment efficiency in the space(s) labeled *Efficiency* and record the equipment make and model number in the space(s) labeled *Make and Model Number*. If you plan to install more than one piece of heating equipment or more than one piece of cooling equipment, you must enter the efficiency of the unit with the lowest rating.

## Step 9: Check for Compliance

Compliance is achieved if:

- the *Proposed Glazing Area* percentage is less than or equal to the *Maximum Glazing Area* percentage, and
- all R-values in the *Proposed R-Value* column are greater than or equal to the corresponding values in the *Minimum R-Value* column, and
- all glazing and door U-factors in the *Proposed U-Factor* column are less than or equal to the corresponding values in the *Maximum U-Factor* column, and
- your selected package specifies *Normal* equipment; OR your package specifies *High Heating* equipment and your proposed heating equipment has an AFUE of at least 90% or an HSPF of at least 7.8; OR your package specifies *High Cooling* equipment and your proposed heating equipment has a SEER of at least 12; OR your package specifies *High Heat/Cool* and your proposed equipment meets both of the above-listed requirements.

If all components do not meet the requirements of the selected prescriptive package, you can select another package, modify the design to meet the selected package requirements, or select another compliance approach.

When you have completed the *Prescriptive Package Worksheet*, sign and date the worksheet in the blanks provided. Transfer the insulation R-values and glazing and door U-factors to the building plans or specifications. If you are taking credit for high-efficiency equipment, also transfer the efficiency, make, and model number of the equipment.

---

## Steel-Frame Wall Equivalent R-Values

The MEC*check* Prescriptive Packages give R-value requirements for wood-frame walls. Steel-frame walls can comply with these requirements if equivalent cavity and sheathing insulation R-values are selected from the following tables. Use Table 1 for 16-in. O.C.

steel-frame wall constructions. Use Table 2 for 24-in. O.C. steel-frame wall constructions.

The left column lists the wood-frame wall R-value requirements specified in the prescriptive packages. The right column lists equivalent steel-frame wall cavity and sheathing R-value requirements. An equivalent steel wall must be insulated to one of the cavity plus sheathing R-value combinations listed to the right of the wood-frame wall requirement.

Example: A steel-frame house is being built to the specifications of the 1995 MEC Single-Family Prescriptive Package 5 in Zone 8. The wood-frame wall R-value requirement for this package is R-13. The steel-frame walls are to be 16-in. O.C. construction with R-5 sheathing. The Table 1 for the 1995 MEC indicates that R-11 cavity insulation must be installed. The other acceptable combinations are R-15 cavity insulation with R-4 sheathing and R-21 cavity insulation with R-3 sheathing.

1992 1993

Table 1. 16-in. O.C. Steel-Frame Wall Equivalent R-Values

Wood-Frame Wall R-Value	Equivalent Steel-Frame Wall Cavity and Sheathing R-Value(a)
R-11	R-0+R-10, R-11+R-5, R-15+R-4, R-21+R-3
R-13	R-11+R-6, R-15+R-5, R-21+R-4
R-14	R-11+R-7, R-15+R-6, R-19+R-5
R-15	R-11+R-7, R-19+R-6, R-25+R-5
R-16	R-11+R-9, R-15+R-8, R-21+R-7
R-17	R-11+R-10, R-15+R-9, R-21+R-8
R-18	R-13+R-10, R-19+R-9, R-25+R-8
R-19	R-15+R-10, R-21+R-9
R-20	R-19+R-10, R-25+R-9
R-21	R-25+R-10
(a) The cavity insulation R-value requirement is listed first, followed by the sheathing R-value requirement.	

1992 1993

Table 2. 24-in. O.C. Steel-Frame Wall Equivalent R-Values

Wood-Frame Wall R-Value	Equivalent Steel-Frame Wall Cavity and Sheathing R-Value(a)
R-11	R-0+R-10, R-11+R-4, R-13+R-3, R-19+R-2, R-25+R-0
R-13	R-11+R-5, R-15+R-4, R-19+R-3, R-25+R-2
R-14	R-11+R-6, R-13+R-5, R-19+R-4, R-25+R-3
R-15	R-11+R-6, R-15+R-5, R-19+R-4, R-25+R-3
R-16	R-11+R-8, R-15+R-7, R-19+R-6, R-25+R-5
R-17	R-11+R-9, R-13+R-8, R-19+R-7, R-25+R-6
R-18	R-11+R-10, R-13+R-9, R-15+R-8, R-21+R-7
R-19	R-11+R-10, R-15+R-9, R-19+R-8, R-25+R-7
R-20	R-13+R-10, R-15+R-9, R-21+R-8
R-21	R-15+R-10, R-19+R-9, R-25+R-8
(a) The cavity insulation R-value requirement is listed first, followed by the sheathing R-value requirement.	

Table 1. 16-in. O.C. Steel-Frame Wall Equivalent R-Values

Wood-Frame Wall R-Value	Equivalent Steel-Frame Wall Cavity and Sheathing R-Value <sup>(a)</sup>
R-11	R-0+R-9, R-11+R-4, R-15+R-3, R-21+R-2
R-13	R-11+R-5, R-15+R-4, R-21+R-3
R-14	R-11+R-6, R-13+R-5, R-19+R-4
R-15	R-11+R-6, R-15+R-5, R-19+R-4
R-16	R-11+R-8, R-15+R-7, R-21+R-6
R-17	R-11+R-9, R-13+R-8, R-19+R-7
R-18	R-11+R-9, R-15+R-8, R-21+R-7
R-19	R-11+R-10, R-13+R-9, R-19+R-8, R-25+R-7
R-20	R-11+R-10, R-13+R-9, R-19+R-8
R-21	R-13+R-10, R-19+R-9, R-25+R-8
R-22	R-13+R-10, R-19+R-9
R-24	R-19+R-10, R-25+R-9
R-25	R-19+R-10
R-26	R-19+R-11, R-21+R-10
(a) The cavity insulation R-value requirement is listed first, followed by the sheathing R-value requirement.	

Table 2. 24-in. O.C. Steel-Frame Wall Equivalent R-Values

Wood-Frame Wall R-Value	Equivalent Steel-Frame Wall Cavity and Sheathing R-Value <sup>(a)</sup>
R-11	R-0+R-9, R-11+R-3, R-15+R-2, R-25+R-0
R-13	R-11+R-4, R-15+R-3, R-19+R-2
R-14	R-11+R-5, R-13+R-4, R-15+R-3, R-21+R-2
R-15	R-11+R-5, R-13+R-4, R-19+R-3, R-21+R-2
R-16	R-11+R-7, R-13+R-6, R-19+R-5, R-25+R-4
R-17	R-11+R-8, R-13+R-7, R-15+R-6, R-21+R-5
R-18	R-11+R-8, R-13+R-7, R-19+R-6, R-25+R-5
R-19	R-11+R-9, R-13+R-8, R-15+R-7, R-21+R-6
R-20	R-11+R-9, R-13+R-8, R-19+R-7, R-21+R-6
R-21	R-11+R-9, R-15+R-8, R-21+R-7
R-22	R-11+R-10, R-13+R-9, R-19+R-8, R-21+R-7
R-24	R-11+R-10, R-15+R-9, R-19+R-8
R-25	R-13+R-10, R-19+R-9, R-21+R-8
R-26	R-15+R-10, R-19+R-9, R-25+R-8
(a) The cavity insulation R-value requirement is listed first, followed by the sheathing R-value requirement.	

# Mass Wall Equivalent R-Values

The MECcheck Prescriptive Packages give R-value requirements for wood-frame walls. High mass walls in some locations have lower insulation requirements than wood-frame walls, with more credit given in warmer locations. The following tables can be used to determine the equivalent insulation requirements when high-mass walls are used instead of wood-frame walls. To qualify as a high-mass wall, the heat capacity of the exterior wall must be greater than or equal to 6 Btu/ft<sup>2</sup> °F [123 kJ/m<sup>2</sup> K] of exterior wall area. Masonry and concrete walls having a mass greater than or equal to 30 lb/ft<sup>2</sup> (146 kg/m<sup>2</sup>) and solid walls having a mass greater than or equal to 20 lb/ft<sup>2</sup> (98 kg/m<sup>2</sup>) will meet this requirement.

Use Table 3 for mass walls with exterior or integral insulation and Table 4 for mass walls with interior insulation. The left column lists the wood-frame wall R-value requirements specified in the prescriptive packages. The right column lists equivalent mass wall insulation R-value requirements.

Example: A house with high-mass walls is being built to the specifications of Prescriptive Package 5 in Zone 8. The wood-frame wall R-value requirement for this package is R-13. The mass walls will have exterior insulation. Table 3 for the 1995 MEC indicates that in Zone 8, R-6 exterior insulation may be installed instead of R-13.

1992 1993

Table 3. High-Mass Wall Equivalent R-Values; Exterior or Integral Insulation for 1992 and 1993 MEC

Wood-Frame Wall R-Value	Equivalent High-Mass Wall R-Value					
	Zones 1 to 4	Zones 5 to 8	Zones 9 to 11	Zones 12 to 13	Zones 14 to 15	Zones 16 to 19
R-11	R-6	R-6	R-8	R-9	R-10	R-11
R-13	R-7	R-7	R-8	R-9	R-11	R-12
R-14	R-7	R-7	R-9	R-10	R-11	R-13
R-15	R-7	R-8	R-9	R-10	R-11	R-13
R-16	R-7	R-8	R-9	R-10	R-12	R-14
R-17	R-8	R-8	R-9	R-11	R-12	R-14
R-18	R-8	R-9	R-10	R-11	R-13	R-15
R-19	R-9	R-9	R-11	R-12	R-14	R-17
R-20	R-9	R-10	R-11	R-13	R-15	R-18
R-21	R-9	R-10	R-11	R-13	R-15	R-18
R-22	R-9	R-10	R-11	R-13	R-16	R-19
R-23	R-10	R-10	R-12	R-13	R-16	R-19
R-24	R-10	R-10	R-12	R-14	R-16	R-20
R-25	R-10	R-10	R-12	R-14	R-17	R-20
R-26	R-10	R-11	R-12	R-14	R-17	R-21

Table 4. High-Mass Wall Equivalent R-Values; Interior Insulation for 1992 and 1995 MEC

Wood-Frame Wall R-Value	Equivalent High-Mass Wall R-Value					
	Zones 1 to 4	Zones 5 to 8	Zones 9 to 11	Zones 12 to 13	Zones 14 to 15	Zones 16 to 19
R-11	R-11	R-11	R-12	R-12	R-14	R-14
R-13	R-13	R-13	R-13	R-14	R-15	R-15
R-14	R-14	R-14	R-14	R-15	R-16	R-16
R-15	R-15	R-15	R-15	R-16	R-16	R-16
R-16	R-15	R-15	R-15	R-16	R-16	R-16
R-17	R-15	R-15	R-15	R-17	R-17	R-17
R-18	R-16	R-16	R-16	R-18	R-18	R-18
R-19	R-18	R-18	R-18	R-22	R-22	R-22
R-20	R-20	R-20	R-20	R-22	R-22	R-22
R-21	R-21	R-21	R-21	R-23	R-23	R-23
R-22	R-22	R-22	R-22	R-24	R-24	R-24
R-23	R-22	R-22	R-22	R-24	R-24	R-24
R-24	R-23	R-23	R-23	R-25	R-25	R-25
R-25	R-24	R-24	R-24	R-25	R-25	R-25
R-26	R-25	R-25	R-25	R-26	R-26	R-26

Table 3. High-Mass Wall Equivalent R-Values; Exterior or Integral Insulation for 1995 MEC

Wood-Frame Wall R-Value	Equivalent High-Mass Wall R-Value					
	Zones 1 to 4	Zones 5 to 8	Zones 9 to 11	Zones 12 to 13	Zones 14 to 15	Zones 16 to 19
R-11	R-6	R-6	R-7	R-8	R-9	R-10
R-13	R-6	R-6	R-8	R-9	R-10	R-11
R-14	R-6	R-7	R-8	R-9	R-10	R-11
R-15	R-7	R-7	R-8	R-9	R-10	R-12
R-16	R-7	R-7	R-8	R-9	R-11	R-12
R-17	R-7	R-7	R-9	R-10	R-11	R-13
R-18	R-7	R-7	R-9	R-10	R-11	R-13
R-19	R-8	R-9	R-10	R-11	R-13	R-15
R-20	R-8	R-9	R-10	R-11	R-13	R-16
R-21	R-8	R-9	R-10	R-12	R-14	R-16
R-22	R-8	R-9	R-10	R-12	R-14	R-17
R-23	R-9	R-9	R-11	R-12	R-14	R-17
R-24	R-9	R-9	R-11	R-12	R-14	R-27
R-25	R-9	R-10	R-11	R-13	R-15	R-18
R-26	R-9	R-10	R-11	R-13	R-15	R-18

Table 4. High-Mass Wall Equivalent R-Values; Interior Insulation for 1995 MEC

Wood-Frame Wall R-Value	Equivalent High-Mass Wall R-Value					
	Zones 1 to 4	Zones 5 to 8	Zones 9 to 11	Zones 12 to 13	Zones 14 to 15	Zones 16 to 19
R-11	R-10	R-10	R-11	R-11	R-12	R-12
R-13	R-11	R-11	R-12	R-12	R-14	R-14
R-14	R-12	R-12	R-12	R-12	R-15	R-15
R-15	R-13	R-13	R-13	R-13	R-15	R-15
R-16	R-13	R-13	R-13	R-14	R-15	R-15
R-17	R-14	R-14	R-14	R-15	R-16	R-16
R-18	R-15	R-15	R-15	R-15	R-16	R-16
R-19	R-16	R-16	R-16	R-19	R-19	R-19
R-20	R-16	R-16	R-16	R-20	R-20	R-20
R-21	R-17	R-17	R-17	R-21	R-21	R-21
R-22	R-17	R-17	R-17	R-21	R-21	R-21
R-23	R-18	R-18	R-18	R-22	R-22	R-22
R-24	R-19	R-19	R-19	R-22	R-22	R-22
R-25	R-20	R-20	R-20	R-22	R-22	R-22
R-26	R-21	R-21	R-21	R-23	R-23	R-23

---

## Compliance Example

Assume that you plan to build the single-family house shown in Figure 4 on a lot located in Greensboro, North Carolina. Greensboro is in Guilford County and is designated as Zone 8 (see Appendix E). For the purposes of this example, assume you have chosen Package 4 from the single-family prescriptive packages offered for Zone 8. Compliance for a multifamily building is handled in much the same way, only packages should be selected from the tables developed specifically for multifamily buildings.

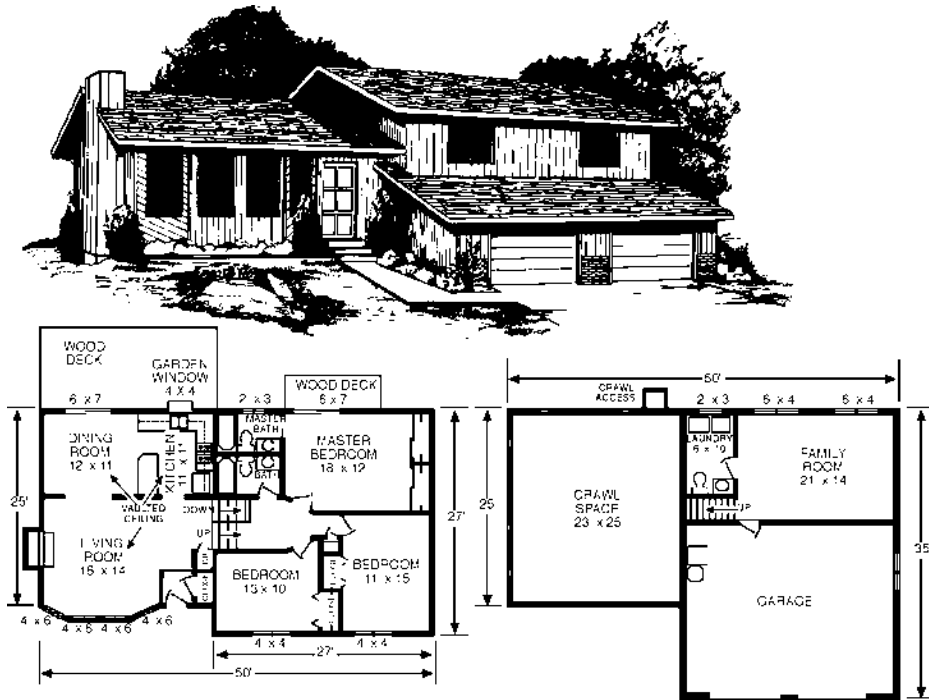


Figure 4. Example House

Table 5 lists the components that make up the building envelope, the dimensions of some of these components, and the proposed insulation R-values and window and door U-factors. Figure 5 shows how to determine the proposed and required R-values recorded on the *Prescriptive Package Worksheet*.

Table 5. Example House Specifications

Building Component	Area	Insulation Level
Ceilings		
With Attic (Std. Truss)	N/A	R-38
Vaulted	N/A	R-30
Walls (2x4 @ 16-in. O.C.)		
Without Sheathing(a)	276 ft <sup>2</sup> (gross)	R-13
With Sheathing	1647 ft <sup>2</sup> (gross)	R-19 (R-13 cavity + R-6 sheathing)
Windows	204 ft <sup>2</sup>	U-0.45
Sliding Glass Doors	84 ft <sup>2</sup>	U-0.61
Doors		
Entrance	N/A	U-0.54
Garage to Family Room	N/A	U-0.35
Floors		
Over Garage	N/A	R-19
Over Crawl Space	N/A	R-19
Slab (Unheated)	N/A	R-8 (24-in. depth)
Bay Window Floor	N/A	R-30
(a) Walls without sheathing are located between the family room and the garage, the laundry room and the crawl space, and the garage and the living room.		



## Determine Which Components are Part of the Building Envelope

The advantage of the prescriptive package approach over the trade-off approach and the software approach is that you are not required to know the areas of many of the building components (Table 1 lists only the areas that you will need). You **DO** need to compute a glazing area percentage, however, and this computation requires the gross wall area and total glazing area. Before you can determine the gross wall area of your building, you must first determine which walls are part of the building envelope and which are not. Only the building components that are part of the building envelope are relevant.

Building envelope components are those that separate conditioned spaces (heated or cooled rooms) from outside air or from unconditioned spaces (rooms that are neither heated nor cooled). Walls, floors, and other building components separating two conditioned spaces are **NOT** part of the building envelope.

**Walls** In this example, the garage is unconditioned, so the exterior garage walls are not part of the building envelope. The wall between the conditioned family room and the unconditioned garage is part of the building envelope, including the wall of the stairwell facing the garage. Likewise, the wall between the garage and the living room is part of the building envelope.

Part of the laundry room wall separates the laundry room from the crawl space and the other part separates the laundry room from the kitchen. The wall portion adjacent to the crawl space is part of the building envelope because it separates the conditioned laundry from the unconditioned crawl space. The wall portion adjacent to the kitchen can be ignored because it separates two conditioned spaces. The wall portion adjacent to the family room can also be ignored. Likewise, the wall between the upstairs bathrooms and the kitchen and the wall between the center bedroom and the living room are not part of the building envelope. Portions of both of these walls are also adjacent to outside air, and those portions are part of the building envelope. The following walls are part of the building envelope and their areas need to be included when computing the gross wall area:

- all walls between interior conditioned space and outside air
- the walls between the family room and the garage
- the walls between the garage and the living room
- the wall between the laundry room and the crawl space.

**Ceilings** The dining room, living room, bay window roof, and entryway have a vaulted ceiling that will be insulated to R-30. The rest of the home has a ceiling with attic which will be insulated to R-38.

**Floors** The floor of the bay window is considered a floor over outside air and must meet the ceiling R-value requirement. The floors over the garage and the crawl space are floors over unconditioned space, and must meet the floor R-value requirement. Because the floor over the crawl space is to be insulated, the crawl space is not part of the building envelope and the crawl space walls are not considered. The family room has a slab-on-grade floor which must meet the slab perimeter R-value requirement.

**Glazing and Doors** There are two sliding glass doors in the building envelope – one leading from the dining room to the larger deck and one leading from the master bedroom to the smaller deck. There are two opaque doors in the building envelope – the front entry door and the door leading from the garage into the family room.

## Complete the Required Section

Transfer all of the requirements specified by Package 4 to the right side of the *Prescriptive Package Worksheet* (in the *REQUIRED* section). Record the maximum allowed glazing area (15% in this example) in the space labeled *Maximum Glazing Area*. Transfer the R-value and U-factor requirements from the package to the boxes under the *Minimum R-Value* and *Maximum U-Factor* columns. Note that floors over outside air must meet the prescriptive package ceiling R-value requirement (R-30 in this example), so the ceiling requirement is listed across from the *Floor Over Outside Air* component. The U-factor requirement for all doors is 0.35, so this value has been entered on the worksheet for you (one door may be exempted from this requirement). Package 4 specifies *Normal* heating equipment efficiency, so place an "X" in the *Normal* box.

## Complete the Proposed R-Value Section

Record the R-values of the insulation that you intend to install in the *Proposed R-Value* column. These proposed values are listed in Table 5. The example house does not have a basement, so place "N/A" in the *Proposed R-Value* column for basement walls to indicate that they are not applicable. Although there is a crawl space, it is ventilated and the insulation will be installed on the floor over the crawl space, so place "N/A" in the *Proposed R-Value* column for crawl space walls as well.

**Ceiling R-Value** Two ceiling insulation R-values will be installed in the house. R-38 insulation is proposed for the flat ceiling below a vented attic and R-30 insulation is proposed for the vaulted ceiling. The selected package requires a minimum of R-30 ceiling insulation. Because the lowest proposed R-value (R-30 for the vaulted ceiling) is greater than or equal to the minimum required (also R-30), you may enter R-30 in the *Proposed R-Value* column for ceilings. You do not need to calculate an average R-value for ceilings. If the required ceiling R-value is greater than the R-value you plan to install in one part of the ceiling, but is less than the R-value you plan to install in another part of the ceiling, you may be able to meet or exceed the required ceiling R-value with the area-weighted average R-value. You can calculate this average R-value using the *R-Value/U-Factor Weighted Average Worksheet*.

R-30 insulation is proposed for the floor of the bay window (floors over outside air are subject to the ceiling R-value requirement). Enter R-30 in the *Proposed R-Value* column for floors over outside air.

**Wall R-Value** Most of the walls will be insulated with R-13 cavity insulation and covered with R-6 insulating sheathing. Cavity insulation and sheathing can be added together – in this case resulting in R-19. However, R-13 cavity insulation without sheathing will be installed on walls between

- the family room and the garage
- the laundry room and the crawl space
- the garage and the living room.

The selected package requires a minimum of R-13 wall insulation. Because the lowest proposed wall R-value (R-13) is greater than or equal to the minimum required (also R-13), you are not required to calculate an average R-value for walls. Enter R-13 in the *Proposed R-Value* column for walls.

**Floor R-Value** The floor above the crawl space and the floor over the garage are both floors over unconditioned space. Both of these floors will be insulated with R-19 batt insulation. Enter R-19 for the *Floor Over Unconditioned Space* component.

**Slab R-Value** Enter R-8 for the *Slab Floor* component. In the *Comments* column, indicate that the slab will be unheated. In all locations except Zone 1, heated slabs have more stringent requirements than unheated slabs (see Footnote 7). Also indicate the

depth of the insulation you intend to install (slab insulation must extend 24 in. in Zones 2-12 and 48 in. in Zones 13-19).

## Complete the Proposed U-Factor Section

**Glazing U-Factor** Two different glazing U-factors were proposed. The windows have a U-factor of 0.45 and the sliding glass doors have a U-factor of 0.61, both of which have been rated and labeled by the manufacturer in accordance with the NFRC test procedure. Because 0.61 is greater than the maximum U-factor specified in the package (0.50), you must calculate an area-weighted average U-factor. Complete the *R-Value/U-Factor Weighted Average Worksheet* and transfer the results to the *Prescriptive Package Worksheet*. Figure 5 shows the portion of the *R-Value/U-Factor Weighted Average Worksheet* used to calculate the average glazing U-factor for this house (0.50). If both proposed U-factors had been less than or equal to the required U-factor, then the weighted-average computation would not have been necessary and you could have recorded the higher of the two U-factors.

**Door U-Factor** The U-factor requirement for all opaque doors (regardless of the prescriptive package chosen) is 0.35. The entry door has a U-factor of 0.54 and the door from the garage to the family room has a U-factor of 0.35. Therefore, the entry door does not meet the U-factor requirement and the garage door does meet it exactly. On average, the proposed door U-factors will clearly not comply with this or any other package. However, one door may be exempted from this requirement (see Note b). This exemption allows one door to exceed the 0.35 U-factor requirement. Because the entry door of the example house may be exempted and the garage door complies, record the U-factor of the garage door (0.35) as the *Proposed U-Factor* for the *Door* component. If more than one door had exceeded the door U-factor requirement, an area-weighted average of all non-exempted doors would have been necessary to show compliance.

## Complete the Proposed Heating Efficiency Section

The selected package does not require high-efficiency equipment. You may leave this section blank.

## Check for Compliance

To verify compliance with the requirements of Prescriptive Package 4 for Zone 8, compare the *PROPOSED* and *REQUIRED* sections of the *Prescriptive Package Worksheet*.

- The *Proposed Glazing Area* is less than or equal to the allowed *Maximum Glazing Area*, and
- the *Proposed R-Values* for each of the building components are greater than or equal to the required *Minimum R-Values*, and
- the *Proposed U-Factors* for glazing and doors are less than or equal to the required *Maximum U-Factors*, and
- there are no equipment efficiency requirements.

You have demonstrated that your building design complies with the code insulation and window requirements (congratulations!). Sign and date the worksheet.

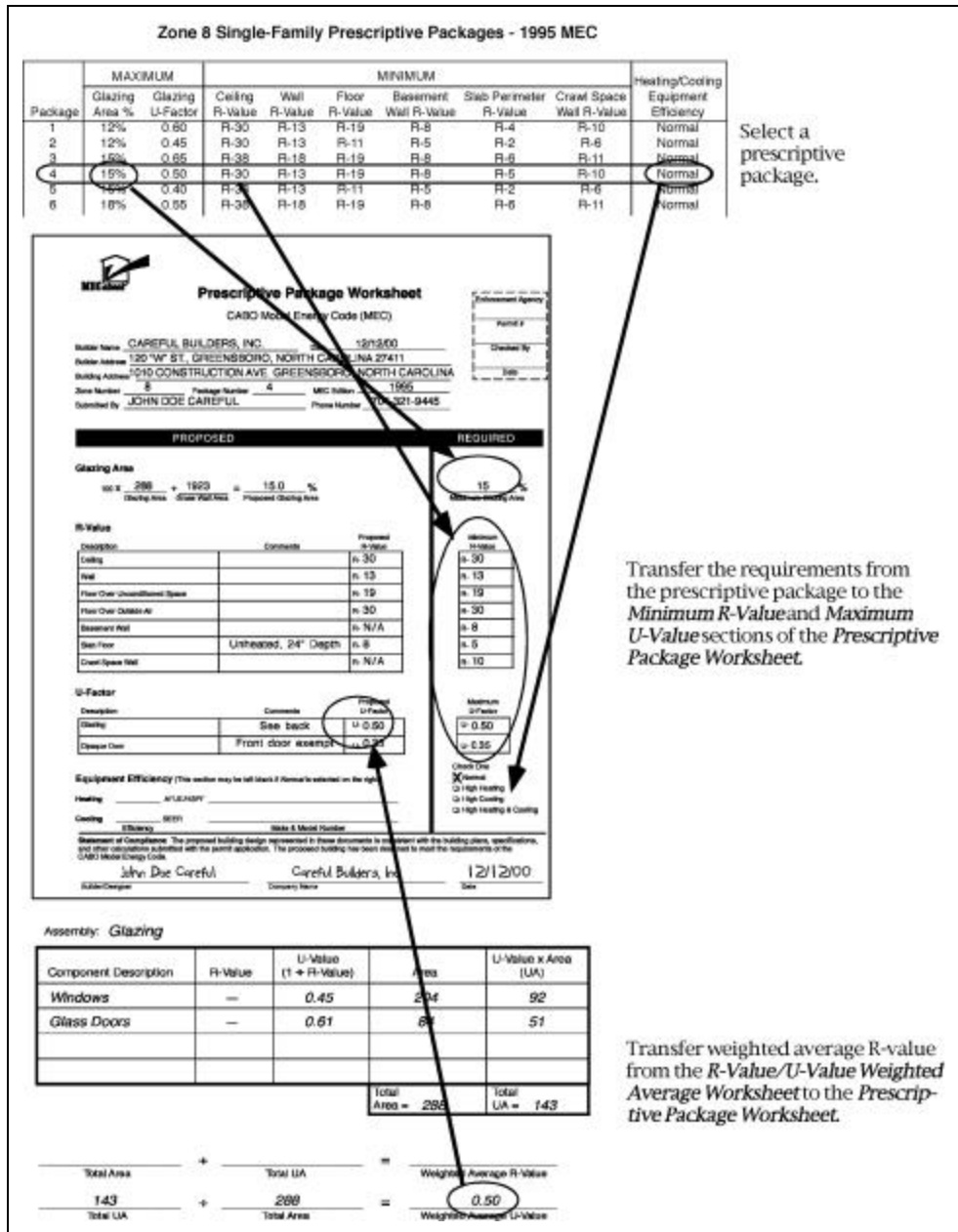


Figure 5. Determining Proposed and Required R-Values and U-Factors



# Prescriptive Package Worksheet

CABO Model Energy Code (MEC)

Enforcement Agency:
Permit #
Checked By
Date

Builder Name \_\_\_\_\_ Date \_\_\_\_\_  
 Builder Address \_\_\_\_\_  
 Building Address \_\_\_\_\_  
 Zone Number \_\_\_\_\_ Package Number \_\_\_\_\_ MEC Edition \_\_\_\_\_  
 Submitted By \_\_\_\_\_ Phone Number \_\_\_\_\_

## PROPOSED REQUIRED

### Glazing Area

$$100 \times \frac{\text{Glazing Area}}{\text{Gross Wall Area}} = \text{Proposed Glazing Area} \%$$

\_\_\_\_\_ %  
Maximum Glazing Area

### R-Value

Description	Comments	Proposed R-Value
Ceiling		R-
Wall		R-
Floor Over Unconditioned Space		R-
Floor Over Outside Air		R-
Basement Wall		R-
Slab Floor		R-
Crawl Space Wall		R-

Minimum R-Value
R-
R-
R-
R-
R-
R-
R-

### U-Factor

Description	Comments	Proposed U-Factor
Glazing		U-
Opaque Door		U-

Maximum U-Factor
U-
U- 0.35

### Equipment Efficiency (This section may be left blank if *Normal* is selected on the right.)

Heating \_\_\_\_\_ AFUE/HSPF \_\_\_\_\_  
 Cooling \_\_\_\_\_ SEER \_\_\_\_\_  
 Efficiency \_\_\_\_\_ Make & Model Number \_\_\_\_\_

- Check One
- Normal
  - High Heating
  - High Cooling
  - High Heating & Cooling

**Statement of Compliance:** The proposed building design represented in these documents is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the requirements of the CABO Model Energy Code.

Builder/Designer \_\_\_\_\_ Company Name \_\_\_\_\_ Date \_\_\_\_\_

# R-Value/U-Factor Weighted Average Worksheet



(optional)

Assembly:

Component Description	R-Value	U-Factor (1 ÷ R-Value)	Area	U-Factor x Area (UA)
			Total Area =	Total UA =

$$\frac{\text{Total Area}}{\text{Total UA}} = \text{Weighted Average R-Value}$$

$$\frac{\text{Total UA}}{\text{Total Area}} = \text{Weighted Average U-Factor}$$

Assembly:

Component Description	R-Value	U-Factor (1 ÷ R-Value)	Area	U-Factor x Area (UA)
			Total Area =	Total UA =

$$\frac{\text{Total Area}}{\text{Total UA}} = \text{Weighted Average R-Value}$$

$$\frac{\text{Total UA}}{\text{Total Area}} = \text{Weighted Average U-Factor}$$

## R-Value/U-Factor Weighted Average Worksheet: Examples

This worksheet can be used to calculate the average R-value of two or more building components of the same type but with different R-values, or to calculate the average U-factor of two or more glazing or door components with different U-factors.

**R-Value Example:** Our example has a ceiling with attic component insulated to R-38 and covering 729 ft<sup>2</sup>, and a vaulted ceiling component insulated to R-30 and covering 592 ft<sup>2</sup>. After entering these values and performing the indicated calculations, the weighted average R-value for these components is determined to be R-34.3. These two ceiling components, taken together, will meet the requirements of any prescriptive package that has a ceiling R-value requirement of R-34 or less.

Assembly: <i>Ceilings</i>				
Component Description	R-Value	U-Factor (1 ÷ R-Value)	Area	U-Factor x Area (UA)
<i>with Attic</i>	38	0.026	729	19.0
<i>Vaulted</i>	30	0.033	592	19.5
			Total Area = 1321	Total UA = 38.5

<u>1321</u>	+	<u>38.5</u>	=	<u>34.3</u>
Total Area		Total UA		Weighted Average R-Value

<u>143</u>	+	<u>288</u>	=	<u>0.50</u>
Total UA		Total Area		Weighted Average U-Factor

**U-Factor Example:** Our example house has two glazing components; windows with a U-factor of 0.45 and a combined area of 204 ft<sup>2</sup> and sliding glass doors with a U-factor of 0.61 and a total area of 84 ft<sup>2</sup>. After entering these values and performing the indicated calculations, the weighted average U-factor for these components is determined to be 0.50. These two glazing components, taken together, will meet the requirements of any prescriptive package that has a glazing U-factor requirement of 0.50 or higher.

Assembly: <i>Glazing</i>				
Component Description	R-Value	U-Factor (1 ÷ R-Value)	Area	U-Factor x Area (UA)
<i>Windows</i>	—	0.45	204	92
<i>Glass Doors</i>	—	0.61	84	51
			Total Area = 288	Total UA = 143

<u>143</u>	+	<u>288</u>	=	<u>0.50</u>
Total UA		Total Area		Weighted Average U-Factor

## Glazing Area/U-Factor Trade-Off Worksheet (optional)

The glazing area and U-factor requirements for any prescriptive package can be altered to better meet your building design. Any combination of area and U-factor that satisfies the following relationship can be used:

$$\text{New Area} \times \text{New U-Factor} \# \text{Package Area} \times \text{Package U-Factor}$$

Where *Package Area* and *Package U-Factor* are the area and U-Factor in the prescriptive package you have selected and *New Area* and *New U-Factor* are your altered glazing and U-factor combination.

Fill in the following blanks and attach this worksheet to the *Prescriptive Package Worksheet*. See the back side of this worksheet for examples.

Zone Number _____	Package Number _____	
MEC Edition _____		
Package Glazing Requirements:		
_____	X	_____ = _____
Glazing Area %		Glazing U-Factor      Package Glazing Total
New Glazing Requirements:		
_____	X	_____ = _____
Glazing Area %		Glazing U-Factor      New Glazing Total

}

*New Glazing Total must be less than or equal to Package Glazing Total.*



*Example 1 (based on 1995 Single Family Packages):*

Refer to the single family prescriptive packages for Zone 8. Package 3 lists a maximum glazing area percentage of 15% and a maximum U-factor of 0.65. The *Package Glazing Total* (area x U-factor) for this package is 9.8. Assume, however, that your building design calls for a glazing area of 17%. To determine the maximum allowable U-factor for a 17% glazing area, divide the *Package Glazing Total* by 17%:

$$\text{New Glazing U-Factor} = ( 15 \times 0.65 ) \div 17 = 0.57$$

The new glazing requirements are a glazing area percentage of 17% and a U-factor of 0.57.

Zone Number	<u>8</u>	Package Number	<u>3</u>	
MEC Edition	<u>1995</u>			
Package Glazing Requirements:				
<u>15</u>	x	<u>0.65</u>	=	<u>9.8</u>
Glazing Area %		Glazing U-Factor		Package Glazing Total
New Glazing Requirements:				
<u>17</u>	x	<u>0.57</u>	=	<u>9.7</u>
Glazing Area %		Glazing U-Factor		New Glazing Total

} *New Glazing Total must be less than or equal to Package Glazing Total.*

*Example 2 (based on 1995 Single-Family Packages):*

The *Glazing Area/U-Factor Trade-Off Worksheet* is also useful if you prefer to install windows with a U-factor that is different from the package requirement. As in the previous example, assume that you have selected Package 3 from Zone 8, but prefer to use windows with a U-factor of 0.72. To determine the maximum allowable area for windows with a U-factor of 0.72, divide the *Package Glazing Total* by 0.72:

$$\text{New Window U-Factor} = ( 15 \times 0.65 ) \div 17 = 0.57$$

The new glazing requirements are a glazing area percentage of 13.5% and a U-factor of 0.72.

Zone Number	<u>8</u>	Package Number	<u>3</u>	
MEC Edition	<u>1995</u>			
Package Glazing Requirements:				
<u>15</u>	x	<u>0.65</u>	=	<u>9.8</u>
Glazing Area %		Glazing U-Factor		Package Glazing Total
New Glazing Requirements:				
<u>13.5</u>	x	<u>0.72</u>	=	<u>9.7</u>
Glazing Area %		Glazing U-Factor		New Glazing Total

} *New Glazing Total must be less than or equal to Package Glazing Total.*