

Software User's Guide

1992, 1993, and 1995 MEC and 1998 IECC and 2000 IECC

Inside This Guide

- Software Overview
- Getting Started
- Project Folder
- Envelope Folder
- Mechanical Folder
- Menus
- Compliance Example

Software Overview

This user's guide describes how to use the MECcheck™ Software. MECcheck is designed to demonstrate compliance with the requirements of the Council of American Building Officials (CABO) Model Energy Code (MEC) and the International Code Council (ICC) International Energy Conservation Code (IECC). It is the most flexible approach for meeting the MEC insulation and window requirements (refer to the *Basic Requirements Guide* in the MECcheck *Workbook* for additional requirements that must also be satisfied). The MECcheck software runs on the Microsoft Windows operating system.

The MECcheck software demonstrates compliance with the 1992, 1993, and 1995 editions of the MEC, the 1998 and 2000 editions of the IECC, and the following state and county residential codes: Arkansas, Georgia, Massachusetts, Minnesota, New Hampshire, Vermont, Wisconsin, and Pima County, Arizona. The software enables you to quickly compare different insulation levels in different parts of your building to arrive at a package that works best for you. A report that can be submitted with your building plans for plan review is automatically generated.

MECcheck performs a simple U-factor x Area (UA) calculation for each building assembly to determine the overall UA of your building. The UA that would result from a building conforming to the code requirements is compared against the UA for your building. If the total heat loss (represented as a UA) through the envelope of your building does not exceed the total heat loss from the same building conforming to the code, then the software declares that you pass. A high-efficiency equipment trade-off can also be performed.

MECcheck is appropriate for insulation and window trade-off calculations in residential detached one- and two-family buildings (referred to as single-family buildings) and multifamily buildings (such as apartments, condominiums, townhouses, and rowhouses).

Multifamily buildings include residential buildings three stories or less in height with three or more attached dwelling units.

*New
Hampshire*

The New Hampshire Code applies to residential structures under four stories in height and commercial structures under 4,000 square feet.

Wisconsin

The Wisconsin Residential Code does not include multifamily buildings.

The MEC*check* software generates a report that lists the insulation and window levels of your proposed building, as well as the additional basic requirements found in the code. The *Basic Requirements Guide* covers these other requirements in detail.

Getting Started

Conventions Used in This Guide

The MEC*check* software can be used to demonstrate compliance with the 1992, 1993, and 1995 editions of the MEC and the 1998 and 2000 editions of the IECC. Although these codes are quite similar, there are some differences in the code requirements that occasionally must be reflected in the text of this user's guide. When a block of text or a table only applies to a certain edition of the code, the applicable year is printed in the margin to the left of the text or table in the printed materials.

Georgia

Code years or state names in italics indicate text is only applicable to the indicated code edition.

ALL
CAPITALS

ALL CAPITALS - File and directory names are capitalized.

Bold Italics

Bold Italics - Commands are shown in bold italics.

**Bold Initial
Caps**

Bold Initial Caps - The keys on your keyboard, such as **Tab** and **Shift+Tab**, are shown in bold initial caps. Some keyboard short cuts require you to hold down the **Alt** key while pressing another key. For example, you press **Alt+F** to select the *File* menu. In this guide, short cuts are shown in bold type.

Italics

Italics - An italic typeface is used to represent text as it appears on the screen in the program.

→

An arrow is used to indicate a sequence of menu and submenu selections, such as *Help*→*Help Topics*.

What you Need to Run MEC*check*

MEC*check* requires a Windows-based computer with at least the following hardware and software:

- an 80486 processor
- 6 MB extended RAM
- a VGA or Super VGA monitor
- a Microsoft-compatible mouse.

MEC*check* is a Windows application and requires Microsoft Windows 95, 98, 2000, or NT.

Installing MEC*check*

You must install MEC*check* onto your hard disk as instructed below. Before installing the software, make sure your computer meets the minimum hardware and software requirements.

To install MEC*check* from the CD-ROM:

1. Insert the CD into the CD drive of your computer. The Installation dialogs will automatically appear.
2. Follow the instructions on the screen.

If the installation dialogs do not appear:

1. Select the *Start* button and choose *Run* from the menu.
2. Type <source>\MECcheck\setup.exe (where <source> is the CD drive letter).
3. Click *OK* and follow the installation instructions.

Starting MECcheck

To run the MECcheck software after installation, select *Programs* from the *Start* button and select *MECcheck* from the programs list. Alternatively, if you are using Windows Explorer or File Manager, you can change to the MECcheck subdirectory and double-click on the MECcheck icon.

Screen Layout

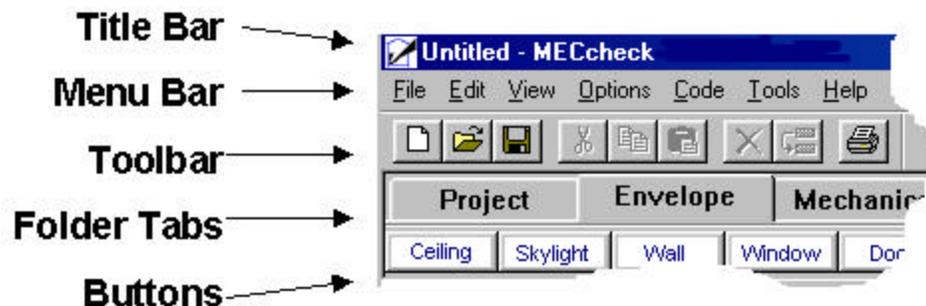
Title Bar - The title bar displays the name of the currently open project data file and the currently selected code. If no file is open, the word *Untitled* is displayed.

Menu Bar - The menu bar is located directly under the title bar and displays the available menus—*File*, *Edit*, *View*, *Code* and *Help*. These menus are discussed in more detail in the following sections.

Toolbar - The toolbar contains buttons with images representing some of the same options available in the menus.

Folder Tabs - The *Project*, *Envelope*, and *Mechanical* folder tabs are used to choose the respective screens.

Buttons - The buttons located directly under the *Envelope* and *Mechanical* folder tabs are used to create a list of building or HVAC components.



User Prompts and Status Messages - The bottom left corner of the screen displays prompts and status messages.

Compliance Status Bar

Max. UA

The *Max. UA* field displays the total UA of the code building (the house built to code requirements). To demonstrate compliance with the code, the UA of your house must be less than or equal to the UA displayed in this field.

Your UA

The field labeled *Your UA* displays the UA of your proposed building based on the building components you chose and the information you supplied about each of these components. The UA displayed in this field must be less than or equal to the UA displayed in the *Code UA* field to demonstrate compliance with the code.

% Better Than Code

MEC*check* compares the UA of your proposed house to the UA of the code house (the same house built to code requirements). This comparison is expressed as a percentage and displayed in the *% Better (Worse) Than Code* field. The percentage gives an indication of the amount by which your house exceeds or fails code requirements. A green percentage indicates that your home's heat loss is less than that of the code house. A red percentage indicates that your home's heat loss exceeds that of the code house.

Colors Used in the Software

Colors Used In Table Fields

Black on white text indicates the data is editable by the user.

Black on gray text indicates the data was calculated by the program and is not directly editable by the user.

Dark blue on white text indicates the data was selected from a drop down list. Clicking on such fields with the left mouse will re-display the appropriate list.

Red on white text indicates data is either missing or not within a valid range.

Colors Used In Compliance Fields

Red on white compliance results indicates the design does not comply.

Green on white compliance results indicates the design complies.

Table Columns and Rows

The *Envelope* and *Mechanical* screens have grid-like tables used to enter and store data. The rows and columns in the tables can be deleted, moved, collapsed and expanded.

Rows

Selecting Rows - To select a row, click on the tree label corresponding to that row or click on the leftmost column of that row (the column containing row numbers). The row will be reversed (black background) when correctly selected. You can also select multiple rows by holding down the left mouse button on the left-hand column and dragging it over the desired rows.

Moving Rows - Rows can be moved by:

1. selecting the row(s) to be moved (as described above),
2. releasing the mouse button,
3. clicking the mouse button on the leftmost column of any of the selected rows (a small box will appear at the tail end of the arrow cursor),
4. dragging the mouse to the new location – a thin red line will appear indicating where the row(s) should be placed,

5. releasing the mouse button when the red line has been placed in the desired location.



Arrow cursor when dragging rows or columns.

A single table row can also be moved by dragging the corresponding row label in the tree located to the left of the table. Click the mouse on the desired label and drag it to another label on the tree. After releasing the mouse, the dragged label (and row) will be positioned directly under the label on which it was dropped. Some restrictions apply to the placement of rows. In the *Envelope* screen, for example, window and door rows can only be placed under above-grade wall or basement wall rows. Skylight rows can only be placed under ceiling rows.

Collapsing and Expanding Rows - On the *Envelope* screen, rows can also be collapsed and expanded by using the tree located to the left of the table. Rows that fall below a "parent" row on the tree can be collapsed so they are not displayed. For example, an exterior wall row with several windows and doors under it can be collapsed to hide the windows and doors. A tree label with a minus sign to the left of the label is already expanded. It can be collapsed by clicking on the box containing the minus sign. Tree labels that are already collapsed have a plus sign to the left of the label. They can be expanded by clicking the box containing the plus sign. Clicking the plus or minus sign to the left of the *Building* label will expand or collapse all rows in the table.

Deleting Rows – Rows can be deleted by selecting the row or rows to be deleted and selecting *Delete Row(s)* from the *Edit* menu or selecting the delete rows icon from the toolbar.



Multiple consecutive rows can be selected by holding down the left mouse button on the left-hand column and dragging it over the desired rows. Non-consecutive rows can be selected by holding down the **Ctrl** key while clicking on the leftmost column of each row to be selected.

In the *Envelope* screen, if you delete a wall or basement row with windows or doors linked to it, the windows and doors will also be deleted. Likewise, deleting a ceiling row with a skylight linked to it will cause the skylight to be deleted as well.

Duplicating Rows – Rows can be duplicated by selecting the row or rows to be duplicated and selecting *Duplicate Row(s)* from the *Edit* menu or selecting the duplicate rows icon from the toolbar.



Multiple rows can be duplicated, but they must be consecutive.

Columns

Selecting Columns - Select a single column by clicking the left mouse button on the column heading. Select multiple columns by pressing the left mouse button and dragging it over the desired column headings. Selected columns will be reversed (black background).

Moving Columns - Columns can be moved by:

1. selecting the column(s) to be moved (as described above),
2. releasing the mouse button,
3. clicking the mouse button on the column heading of any of the selected columns (a small box will appear at the tail end of the arrow cursor),
4. dragging the mouse to the new location-a thin red line will appear indicating where the column(s) should be placed,

5. releasing the mouse button when the red line has been placed in the desired location.

Changing Column Widths - Table column widths can also be modified. To change the width of a column, move the mouse over the right edge of the corresponding column header until the mouse pointer changes to a double-sided arrow. 

When the mouse pointer changes, drag the column to the desired width. Columns that have been totally collapsed can be restored by double-clicking the mouse on the column header separation (the vertical line in the top row representing the hidden column).

Project Folder

Your building's location and construction type (single family or multifamily) are entered in the *Project* screen. MECcheck lists the cities or counties for each state. The location and construction type of your building are necessary for MECcheck to determine compliance. If this information is not accurate, the results will not be valid.

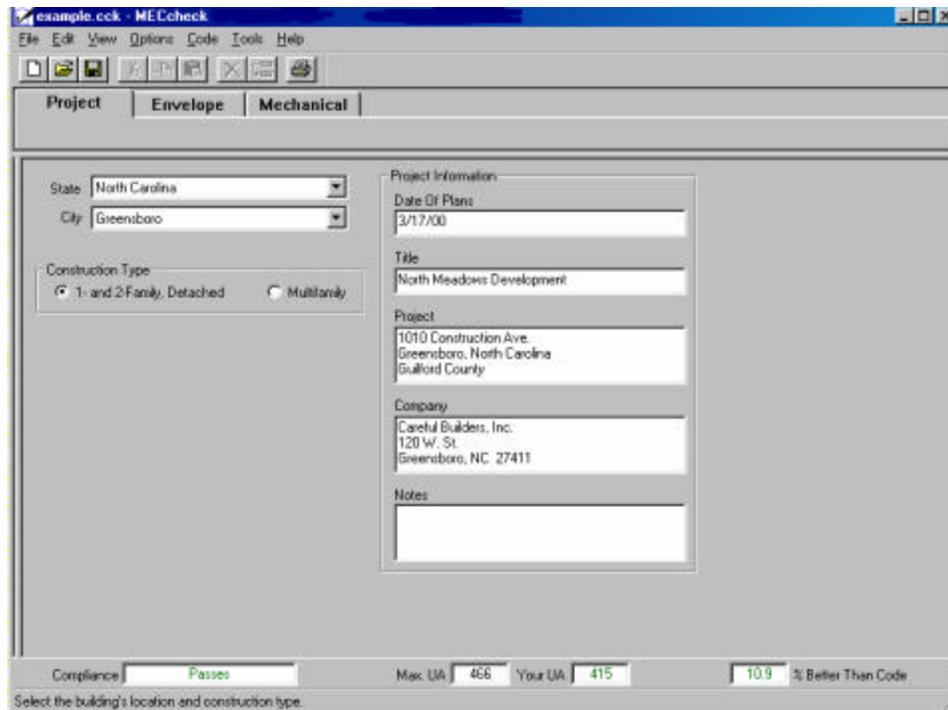
New Hampshire

The New Hampshire Code applies to residential structures under four stories in height and commercial structures under 4,000 square feet. Since the code is the same for all locations within the state, there are no entries for location or construction type.

Wisconsin

The Wisconsin Residential Code does not include multifamily buildings.

The *Project* screen also has input fields entitled *Date of Plans*, *Title*, *Project*, *Company*, and *Notes*. All of the information entered in these fields is included in your project report. None of this information is required by the software to determine compliance with the code. This information may be useful, however, to the building department or as a way to track and label your reports.



Project Folder

Whenever you exit *MECcheck*, the currently selected building location and construction type are saved. When re-entering the software, the location and construction type fields are automatically updated to reflect your last entries.

Project Folder Required Inputs

<i>State</i>	To choose a new state, select the arrow button to the right of the field. A list appears containing state names. If a state code is selected from the <i>Code</i> menu, the state corresponding to the new code will be the only one listed.
<i>City or County</i>	Each time you enter a new state, the list of cities or counties changes – reflecting only the cities or counties located in the new state. To choose a new location, select the arrow button to the right of the field. A list appears containing the names of cities or counties located in the selected state. If you cannot find the city in which your building will be located, choose a city that is close to your building site and has similar weather conditions.
<i>New Hampshire</i>	The New Hampshire state code is the same for the entire state. If you select <i>New Hampshire</i> from the <i>Code</i> menu, the <i>City/County</i> field will disappear.
<i>Construction Type</i>	The code specifies different requirements for 1- and 2-family detached (single family) buildings and multifamily buildings, so <i>MECcheck</i> must know which of these construction types you are going to build. You must select either the <i>1- and 2-Family, Detached</i> or the <i>Multifamily</i> button.
<i>New Hampshire</i>	The New Hampshire residential code applies to all residential structures under four (4) stories in height and commercial structures under 4,000 ft ² . It does not distinguish between single family and multifamily buildings. If you select <i>New Hampshire</i> from the <i>Code</i> menu, the <i>Construction Type</i> options will disappear.
<i>1- and 2-Family, Detached</i>	To choose single-family construction (defined as all detached one- and two-family dwellings), click on the <i>1- and 2-Family, Detached</i> radio button with the mouse.
<i>Multifamily</i>	To choose multifamily construction, click on the <i>Multifamily</i> radio button with the mouse. Multifamily buildings are three stories or less in height and contain three or more attached dwelling units. Apartments, condominiums, townhouses, dormitories, and rowhouses are included in this category. Multifamily buildings can be considered as a whole or separate reports can be generated for each dwelling unit. Where individual units are identical, one report may be submitted as representative of the others. Contact the authority having jurisdiction to determine which approach to take.
<i>Massachusetts Heating System Type</i>	If the dwelling is primarily heated with electric resistance heating, select the <i>Electric Resistance</i> button. If the dwelling is primarily heated with any other heating system, select the <i>Other</i> button. An electric heat pump is not electric resistance heating. The code has more stringent envelope requirements for single-family dwellings with electric resistance heating.
<i>Wisconsin Heating System Type</i>	The code has more stringent requirements for electrically heated homes. If the dwelling is primarily heated with electric heat (including electric heat pumps), select the <i>Electric</i> button. If the dwelling is primarily heated with any other non-electric heating system, select the <i>Non-Electric</i> button.
<i>Sustainable Energy Standard Conditioned Floor Area</i>	If you are determining compliance to the Sustainable Energy Standard, you must enter the conditioned floor area. If this information is not accurate, the results will not be valid. The conditioned floor area includes the gross area of all heated and/or cooled rooms, including the floor area of heated or cooled basements.

Project Folder Optional Inputs

<i>Date of Plans</i>	The <i>Date of Plans</i> field is used to record the date stamped on the building plans. This date can be used to track the plans on which the MECcheck documentation is based, in the event that the plans are later modified.
<i>Title</i>	The <i>Title</i> field is a single-line text field used to enter a project title. You can use the title to identify specific projects. This title is displayed at the top of your report.
<i>Project</i>	Enter a description of your project in the <i>Project</i> field (such as the project name and address).
<i>Company</i>	Enter a description of your company in the <i>Company</i> field (such as the name and address).
<i>Notes</i>	Enter any additional information in the <i>Notes</i> field.

Envelope Folder

Assembly	Gross Area or Slab Perimeter	Cavity Insulation R-Value	Continuous Insulation R-Value	U-Factor	UA	Depth of Insulation (ft)
1 Flat Ceiling or Scissor Truss	729 ft2	38.0	0.0	0.030	22	
2 Flat Ceiling or Scissor Truss	592 ft2	30.0	0.0	0.035	21	
3 Wood Frame, 16" o.c.	1647 ft2	13.0	6.0	0.061	62	
4 Glass	84 ft2			0.610	51	
5 Vinyl Frame, Double Pane with	204 ft2			0.450	82	
6 Solid	20 ft2			0.540	11	
7 Wood Frame, 16" o.c.	276 ft2	13.0	0.0	0.082	21	
8 Solid	18 ft2			0.350	6	
9 All-Wood Joist/Truss, Over Lh	938 ft2	19.0	0.0	0.047	44	
10 All-Wood Joist/Truss, Over Ou	32 ft2	30.0	0.0	0.033	1	
11 Unheated	82 ft		8.0	0.779	64	2.0

Envelope Folder

The blue-on-white buttons at the top of the *Envelope* screen are used for choosing the building components in your proposed design. You can select from buttons representing general building components – ceilings, walls, basement walls, windows, skylights, doors, floors, slab floors, and crawl space walls. When you select any of these buttons the component is added to the table on the *Envelope* screen. The table continues to grow as you add new components. You may add as many components as you need to describe your building, including multiple components of the same type. The status bar message at the bottom of the screen explains what type of information goes into the currently selected field.

After you have filled in the information about each component, the program computes the UA of your proposed building and the UA of the code building. The code building has the same dimensions as your building but conforms to the code requirements. If the total UA of your

building is less than or equal to the total UA of the code building, your building complies with the code and the *Compliance* field displays the message "Passes."

Ceilings

Ceilings include opaque portions of the building envelope that are above conditioned space and are horizontal or tilted at less than 60 degrees from horizontal.

Select the *Ceiling* button to add a ceiling component to the description of your design on the *Envelope* screen. Each unique ceiling assembly should be entered as a separate component, but multiple ceiling elements sharing the same construction may be entered as one component with appropriate total area.

Ceiling Types

After selecting the *Ceiling* button, a new ceiling assembly is added to the table and a popup menu is displayed in the *Assembly* field. Choose from the following ceiling types:

<i>Flat Ceiling or Scissor Truss</i>	Wood-frame ceiling structures with attics in which batt or loose-fill insulation is placed between and on top of structural ceiling members.
<i>Cathedral Ceiling (no attic)</i>	Sloped, wood-frame ceiling structures without attic spaces.
<i>Raised or Energy Truss</i>	Wood-frame ceiling structures with raised or oversized truss construction allowing the insulation to achieve its full thickness over the plate lines of exterior walls.
<i>Structural Insulated Panels (SIPs)</i>	Typically 4- to 6-in. stressed-skin panels with foam insulation sandwiched between oriented strand-board (OSB). For SIPs assemblies, you must provide the manufacturer-reported R-value in the <i>Continuous Insulation R-Value</i> field.
<i>Other</i>	Ceiling assemblies that do not fit into any of the other ceiling types, including steel-framed roofs. If you use the <i>Other</i> ceiling type, you must enter an overall U-factor for the entire ceiling assembly (including air films). Be prepared to provide the building department with manufacturers' literature or documentation of U-factor calculations.

Ceiling Software Inputs

<i>Gross Area</i>	Enter the gross area of the ceiling component in the <i>Gross Area or Perimeter</i> field. The gross ceiling area includes the area of all skylights within the ceiling. You must link the ceiling to the skylights within that ceiling by using the tree on the left side of the <i>Envelope</i> screen. To link a skylight to a ceiling assembly, drag the skylight label on the tree to the ceiling label and release the mouse. The ceiling area should be measured on the slope of the finished interior surface.
<i>Cavity Insulation R-Value</i>	Enter the R-value of any insulation to be installed in the cavities between ceiling structural members, including all blown insulation. The insulating values of other parts of the building assemblies (e.g., gypsum board and air films) are accounted for by the program and should not be included.
<i>Continuous Insulation R-Value</i>	Enter the R-value of any continuous ceiling insulation. Continuous insulation is insulation that runs continuously over structural members and is free of significant thermal bridging; such as rigid foam insulation above the ceiling deck. For ventilated ceilings, insulating sheathing must be placed between the conditioned space and the ventilated portion of the ceiling (typically applied to the trusses or rafters immediately behind the drywall or other ceiling finish material). For structural insulated panels, enter the manufacturer-reported R-value for the entire assembly.

*Assembly
U-Factor*

If you have selected the *Other* ceiling type option, enter the overall U-factor of the ceiling assembly including exterior and interior air films. Do not include the finished ceiling in the U-factor calculation if the space between ceiling and ceiling structure is used as an HVAC plenum. Building departments may require supporting documentation for assemblies entered using the *Other* ceiling type and *U-Factor* field.

Walls

Select the *Wall* button to add an above-grade wall component to the description of your design on the *Envelope* screen. Each unique above-grade wall assembly should be entered as a separate component, but multiple wall elements sharing the same construction may be entered as one component with appropriate total area.

Wall Types

*Wood
Frame, 16"
o.c.*

Wood frame walls with 16" on-center stud spacing. The category is intended primarily for lightweight walls but may also be used for walls with masonry veneers.

*Wood
Frame, 24"
o.c.*

Wood frame walls with 24-in. on-center stud spacing. The category is intended primarily for lightweight walls but may also be used for walls with masonry veneers.

*Steel
Frame, 16"
o.c.*

Steel frame (stud) walls of any gauge or depth, with 16" on-center stud spacing. The category is intended primarily for lightweight walls but may also be used for walls with masonry veneers.

*Steel
Frame, 24"
o.c.*

Steel frame (stud) walls of any gauge or depth, with 24" on-center stud spacing. The category is intended primarily for lightweight walls but may also be used for walls with masonry veneers.

*Solid
Concrete or
Masonry*

Solid precast or poured-in-place concrete as well as concrete masonry units with grouted cells. In making this selection, you must also indicate whether the insulation will be located on the interior or exterior of the wall. If insulation will be placed on both the interior and exterior of the wall, select the option corresponding to the larger insulative R-value. For example, if R-5 exterior sheathing will be used with R-13 interior cavity insulation on a furred concrete wall, select the *Interior Insulation* option. To receive full credit for light-weight (insulated) concrete walls, use the *Other* wall type.

*Masonry
Block with
Empty Cells*

Concrete masonry block units with at least 50% of the cells free of grout. In making this selection, you must also indicate whether the insulation will be located on the interior or exterior of the wall. If insulation will be placed on both the interior and exterior of the wall, select the option corresponding to the larger insulative R-value. To receive full credit for light-weight (insulated) concrete walls, use the *Other* wall type.

*Masonry
Block with
Integral
Insulation*

Concrete masonry block units with integral insulation, such as perlite or rigid foam inserts. Integral insulation means insulation placed within the cells. Selecting this wall type gives you credit for integral insulation. DO NOT enter values for cavity R-value and continuous R-value unless additional insulation will be installed. In making this selection, you must also indicate whether the additional insulation will be located on the interior or exterior of the wall. If additional insulation will be placed on both the interior and exterior of the wall, select the option corresponding to the larger insulative R-value. To receive full credit for light-weight (insulated) concrete walls, use the *Other* wall type.

<i>Log</i>	Walls constructed from 5" or larger diameter logs. <i>NOTE:</i> Concrete, masonry, and log walls with 7-in or larger diameter logs receive a mass wall credit in some locations. In order to qualify for this credit, the heat capacity of the exterior wall must be greater than or equal to 6 Btu/ft ² °F [123 kJ/m ² °K] of exterior wall area. Masonry and concrete walls having a mass greater than or equal to 30 lb/ft ² of exterior wall area (146 kg/m ²) will meet this requirement. Masonry and concrete walls with lesser mass should be entered as wood-framed walls. Log walls with 5-in and 6-in diameter logs may be entered as log walls, but will not receive the mass wall credit.
<i>Vermont</i>	The Vermont residential code has lesser overall thermal envelope requirements but greater heating system efficiency requirements for log wall homes. Contact the Department of Public Service to find out more about log homes and their requirements.
<i>Structural Insulated Panels (SIPs)</i>	Typically 4- to 6-in. stressed-skin panels with foam insulation sandwiched between oriented strand-board (OSB). For SIPs assemblies, you must provide the manufacturer-reported R-value in the <i>Continuous Insulation R-Value</i> field.
<i>Insulated Concrete Forms (ICFs)</i>	ICFs are insulating, stay-in-place forms for poured concrete walls. The forms, which remain a permanent part of the wall assembly, are either pre-formed interlocking blocks or separate panels connected with plastic ties. For ICF systems, you must provide the manufacturer-reported R-value in the <i>Continuous Insulation R-Value</i> field. This <i>R-Value</i> should include air films and all materials used in the assembly, including insulation but excluding soil effects. The effects of mortar joints and steel framing reinforcement that penetrates insulation must be included. The R-value of the insulation only may not be used. To determine the total assembly R-value, manufacturers may use the Series-Parallel method described in the ASHRAE Fundamentals Handbook, or may provide third-party independent test results from a physical testing laboratory. Acceptable physical testing procedures include ASTM C177, ASTM C518, ASTM C236 or ASTM C976. Tested R-value results should be included with permit submittals.
<i>Other</i>	Wall assemblies that do not fit into any of the other above-grade wall types. Also use the <i>Other</i> wall type to receive full credit for the extra insulative value of light-weight (insulated) concrete walls. You must enter an overall U-factor for the entire wall assembly (including air films). Be prepared to provide the building department with manufacturers' literature or documentation of U-factor calculations.
<i>Wisconsin</i>	Assembly U-factors entered under the <i>Other</i> wall type must be approved through the Department of Commerce.

Wall Software Inputs

<i>Gross Area</i>	Enter the gross area of the wall component in the <i>Gross Area or Perimeter</i> field. The gross wall area includes the area of all windows and doors within the wall. You must link the wall to the windows and doors within that wall by using the tree on the left side of the <i>Envelope</i> screen. To link a window or door to a wall, drag the window or door label on the tree to the wall label and release the mouse. The gross wall area also includes the peripheral edges of floors (the area of the band joist and subfloor between floors). The gross area of any individual wall of a conditioned basement with an average depth less than 50% below grade should be entered as a wall (not as a basement). In this case, the gross wall area includes the below-grade portion of the wall and the areas of doors and windows within those walls.
<i>Cavity Insulation R-Value</i>	Enter the R-value of any insulation to be installed in the cavities between above-grade wall structural members. The insulating values of other parts of the building assembly (e.g., gypsum board and air films) are accounted for by the program and should not be included.

<i>Continuous Insulation R-Value</i>	Enter the R-value of any continuous insulation in the above-grade wall. Continuous insulation is continuous over framing members or furring strips and is free of significant thermal bridging. The R-values of other parts of the building assembly (e.g., gypsum board and air films) are accounted for by the program and should not be entered. Insulating sheathing installed on the exterior of above-grade walls is an example of continuous insulation. For structural insulated panels and insulated concrete forms, enter the manufacturer-reported R-value for the entire assembly.
<i>Assembly U-Factor</i>	If you have selected the <i>Other</i> wall type, enter the overall U-factor of the above-grade wall assembly including exterior and interior air films. Building departments may require supporting documentation for assemblies entered using the <i>Other</i> wall type and <i>U-Factor</i> field.

Windows

Windows are defined as any transparent or translucent section in an exterior building wall including glass block but excluding glass doors (which are entered using the *Door* button). Glazing having a slope greater than 60 degrees from horizontal is considered a window while glazing having a slope less than 60 degrees from horizontal is considered a skylight.

Select the *Window* button to add a window component to the description of your design on the *Envelope* screen. Each unique window assembly should be entered as a separate component, but multiple window elements having the same characteristics may be entered as one component with an appropriate total area.

Windows must be linked to their corresponding wall component. Link a window to a wall by using the tree on the left side of the *Envelope* screen. Drag the window or door label on the tree to the wall label and release the mouse. Windows in the exterior walls of conditioned basements should be included in the table and should be linked to their corresponding basement wall assembly. Windows in unconditioned basements are *NOT* included.

Window Types

<i>Frame Type</i>	The frame type enables you to identify the window frame material. Use <i>Other</i> for frame types that do not fit into any of the other frame types.
<i>Glazing Layers</i>	The glazing layers enables you to identify the number of glazing layers in the windows (i.e., single, double, or triple). <i>Double Pane with Low-E</i> is included because the performance impact of low-emissivity films is similar to that of additional glass layers.

Window Software Inputs

<i>Gross Area</i>	Enter the area of the entire window component in square feet. Window area is the interior surface area of the entire assembly, including glazing, sash, curbing, and other framing elements. The nominal area or rough opening is also acceptable for flat windows.
<i>U-Factor</i>	Enter the U-factor for each component in its corresponding <i>U-Factor</i> field. U-factors for glazing must be tested and documented by the manufacturer in accordance with the NFRC test procedure or taken from the default glazing U-factors table in Appendix B. Center-of-glass U-factors cannot be used.
<i>Minnesota</i>	The Minnesota residential code further requires that the area-weighted average U-factor of all foundation windows 5.6 ft^2 and less not exceed 0.51. The area-weighted average U-factor of all skylights may not exceed 0.55. The area-weighted average U-factor for all other windows and sliding glass doors may not exceed 0.37.

Skylights

Skylights are defined as any transparent or translucent section in a building ceiling. Glazing having a slope less than 60 degrees from horizontal is considered a skylight, while glazing having a slope greater than 60 degrees from horizontal is considered a window.

Select the *Skylight* button to add a skylight component to the description of your design on the *Envelope* screen. Each unique skylight assembly should be entered as a separate component, but multiple skylight elements having the same characteristics may be entered as one component with the appropriate total area.

Skylights must be linked to their corresponding ceiling component. Link a skylight to a ceiling by using the tree on the left side of the *Envelope* screen. Drag the skylight label on the tree to the ceiling label and release the mouse.

Skylight Types

<i>Frame Type</i>	The frame type enables you to identify the skylight frame material. Use <i>Other</i> for frame types that do not fit into any of the other frame types.
<i>Glazing Layers</i>	The glazing layers enables you to identify the number of glazing layers in the skylights (i.e., single, double, or triple). <i>Double Pane with Low-E</i> is included because the performance impact of low-emissivity films is similar to that of additional glass layers.

Skylight Software Inputs

<i>Gross Area</i>	Enter the area of the entire skylight component in square feet. Skylight area is the interior surface area of the entire assembly, including glazing and framing elements. The nominal area or rough opening is also acceptable.
<i>U-Factor</i>	Enter the U-factor for each component in its corresponding <i>U-Factor</i> field. U-factors for glazing must be tested and documented by the manufacturer in accordance with the NFRC test procedure or taken from the default glazing U-factors table in Appendix B. Center-of-glass U-factors cannot be used.

Doors

Select the *Door* button to add a door component to the description of your design on the *Envelope* screen. Each unique door assembly should be entered as a separate component, but multiple door elements sharing the same construction may be entered as one component with the appropriate total area.

Door Types

<i>Solid</i>	Exterior doors that are mostly opaque (i.e., glass covers 50% or less of the door's area).
<i>Glass</i>	Exterior doors that are mostly glazed (i.e., glass covers more than 50% of the door's area).
<i>Other</i>	Exterior doors that do not fit into any of the other door types. You must enter a U-factor and you should be prepared to provide the building department with manufacturers' literature or documentation of U-factor calculations.

Sidelites: Decorative door sidelites can be included with the door area and U-factor if an aggregate U-factor is known for the entire assembly (the door plus all sidelites). If the U-factor rating does not include the sidelites, enter the sidelites separately as windows and use a default glazing U-factor from the table in Appendix B.

Door Software Inputs

<i>Gross Area</i>	Enter the total area of the door in square feet including any glazed portions. The nominal area or rough opening is also acceptable.
-------------------	--

U-Factor

Door U-factors must be tested and documented by the manufacturer in accordance with the NFRC test procedure or taken from the default door U-factors table in Appendix B.

If the door is rated with an aggregate R-value (an R-value that includes both the glass and opaque area), the following equation applies:

$$U\text{-Factor} = \frac{1}{R\text{-Value}}$$

If an opaque door contains glass and an aggregate R-value or U-factor rating for that door is not available, enter the door's glass area as a separate glazing component, enter the opaque area as an opaque door component, and enter an opaque door U-factor taken from the table in Appendix B. The U-factors listed in Appendix B are only for doors without glass.

Basements

Any individual wall of a conditioned basement with an average depth 50% or more below grade should be entered using the Basement button. Walls of conditioned basements with an average depth LESS than 50% below grade should be entered as an above-grade wall using the Wall button.

Select the *Basement* button to add a basement wall component to the description of your design on the *Envelope* screen. Each unique basement wall assembly should be entered as a separate component, but multiple basement wall elements sharing the same construction may be entered as one component with the appropriate total area.

2000 IECC

The 2000 IECC requires exterior foundation wall insulation to have a rigid, opaque, and weather-resistant covering that prevents the degradation of the insulation's performance. The protective covering must cover the exposed (above-grade) area of the insulation and extend to a minimum of 6 in. (153 mm) below grade. This requirement exists in the 2000 IECC.

Basement Wall Types

Solid Concrete or Masonry

Solid precast or poured-in-place concrete as well as concrete masonry units with grouted cells. To receive full credit for light-weight (insulated) concrete walls, use the *Other* basement wall type.

Masonry Block with Empty Cells

Concrete masonry block units with at least 50% of the cells free of grout. To receive full credit for light-weight (insulated) concrete walls, use the *Other* basement wall type.

Masonry Block with Integral Insulation

Concrete masonry block units with integral insulation, such as perlite or rigid foam inserts. Integral insulation means insulation placed within the cells. Selecting this wall type gives you credit for integral insulation. DO NOT enter values for cavity R-value and continuous R-value unless additional insulation will be installed. To receive full credit for light-weight (insulated) concrete walls, use the *Other* basement wall type.

Wood Frame

Wood-frame walls with any stud spacing.

Insulated Concrete Forms (ICFs)

ICFs are insulating, stay-in-place forms for poured concrete walls. The forms, which remain a permanent part of the wall assembly, are either pre-formed interlocking blocks or separate panels connected with plastic ties. For ICF systems, you must provide the manufacturer-reported R-value in the *Continuous Insulation R-Value* field. The *Assembly R-Value* should include air films and all materials used in the assembly, including insulation but excluding soil effects. The effects of mortar joints and steel framing reinforcement that penetrates insulation must be included. The R-value of the insulation only may not be used. To determine the total assembly R-value, manufacturers may use the Series-Parallel method described in the ASHRAE Fundamentals Handbook, or may provide third-party independent test results from a physical testing laboratory. Acceptable physical testing procedures include ASTM C177, ASTM C518, ASTM C236 or ASTM C976. Tested R-value results should be included with permit submittals.

Other

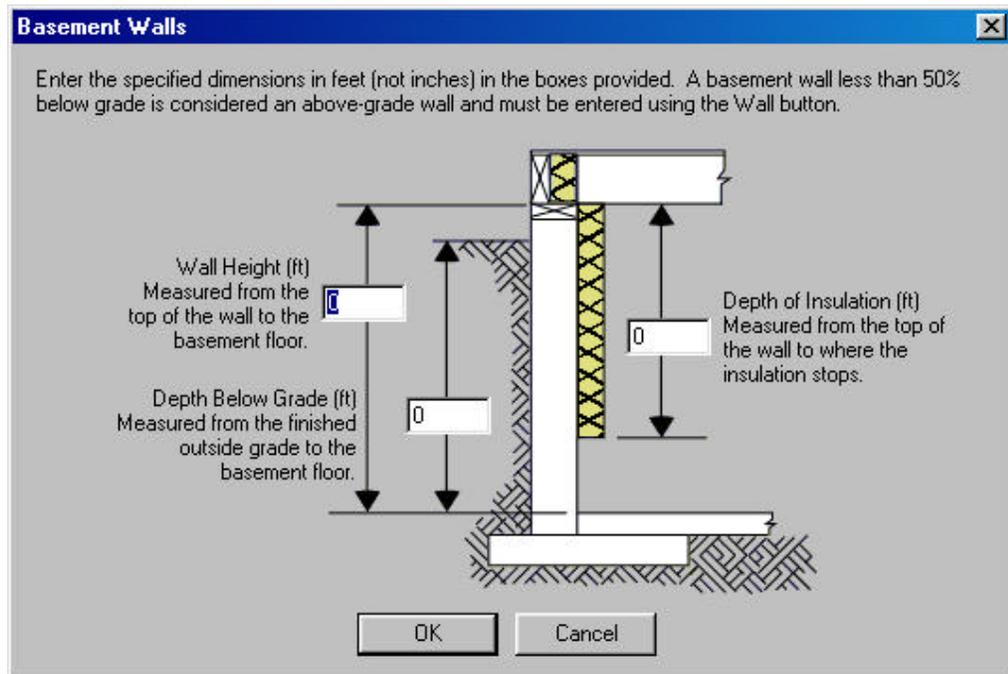
Basement wall assemblies that do not fit into any of the other basement wall types. Also use the *Other* basement wall type to receive full credit for the extra insulative value of light-weight (insulated) concrete walls. If you use the *Other* basement wall type, you must enter an overall U-factor for the entire wall assembly (including interior air film but excluding earth). Be prepared to provide U-factor calculations or documentation from manufacturer's literature to the building department.

Wisconsin

Assembly U-factors entered under the *Other* wall type must be approved through the Department of Commerce.

Basement Software Inputs

After selecting a basement wall type, a basement wall illustration will appear with input boxes for the basement wall height, depth below grade, and depth of insulation. The illustration helps identify the dimensions being requested. You may enter basement wall dimensions directly into this illustration and select the *OK* button to have them transferred to the corresponding row in the table on the *Envelope* screen. If you prefer to enter the dimensions directly into the table on the *Envelope* screen, you can select *Cancel* to remove the illustration without entering dimensions. To view the basement wall illustration and inputs at a later time, click the right-mouse button anywhere on the basement row and select *Edit Basement Inputs* from the popup menu.



<i>Wall Height (ft)</i>	Provide the height of the wall (ft) as measured from the top of the wall to basement floor. If the height is not uniform, provide an average height. If you are entering a partial basement wall component (such as wood kneewalls), enter the height of the wall section instead of the height of the entire wall.
<i>Depth Below Grade (ft)</i>	Provide the depth (ft) that the wall extends from the finished outside grade surface to the basement floor. If the grade is sloped or uneven, provide an average depth below grade. If you are entering a partial basement wall component (such as wood kneewalls), enter the depth below grade of the wall section instead of the depth below grade of the entire wall. For wood kneewalls, the wall section may be entirely above grade, in which case you would enter 0.
<i>Depth of Insulation (ft)</i>	Basement insulation requirements are for the full depth of the basement wall (up to 10 ft). MECcheck, however, allows the depth of the basement wall insulation to be traded against other envelope components. Therefore, you must indicate the depth (ft) of the insulation you intend to install on your basement wall as measured from the top of the wall to where the insulation stops. The insulation must extend from the top of the basement wall downward to a depth equal to the value entered in this field. Note that for a fully insulated wall the depth of insulation should be equal to the height of the wall. For basement walls with non-uniform insulation depths, enter an average. MECcheck accepts basement insulation depths from 0 to 12 ft. If you enter an insulation depth of 0, the program assumes no insulation is installed regardless of the values in the <i>Cavity Insulation R-Value</i> and <i>Continuous Insulation R-Value</i> fields.
<i>Gross Area</i>	Enter the gross area of the basement wall component in the <i>Gross Area or Perimeter</i> field. The gross basement wall area includes the area of all windows and doors within the wall. You must link the wall to the windows and doors within that wall by using the tree on the left side of the <i>Envelope</i> screen. To link a window or door to a wall, drag the window or door label on the tree to the wall label and release the mouse. The gross area of any individual wall of a conditioned basement with an average depth less than 50% below grade should be entered as a wall (not as a basement).
<i>Cavity Insulation R-Value</i>	If the basement will be furred, provide the R-value of the insulation to be installed between furring in the <i>Cavity Insulation R-Value</i> field. Do not include the R-value of other materials (such as interior drywall).
<i>Continuous Insulation R-Value</i>	Enter continuous insulation in the <i>Continuous Insulation R-Value</i> field. Continuous insulation includes exterior rigid foam products and any continuous insulation installed on the exterior or interior of an unfurred basement wall. For ICFs, enter the manufacturer-reported R-value for the entire assembly in the <i>Continuous Insulation R-Value</i> field.
<i>Georgia</i>	The Georgia Residential Code does not allow below-grade exterior foam plastics. If a non-zero value is entered in the <i>Continuous Insulation R-Value</i> field, the output report will identify this entry as interior continuous insulation.
<i>Minnesota</i>	R-5 is the minimum basement wall insulation R-value allowed by the Minnesota residential code.

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.

Create one basement wall component for the wood kneewalls and enter the following information:

- Wall Height 3 ft.
- Depth B.G. 0 ft.
- Depth of Insul 3 ft.

Create a second basement wall component for the concrete foundation and enter the following information:

- Wall Height 5 ft.
- Depth B.G. 4 ft.
- Depth of Insul 5 ft.

Two basement wall components will be added to your list of building components. Provide the gross wall area of the wood kneewalls and enter the insulation R-value as R-13 in the *Cavity Insulation R-Value* field. Provide the gross wall area of the concrete foundation walls and enter the cavity R-value as R-5 in the *Continuous Insulation R-Value* field.

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 cavity insulation. The other three walls will be concrete walls with R-10 rigid insulation. All four walls will be fully insulated.

Create one basement component for the front wall and enter the following information:

- Wall Height 8 ft.
- Depth B.G. 7 ft.
- Depth of Insul 8 ft.

The two side walls are at least 50% below grade, so they are entered as a basement wall component. If they were less than 50% below grade, they would be entered as an above-grade wall component. Therefore, create a second basement wall component for the two side walls and enter the following information:

- Wall Height 8 ft.
- Depth B.G. 4 ft.
- Depth of Insul 8 ft.

The rear wall is fully above grade and should be entered as an above-grade wall using the *Wall* button. Note that the basement floor along this wall should be considered a slab-on-grade component. Create a slab component using the *Slab* button and enter the length of the basement floor along this wall in the *Gross Area or Perimeter* field.

Example 3: Below-Grade Exterior Insulation

An 8-ft. high by 21-ft. wide foundation wall is 7 ft. below grade and is to be insulated using R-5 exterior rigid foam. The insulation will start at grade level and run down to the bottom of the foundation wall. There is 1 foot of uninsulated exposed above-grade wall. The wall has no openings.

This wall is entered in MECcheck by creating two basement wall components. The first component will be used for entering the uninsulated above-grade portion of the wall.

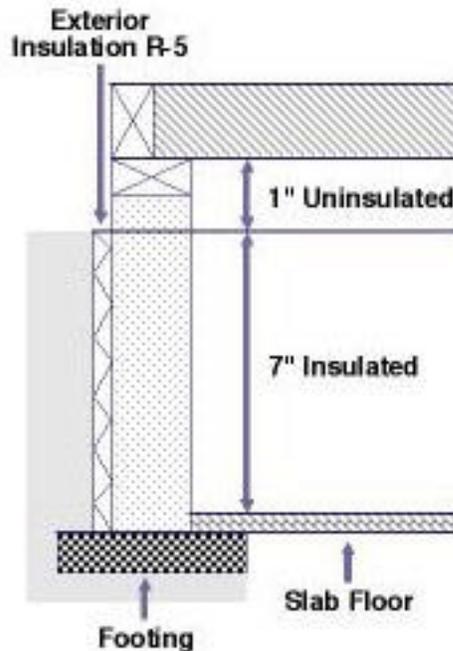
Select the *Basement* button and enter the following information:

- Wall Height 1 ft.
- Depth B.G. 0 ft.
- Depth of Insul 0 ft.

The second component will be used for entering the insulated below-grade portion of the wall. Select the *Basement* button again and enter the following information:

- Wall Height 7 ft.
- Depth B.G. 7 ft.
- Depth of Insul 7 ft.

After these components have been created, enter the gross area of each component and the R-value of the insulation used on the below-grade component.



Example 4: Draped Interior Insulation

Some builders choose to insulate the interior of basement walls with faced insulation batts. Some products have reinforced stapling tabs at the top and bottom of the batts for installation on furring strips using a hammer-stapler. They might also be power-nailed directly to a solid concrete or block wall or installed on pins glued directly to the foundation wall. The batts typically come in 4-ft. wide rolls, and are sometimes installed on only the top four feet of the wall.

A solid concrete basement has 10-ft. high walls and is buried 9 ft. below grade. Foil faced, R-11 basement batt insulation is to be installed on the first four feet of the interior of the basement walls. Select the *Basement* button, select the *Solid Concrete or Masonry* option, and enter the following information:

- Wall Height 10 ft.
- Depth B.G. 9 ft.
- Depth of Insul 4 ft.

With these inputs, the software will assume the lower 6 ft. of the wall is uninsulated. The R-value of the uninsulated concrete wall is provided by the software and should not be entered by the user. After the basement component has been created, enter the sum of the gross area of all

exterior basement walls in the *Gross Area or Perimeter* field and enter the assembly R-value (R-11) in the *Continuous Insulation R-Value* field. Note that the gross area equals the sum of the insulated and uninsulated areas.

Floors

Select the *Floor* button to add a floor component to the description of your design on the *Envelope* screen. Each unique exposed floor assembly should be entered as a separate component, but multiple floor elements sharing the same construction may be entered as one component with the appropriate total area.

Floor Types

<i>All-Wood Joist/Truss</i>	Any structural wood floor in which insulation is placed between the structural members; e.g., batt insulation between wood floor joists.
<i>Structural Insulated Panels (SIPs)</i>	Typically 4- to 6-in. stressed-skin panels with foam insulation sandwiched between oriented strand-board (OSB). For SIPs assemblies, you must provide the manufacturer-reported R-value in the <i>Continuous Insulation R-Value</i> field.
<i>Other</i>	Floor assemblies that do not fit into any of the other floor types. You must enter an overall U-factor for the entire floor assembly (including air films). Be prepared to provide the building department with manufacturers' literature or documentation of U-factor calculations.
<i>Floor Location</i>	For all floor types you must also indicate whether the floor is located over an unconditioned space or over outside air. Floors over unconditioned space include all floors over unconditioned (neither heated nor cooled) basements, crawl spaces, and garages. Floors over outside air include floor cantilevers, floors of an elevated home, and floors over overhangs (such as the floor directly above a recessed entryway or open carport). Floors over heated spaces are not part of the building envelope and should not be included. Concrete slab-on-grade floors are entered separately using the <i>Slab</i> button.

Floor Software Inputs

<i>Gross Area</i>	Enter the gross area of the floor (in square feet) along the boundary where it separates conditioned from unconditioned space.
<i>Cavity Insulation R-Value</i>	Enter the R-value of any insulation to be installed in the cavities between floor structural members. The insulating values of other parts of the building assembly (e.g., subfloor and air films) are accounted for by the program.
<i>Continuous Insulation R-Value</i>	Enter the R-value of any continuous floor insulation. Continuous insulation is insulation that runs continuously over structural members and is free of significant thermal bridging. The insulating values of other parts of the building assembly (e.g., subfloor and air films) are accounted for by the program.
<i>Assembly U-Factor</i>	If you have selected the <i>Other</i> floor type option, you must enter the overall U-factor of the floor assembly including exterior and interior air films. Building departments may require supporting documentation for assemblies entered using the <i>Other</i> floor type and <i>U-Factor</i> field.

Slab Floors

Select the *Slab* button to add a concrete slab-on-grade component to the description of your design on the *Envelope* screen. Slab-on-grade components include all slab edges that are part of the building envelope and are less than 12 in. below grade (i.e., all edges separating conditioned from unconditioned space). Edges of slab floors over 12 in. below grade (such as basement floors) are not subject to code requirements and do not need to be entered in the software. Each unique concrete slab/insulation combination (i.e., insulation R-value and

depth) should be entered separately, but all slabs sharing insulation methods may be entered as a single component with the appropriate total perimeter length.

2000 IECC The 2000 IECC requires slab perimeter insulation to have a rigid, opaque, and weather-resistant covering that prevents the degradation of the insulation's performance. The protective covering must cover the exposed (above-grade) area of the insulation and extend to a minimum of 6 in. (153 mm) below grade. This requirement exists in the 2000 IECC.

Slab Types

Unheated A slab that is not heated (see below).

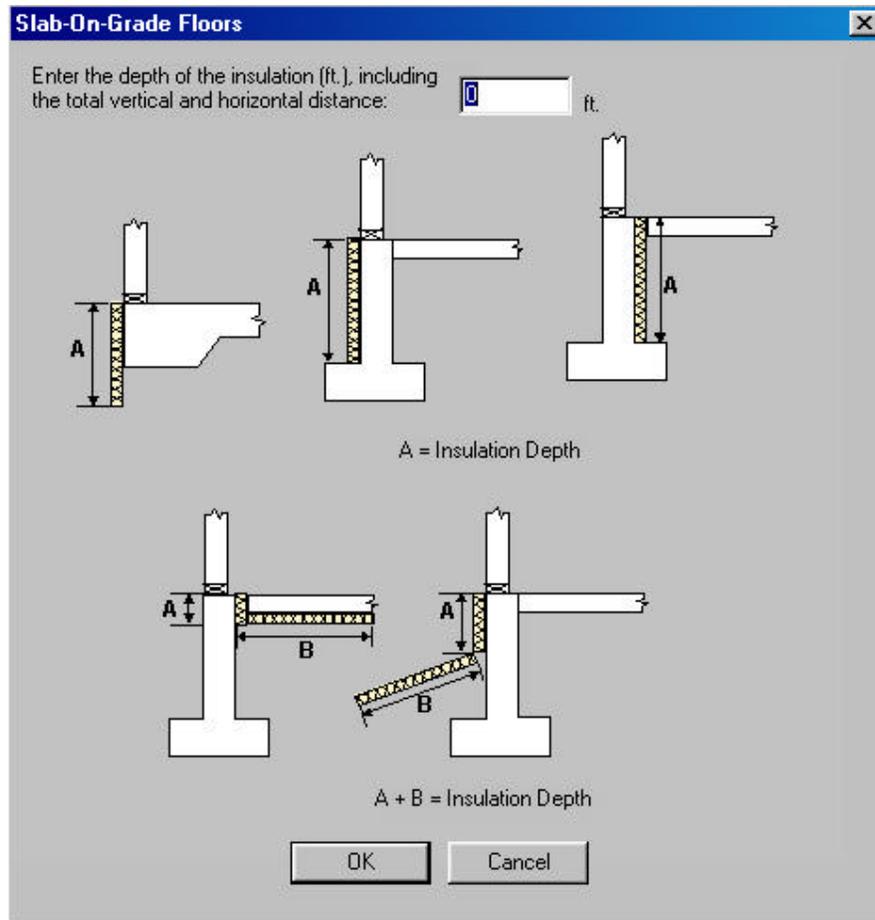
Heated A heated slab is one in which the heating elements or hot air distribution system is in contact with or placed within the slab or the subgrade. Heated slabs have higher insulation requirements than unheated slabs under the code.

Georgia The Georgia Residential Code does not allow below-grade exterior foam plastics, but does give some credit for carpet or hardwood on plywood applied to slab floors. If the code is set to *Georgia*, you will also be asked to indicate whether the slab is covered with either of these treatments.

Minnesota R-5 is the minimum slab perimeter insulation R-value allowed by the Minnesota residential code.

Slab Software Inputs

After selecting a slab type, an illustration of various slab configurations will appear with an input box for the depth of insulation. The illustration helps identify the dimension being requested for various insulation configurations. You may enter the depth of insulation directly into this illustration and select the *OK* button to have it transferred to the corresponding row in the table on the *Envelope* screen. If you prefer to enter the insulation depth directly into the table on the *Envelope* screen, you can select *Cancel* to remove the illustration without entering a value. To view the slab illustration at a later time, click the right-mouse button anywhere on the slab row and select *Edit Slab Input* from the popup menu.



Depth of Insulation

Enter the depth (ft) of the insulation you intend to install as measured from the top of the slab to where the insulation stops. This distance should include the total vertical plus horizontal distance. Refer to the glossary definition of *Slab Insulation* for a description and illustration of acceptable configurations. If you enter a depth of 0, the program assumes no insulation is to be installed.

Perimeter

Enter the perimeter of the on-grade slab component in feet in the *Gross Area or Perimeter* field. The slab perimeter should include the length of all edges of a slab foundation that are part of the building envelope and are less than 12 in. below grade.

Continuous R-Value

Enter the R-value of the slab perimeter insulation.

Georgia

The Georgia Residential Code does not allow below-grade exterior foam plastics. The *Continuous Insulation R-Value* field is disabled when the code is set to *Georgia*.

Crawl Space Walls

The crawl space wall option is for walls of unventilated crawl spaces (i.e. not directly vented to the outside). If you are insulating the floor above the crawl space, do not use the crawl space walls option.

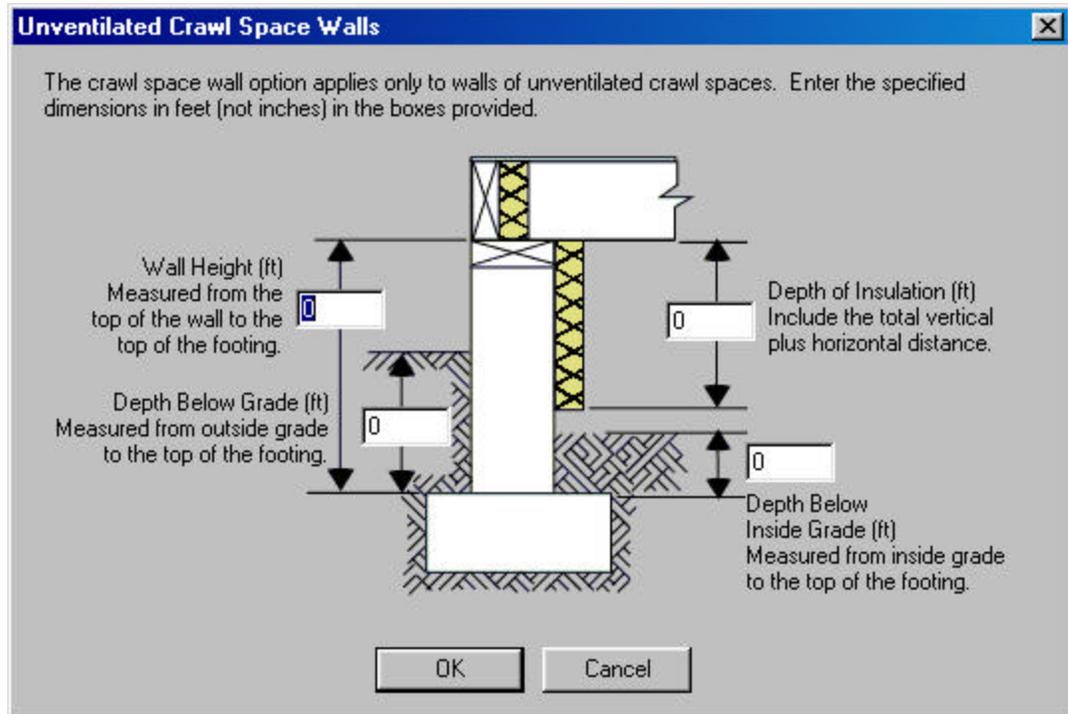
Select the *Crawl* button to add a crawl space wall component to the description of your design on the *Envelope* screen. Each unique crawl space wall assembly should be entered as a separate component, but multiple crawl space wall elements sharing the same construction may be entered as one component with the appropriate total area.

Crawl Space Wall Types

<i>Solid Concrete or Masonry</i>	Solid precast or poured-in-place concrete as well as concrete masonry units with grouted cells. To receive full credit for light-weight (insulated) concrete walls, use the <i>Other</i> crawl space wall type.
<i>Masonry Block with Empty Cells</i>	Concrete masonry block units with at least 50% of the cells free of grout. To receive full credit for light-weight (insulated) concrete walls, use the <i>Other</i> crawl space wall type.
<i>Masonry Block with Integral Insulation</i>	Concrete masonry block units with integral insulation, such as perlite or rigid foam inserts. Integral insulation means insulation placed within the cells. Selecting this wall type gives you credit for integral insulation. DO NOT enter values for cavity R-value and continuous R-value unless additional insulation will be installed. To receive full credit for light-weight (insulated) concrete walls, use the <i>Other</i> crawl space wall type.
<i>Wood Frame</i>	Wood-frame walls with any stud spacing.
<i>Insulated Concrete Forms (ICFs)</i>	ICFs are insulating, stay-in-place forms for poured concrete walls. The forms, which remain a permanent part of the wall assembly, are either pre-formed interlocking blocks or separate panels connected with plastic ties. For ICF systems, you must provide the manufacturer-reported R-value in the <i>Continuous R-Value</i> field.
<i>Other</i>	Crawl space wall assemblies that do not fit into any of the other crawl space wall types. Also use the <i>Other</i> crawl space wall type to receive full credit for the extra insulative value of light-weight (insulated) concrete walls. If you use the <i>Other</i> crawl space wall type, you must enter an overall U-factor for the entire wall assembly (including interior air film but excluding earth). Be prepared to provide U-factor calculations or documentation from manufacturer's literature to the building department.

Crawl Space Wall Software Inputs

After selecting a crawl space wall type, a crawl space wall illustration will appear with input boxes for the crawl space wall height, depth below grade, depth of insulation, and depth below inside grade. The illustration helps identify the dimensions being requested. You may enter crawl space wall dimensions directly into this illustration and select the *OK* button to have them transferred to the corresponding row in the table on the *Envelope* screen. If you prefer to enter the dimensions directly into the table on the *Envelope* screen, you can select *Cancel* to remove the illustration without entering dimensions. To view the crawl space wall illustration and inputs at a later time, click the right-mouse button anywhere on the crawl space row and select *Edit Crawl Inputs* from the popup menu.



Wall Height (ft)

Provide the height of the wall (ft) as measured from the sill to the top of the footing.

Depth Below Grade (ft)

Provide the depth (ft) that the wall extends from the outside finished grade surface to the top of the footing.

Depth of Insulation (ft)

Provide the depth (ft) of the insulation you intend to install as measured from the top of the wall to where the insulation stops. This distance should include the total vertical plus horizontal distance. Because the horizontal distance is included, the depth of insulation may be greater than the height of the wall. If you enter a depth of 0, the program assumes no insulation is to be installed.

Inside Depth Below Grade (ft)

Provide the depth (ft) as measured from the inside grade to the top of the footing.

Gross Area

Enter the gross area of the crawl space wall component in the *Gross Area or Perimeter* field. The area should include the area of the entire wall as measured from the sill to the top of the footing, even if only a portion of the wall is insulated.

Cavity Insulation R-Value

Provide the R-value of any insulation to be installed between structural members in the *Cavity Insulation R-Value* field. Do not include the R-value of other materials.

Continuous Insulation R-Value

Continuous insulation includes exterior rigid foam products and any continuous insulation installed on the exterior or interior of the wall. For ICFs, enter the manufacturer-reported R-value for the entire assembly in the *Continuous Insulation R-Value* field.

Georgia

The Georgia Residential Code does not allow below-grade exterior foam plastics. If a non-zero value is entered in the *Continuous Insulation R-Value* field, the output report will identify this entry as interior continuous insulation.

Mechanical Folder

Use the blue-on-white buttons at the top of the *Mechanical* folder to enter the HVAC equipment in your proposed design. Completion of this section of the software is entirely optional. However, using high-efficiency HVAC equipment may improve the percentage by which your building compares with the code building. The message at the bottom of the screen explains what type of information goes into the currently selected field.

HVAC Efficiency

Trade-offs are allowed for efficient gas and oil furnaces, boilers, and electric heat pumps and air conditioners. No credit is given for electric resistance heating.

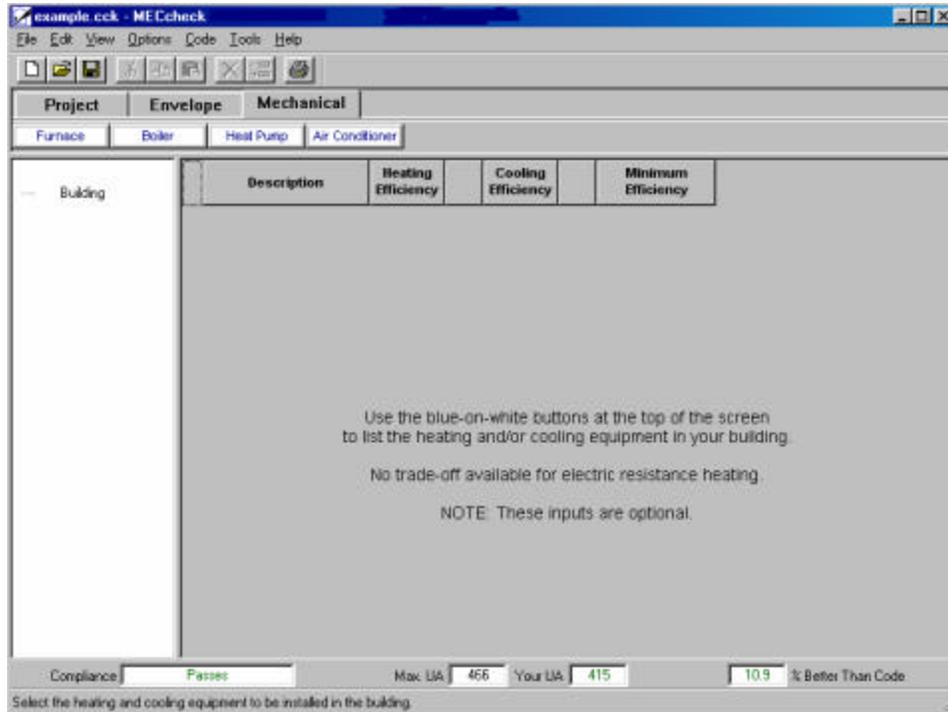
Minimum-required heating and cooling equipment efficiencies are displayed in the *Minimum Efficiency* column. If the efficiency of the equipment you plan to install exceeds these minimums, you qualify for the high-efficiency equipment credit. Enter the annual fuel utilization efficiency (AFUE), heating seasonal performance factor (HSPF), or seasonal energy efficiency ratio (SEER) in the appropriate column.

You can receive credit for only one piece of heating equipment and one piece of cooling equipment (or a single heat pump). When multiple heating equipment or multiple cooling equipment is entered, the least efficient equipment will be used to determine compliance. However, if two furnaces having different efficiencies will be installed, you may create a single furnace entry and enter the average efficiency of both units in the *Heating Efficiency* field. In this case, modify the output report to indicate that the reported efficiency is an average. Enter the make and model number of BOTH pieces of equipment on the line provided in the *Inspection Checklist* portion of the output report.

The high-efficiency equipment credit is applied as a percent increase in the code house UA. To see how much credit you are getting, observe the UA value displayed in the *Code UA* field. The UA will probably be smaller before taking the credit than after. Some locations along the California coast do not qualify for the cooling equipment credit.

Wisconsin

The Wisconsin residential code requires furnaces (non-electric) to have an efficiency rating of 90% or better to receive credit. Buildings heated with heat pumps are treated like homes with electric resistance heating. However, credit is given for heat pumps with HSPF ratings of 7.8 or better. Boiler systems receive credit for any value above 80%.



Mechanical Folder

Wisconsin Heating Loads

The Wisconsin residential code requires a load calculation for sizing the heating equipment of the building. In the *Loads* folder, enter values for the floor area, ceiling height, infiltration rate, and oversizing factor. Once these values are entered into the software, the *Total Building Heating Load* is calculated and can be used for selecting properly sized heating equipment. The total building heating load is the sum of the loads from the assemblies entered in the *Envelope* folder (*Conductive Losses*), the infiltration loads (*Infiltration Losses*), and the loads resulting from the oversizing factor (*Oversizing Factor Losses*).

Conditioned Floor Area

The conditioned floor area includes the gross floor area of all heated rooms, including heated basement floor area.

Average Ceiling Height

The average ceiling height is the area-weighted average height of the ceiling as measured from the finished floor to the underside of the ceiling.

Infiltration Rate

The infiltration rate is the normalized air changes per hour that is anticipated for your building. The software will not accept values above 0.5 ACH or below 0.20 ACH.

Equipment Oversizing Factor

The equipment oversizing factor is a percentage indicating the amount of oversizing you desire in selecting your heating equipment. The software will not accept values over 15%.

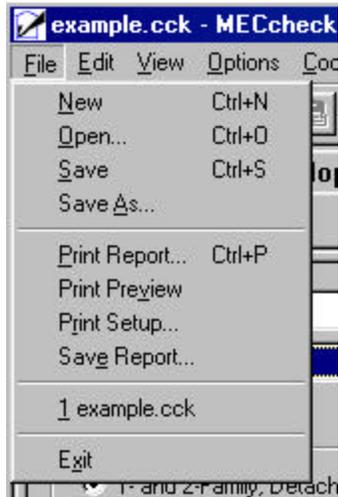
Menus

The menu bar located at the top of the *Envelope* screen is used to select the *File*, *Edit*, *View*, *Code*, and *Help* menus.

File Menu

The data you enter into *MECcheck* can be stored on your hard disk in a project data file. Separate data files can be created for different building projects or for alternate designs of the same project. Data files allow you to retrieve and alter designs at any time. Report files allow you to print the information you have entered and to document the compliance results determined by *MECcheck*. The *File* menu contains options allowing you to create (*New*), retrieve (*Open*), and save project data files and to print project reports.

Data files created by *MECcheck* must have the extension *.CCK*, and report files must have the extension *.RPT*. If you prefer, when you are asked to provide a filename, you may leave the extensions off and let *MECcheck* enter them for you.



File Menu

New

The *New* option allows you to erase the current data and begin a new project data file. When you select *New* and unsaved data exists, *MECcheck* asks if you wish to save the current data. Select *Yes* to save the current data or *No* if you do not want to save the current data. If you select *Yes* and a file is already open, the open file is updated to contain the current data. If no file is open, the *Files* screen appears and you are asked for a filename to which the data will be saved. You can also open a new file by selecting the corresponding icon from the toolbar.



Open

When you want to revise or examine an existing file, you must retrieve a copy of the file by bringing it to the screen. This is referred to as opening the file. The *Open* option allows you to open an existing project data file. When you select *Open*, the *Files* screen appears and you are asked for the filename of the project data file to retrieve. If unsaved data exists, you are asked if you wish to save the current data before opening the new file. If an unsaved file is already open, you are asked if you wish to save the currently open file before opening the new file. You can also open an existing file by selecting the corresponding icon from the toolbar.



Save The *Save* option allows you to save your current data to the filename shown on the title bar. If no file is open, the *Files* screen appears and you are asked for a filename. You can also save data by selecting the corresponding icon from the toolbar.



Save As The *Save As* option allows you to save your current project data file to a new name. This option is useful when an existing file is opened then modified. If you want to save copies of both the original and the modified file, use *Save As* to rename the modified file.

Print Report This option allows you to print a report listing project data and compliance results. A popup window is displayed from which you can elect to print a *Compliance Report*, an *Inspection Checklist*, or both. After choosing the report types to print, the *Print* dialog box will appear allowing you to select the number of copies and the printer. You can also print reports by selecting the corresponding icon from the toolbar. The print icon can be used for direct printing, in which case the printer setup dialog is not displayed and the report is sent to the default printer.



Print Preview Select this option to view the *Compliance Report* and/or *Inspection Checklist* before printing.

Print Setup Select this option to change printer settings.

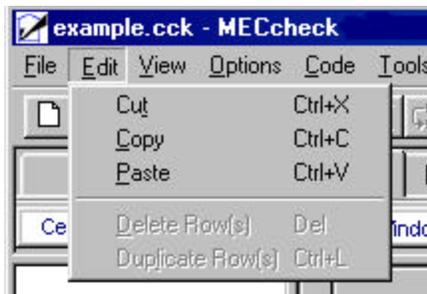
Save Report This option allows you to save a report to a file. A popup window is displayed from which you can elect to generate a *Compliance Report*, an *Inspection Checklist*, or both. After choosing the report types, the *Save Report* dialog box will appear allowing you to provide a name for the file. The report will be saved in Rich Text Format (RTF), which can be loaded into most text processing software.

Exit The *Exit* option allows you to exit MECcheck.

Edit Menu

Use the *Edit* menu to cut, copy, and paste data in editable fields, and to delete and duplicate entire rows. Editable fields include:

- The *Date of Plans*, *Title*, *Project*, *Company*, and *Notes* fields on the *Project* screen
- All black-on-white (or red-on-white) fields in the tables on the *Envelope* and *Mechanical* screens
- The tree labels corresponding to these tables when in edit mode (tree labels are put into edit mode by double-clicking on them).



Edit Menu

Cut The *Cut* option will delete highlighted text in an editable field and copy it to the clipboard. The deleted text can be pasted into another editable field. You can also cut text by selecting the corresponding icon from the toolbar.



Copy The *Copy* option will copy highlighted text in an editable field to the clipboard. The copied text can be pasted into another editable field. You can also copy text by selecting the corresponding icon from the toolbar.



Paste The *Paste* option will paste the last copied text into the selected field at the current cursor location. You can also paste text by selecting the corresponding icon from the toolbar.



Delete Row(s) The *Delete Row(s)* option will delete all selected rows. To select a row, click on the tree label corresponding to that row or click on the leftmost column of that row (the column containing row numbers). Multiple consecutive rows can be selected by holding down the left mouse button on the left-hand column and dragging it over the desired rows. Non-consecutive rows can be selected by holding down the **Ctrl** key while clicking on the leftmost column of each row to be selected. You can also delete rows by selecting the corresponding icon from the toolbar.



Duplicate Row(s) The *Duplicate Row(s)* option will duplicate one or more consecutive selected rows. If non-consecutive rows are selected, this option will be disabled. To select a row, click on the tree label corresponding to that row or click on the leftmost column of that row (the column containing row numbers). Multiple consecutive rows can be selected by holding down the left mouse button on the left-hand column and dragging it over the desired rows. You can also duplicate rows by selecting the corresponding icon from the toolbar.



View Menu



View Menu

Toolbar Toggle the *Toolbar* option to display and hide the toolbar at the top of the screen.

Status Bar Toggle the *Status Bar* option to display and hide the status bar at the bottom of the screen.

Minnesota Proposed and Maximum U-Values The *Proposed and Maximum U-Values* screen shows the maximum U-value requirements allowed by the Minnesota residential code. The screen displays the maximum U-values for glazing and floors and compares these to the area-weighted average U-values for your proposed components. If the area-weighted average U-values of your glazing or floor components exceeds any of the maximums on this screen, your building will not comply. If the glazing U-value maximum is exceeded, the *Compliance* field will display the message *Glazing Exceeds Maximum* in red letters. If the floor U-value maximum is exceeded, the *Compliance* field will display the message *Floor Uo Exceeds Maximum* in red letters.

Options Menu

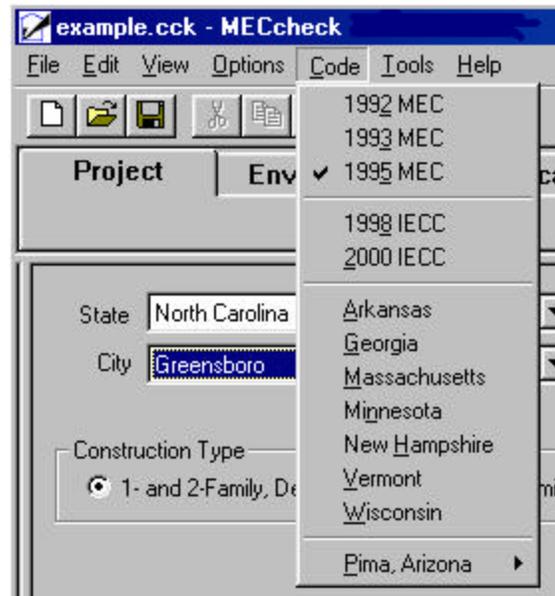


*Comments/
Description
(Envelope)*

Select this option to create a *Comments/Description* column on the Envelope folder. Use the *Comments/Description* column to type additional information about a building assembly that you wish to be included in the *Inspection Checklist*, such as its location. The blank *Comment* lines provided in the *Inspection Checklist* are replaced with any text entered in this column.

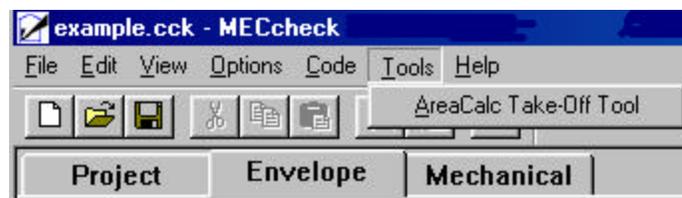
Code Menu

The *Code* menu is used to select the code edition applicable to your jurisdiction.



Code Menu

Tools Menu

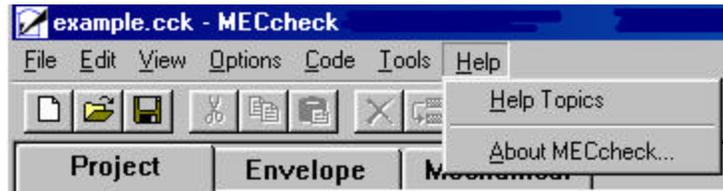


*AreaCalc
Take-Off
Tool*

This option launches the AreaCalc software tool that can be used to do building take-offs. The areas computed in AreaCalc can be transferred directly to MECcheck.

Help Menu

The *Help* menu provides general information on how to use MECcheck.



Help Menu

Help Topics

The *Help Topics* option displays the help topics available for MECcheck.

*About
MECcheck*

The *About MECcheck* option displays the program's version number and release date.

Context Menu

Clicking the right mouse button on a tree label or table displays a pop-up list, referred to as a context menu. The context menu options are applied to a single field in a table or to an entire row in a table, depending on where the mouse is clicked. If the mouse is clicked on a tree label, the menu options are applied to the row corresponding to that label. If the mouse is clicked on the left field of a row in a table, the row is selected and the options are applied to the entire row. Some options are applicable to individual fields of a table, and the mouse must be clicked on the given field to activate the option.

*Cut, Copy,
Paste*

The *Cut*, *Copy*, and *Paste* options are available from the *Edit* menu in the menu bar, from toolbar buttons, and from the context menu. See the *Edit Menu* section for a description of these options. The *Cut*, *Copy*, and *Paste* options are applied to individual fields in a table.

*Delete
Row(s),
Duplicate
Row(s)*

The *Delete Row(s)*, *Duplicate Row(s)* options are available from the *Edit* menu, the toolbar, and the context menu. See the *Edit Menu* section for a description of these options. The *Delete Row(s)*, *Duplicate Row(s)* options apply to selected rows.

Use Default

The *Use Default* option enables you to enter a default U-factor for windows, skylights, and doors that do not have an NFRC rating. The *Use Default* option can be selected by clicking the right mouse button in the *U-Factor* column of any window, skylight, or door assembly. A table of default U-factors based on characteristics of the given assembly will be displayed. Choose the U-factor corresponding to the characteristics of your assembly, then select the *OK* button to transfer this default to the table on the *Envelope* screen.

Edit Text

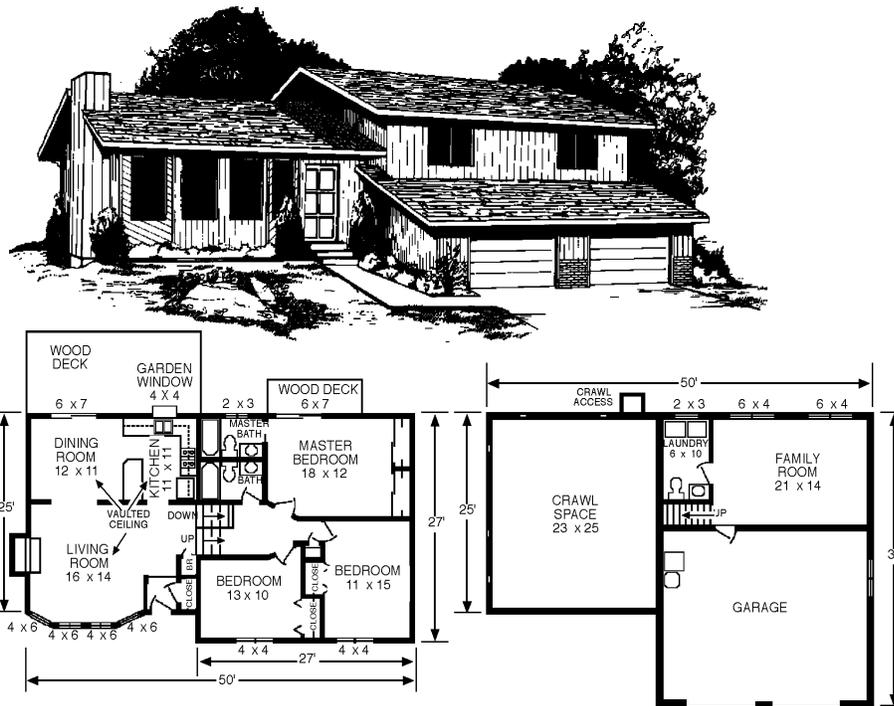
The *Edit Text* option is used to edit the text on a tree label. When you create a new envelope assembly or HVAC component, a new row appears in the corresponding table and a new tree label appears on the tree to the left. The tree labels are assigned default names such as *Roof 1*. These labels can be changed by clicking the right mouse button on the label and selecting *Edit Text* from the context menu. An edit box will become visible where the label used to be, and you can rename the label by typing in the edit box. Press **Enter** or click elsewhere when finished. You can enter a maximum of 32 characters in the edit box. You can also edit tree labels by double-clicking on the label.

Edit Inputs

Basement wall, crawl space wall, and slab-on-grade assemblies display screens which illustrate dimensions being requested of the user. You may enter these dimensions directly into the illustration, then select the *OK* button to transfer them to the table on the *Envelope* screen. You may change any previously entered dimensions directly on the table, or you may use the *Edit Inputs* option to redisplay the illustration with the previously entered values. The *Edit Inputs* option can be selected by clicking the right mouse button on the tree label or table row of any basement wall, crawl space wall, or slab assembly. The option name in the context menu changes to *Edit Basement Inputs*, *Edit Crawl Inputs*, or *Edit Slab Inputs*, depending on the row being selected.

Compliance Example

The software approach is illustrated in this section. Assume that you plan to build the single-family house shown below on a lot located in Greensboro, North Carolina.



The following table lists the components that make up the building envelope, the area of these components, and the proposed insulation R-values and window and door U-factors. To determine compliance, you only need to input the areas, R-values, and U-factors listed in this table into the software, which will then display the compliance results in the *Compliance* field. If desired, you can then alter any or all of these inputs to determine if a revised design still complies with the code.

Determine Which Components Are Part of the Building Envelope

Only the building components that are part of the building envelope are considered for code compliance. 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.

Building Component	Area	Insulation Level
Ceilings With Attic (Std. Truss)	729 ft ²	R-38
Vaulted	592 ft ²	R-30
Walls (2x4 @ 16-in. O.C.) Without Sheathing(a)	276 ft ² (gross)	R-13
With Sheathing	1647 ft ² (gross)	R-19 (R-13 cavity + R-6 sheathing)
Windows	204 ft ²	U-0.45
Doors		
Sliding Glass Doors	84 ft ²	U-0.61
Entrance	20 ft ²	U-0.54
Garage to Family Room	18 ft ²	U-0.35
Floors		
Over Garage	363 ft ²	R-19
Over Crawl Space	575 ft ²	R-19
Slab (Unheated)	82 ft ² (perimeter)	R-8 (2-ft depth)
Bay Window Floor	32 ft ²	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.		

Table 1. Example House Specifications

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 table lists the walls that are part of the building envelope and indicates whether sheathing is installed on them (which is relevant when determining the R-value of the wall).

Wall	Sheathing?	Gross Area
All walls between interior conditioned space and outside air	Yes	1647
The wall between the family room and the garage	No	192
The wall between the garage and the living room	No	44
The wall between the laundry and the crawl space	No	40

Ceilings The dining room, living room, bay window roof, and entryway have a vaulted ceiling that will be insulated to R-30. The area covered by the vaulted ceiling totals 592 ft². The rest of the home has a ceiling with attic which will be insulated to R-38. Since these two ceiling areas will be insulated to different levels, they must be treated as two separate building components.

Floors The example house has a conditioned floor area of 1714 ft², but 378 ft² of the floor area is located over the family room and is not part of the building envelope (both the family room and the rooms above it are conditioned). The living room, dining room, and kitchen are over an unheated crawl space. The family room and garage both have slab-on-grade floors. The floor of the bay window is a floor over outside air.

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.

Enter the Location

On the *Project* folder, enter the location of the building and type of construction. Enter the city and state as Greensboro, North Carolina, and the construction type as single family.

Select the Code Year

This example is based on compliance with the 1995 MEC. Select the *1995 MEC* option from the *Code* menu.

Create the Building Components List

Using the buttons at the top of the *Envelope* folder, create building components for the entries in Table 1. If you need more than one building component of the same type, you must enter each component separately. For example, you will need two different ceiling components since there are two different ceiling insulation R-values used in the example house. Select the *Ceiling* button and choose *All-Wood Joist/Rafter/Truss* from the list of ceiling types. This creates the first ceiling component. Repeat this step to create a second ceiling component. Create two 16" O.C. wood-framed wall components, one window component, three door components, two floor components (one *All-Wood Joist/Truss - Over Unconditioned Space* and one *All-Wood Joist/Truss - Over Outside Air*), and one unheated slab component with 2' depth of insulation. There are actually two *All-Wood Joist/Truss - Over Unconditioned Space* components in Table 1, but they are combined since they both have the same R-value (R-19).

After the building components have been created, fill in the areas, R-values, and U-factors from Table 1. The *Code UA* field should show a total required UA of 466, and the field labeled *Your UA* should show a proposed UA of 415.

Save and Print a Report

Save the data you have entered by selecting the *Save* option from the *File* menu. You will be asked to provide a name for the data file. Print a compliance report and/or inspection checklist by selecting the *Print Report* option from the *File* menu. You can exit MECcheck by selecting the *Exit* option from the *File* menu.

Check Your Work

An example file (EXAMPLE.CCK) has been included with the MECcheck software. EXAMPLE.CCK is a data file which contains the same data used in this example. If you have any questions, the example file can be loaded into the software to show how the building used in this example should be entered into the software. To load this file, select the *Open* option from the *File* menu.

Changing Location Files

The following text provides instructions for changing from the city version of the MEC*check* software to the county version.

The MEC*check* software contains two location files:

1. CITIES.MEC contains a list of cities for each state.
2. COUNTIES.MEC contains a list of counties for each state.

The *useCounties* variable contained in the CHECK.INI file determines which of these location files is used by the software. To modify this variable, open the CHECK.INI file in a text processor (preferably NOTEPAD) and set *useCounties* to true or false. By default, the software uses cities:

```
useCounties=false
```

You MUST save this file in an ASCII text format. The best text processor to accomplish this is NOTEPAD.

Noteworthy:

If you have saved a data file for a building, the location for that building is also saved. If you subsequently change the location file as described above and try to load that data file back into the MEC*check* software, MEC*check* will not find the specified building location and will set the location to a default. Therefore, after loading the file into the program, you must go back to the *Project* screen and reselect your location.

Modifying the Cities or Counties

MEC and IECC code compliance is based on the heating degree-days based 65°F (HDD) of the location in which the building resides. This section describes how locations that are not currently available within MEC*check* can be added and how the HDD values for existing locations can be modified. You should not, however, modify the HDD value for any location without direction from your local jurisdiction. If locations are missing or incorrect for a given jurisdiction, we recommend that you contact the MEC*check* technical support staff and request a change be permanently made. Otherwise, any changes will be overwritten if newer versions of MEC*check* are later installed. Technical support contact information is given on the splash screen that comes up when MEC*check* is first started.

MEC*check* accesses a list of cities or counties, depending on which version you are using. The cities are stored in a file named CITIES.MEC and the counties are stored in a file named COUNTIES.MEC. These files come with the MEC*check* software and should be located in the same directory as the MEC*check* executable file (MECCHECK.EXE).

The first line of the CITIES.MEC file contains the word **cities* and the first line of the COUNTIES.MEC file contains the word **counties*. This keyword tells the software whether cities or counties are contained in the file, and should not be changed. The following text and illustration apply to the cities version. However, modifications can be made to the counties version in exactly the same manner.

The CITIES.MEC file begins with an alphabetical list of the states. The second line of the file contains an asterisk (*) followed by the word *states*. All asterisks are very important because they delineate the sections of the file.

The list of states is followed by lists of cities for each state. The cities for each state are listed separately, starting with the cities for Alabama. The Alabama cities start directly after the line reading **Alabama*.

Each city name is followed by fifteen climate values that apply to that city. The first value represents the heating degree-days base 65°F (HDD), and the second value represents the cooling degree-days base 65°F (CDD). Commas are used to separate the city name and climate values. Commas MAY NOT be used as part of a city name. Remove extra space on either side of all commas.

If the CITIES.MEC or COUNTIES.MEC file is edited, care must be taken to save the new data in text (ASCII) format. To preserve this format, use a text editor, such as NOTEPAD. If a text processor such as Word Perfect or Microsoft Word is used, save the file as DOS text or ASCII text. Copy the edited file to LOCATION.MEC.

To Add, Delete, or Modify Cities

1. Find the list of cities you wish to modify.
2. Add, delete, or modify as many city lines as you wish. Each new line must adhere to the format described above. To add a new city, find the city in the file closest in location and weather to the city you want to add. Copy the existing city line to the correct alphabetical location for the new city. Change the city name to the new city name. You may modify the HDD and/or CDD values to match the new city values, if known. Do not modify any of the other climate data.

To Delete an Entire State

1. Delete the state name from the list of states located at the beginning of the file.
2. Delete the list of cities corresponding to that state. Be sure to delete all cities AND the name of the state which precedes them.

Appendix A: Additions

1998 IECC and 2000 IECC

What is an Addition?

1998 Additions to existing buildings must comply with code requirements when the addition is within the scope of the code and would not otherwise be exempted. An addition is any extension or increase in the height, conditioned floor area, or conditioned volume of a building.

2000 Additions, alterations, and repairs to existing buildings must comply with code requirements when the addition, alteration, or repair is within the scope of the code and would not otherwise be exempted. An addition is any extension or increase in the height, conditioned floor area, or conditioned volume of a building. An alteration is any construction renovation, or change in the mechanical system that involves an extension, addition, or change to the arrangement, type, or purpose of the original installation. A repair includes the reconstruction or renewal of any part of an existing building for maintenance purposes.

Additions include new construction, such as a conditioned bedroom, sunspace, or enclosed porch added to an existing building. Additions also include existing spaces converted from unconditioned or exempt spaces to conditioned spaces.

For example, a finished basement, an attic converted to a bedroom, and a carport converted to a den, are additions. An unconditioned garage converted to a bedroom is an addition, but the addition of an unconditioned garage would not be considered within the scope of the code, since the code applies to heated or cooled (conditioned) spaces. If a conditioned floor area is expanded, such as a room made larger by moving out a wall, only the newly conditioned space must meet the code. A flat window added to a room does not increase the conditioned space and thus is not an addition by this definition. However, replacement windows that are not part of an addition must meet the prescriptive U-factor requirements given in Table 1.

Compliance Options for Additions

The addition (the newly conditioned floor space) complies with the code if it complies with all of the applicable code requirements. For example, requirements applicable to the addition of a new room would most likely include insulating the exterior walls, ceiling, and floor to the levels specified in the code; sealing all joints and penetrations; installing a vapor retarder in unventilated framed walls, floors, and ceilings; identifying installed insulation R-values and window U-factors; and insulating and sealing any ducts in

unconditioned portions or exterior components (walls, ceilings, or floors) of the new space.

There are three approaches by which an addition can comply with the code:

- The addition as defined above meets all code requirements. This approach does not require that the original portion of the building meet code requirements.
- If the building with the addition complies with the code, the addition will also comply, regardless of whether the addition complies alone. For example, a sunroom that does not comply with the code is added to a house. If the entire house (with the sunroom) complies, the addition also complies.
- Additions less than 500 ft² (46.5 m²) of conditioned floor area may meet the prescriptive envelope requirements in Table 1. To use this table, the total area of windows, doors, and skylights cannot exceed 40% of the gross wall and roof area of the addition.

Table 1. Prescriptive Requirements for Additions and Replacement Window

	Maximum	Minimum					
Climate Zone	Fenestration U-factor (a)	Ceiling R-value (b)	Wall R-value	Floor R-value	Basement wall R-value	Slab perimeter R-value and depth (c)	Crawl space wall R-value (d)
1-4	0.75	R-26	R-13	R-11	R-5	R-0	R-5
5-8	0.5	R-30	R-13	R-19	R-8	R-5, 2 ft	R-10
9-12	0.4	R-38	R-18	R-21	R-10	R-9, 2 ft	R-19
13-15	0.35	R-49	R-21	R-21	R-11	R-13, 4 ft	R-20
16-19	0.35	R-49	R-21	R-21	R-19	R-18, 4 ft	R-20

- a. The area-weighted average U-factor for all windows, doors, and skylights in the addition must not exceed the fenestration U-factor requirement.
- b. Floors over outside air must meet ceiling R-value requirements.
- c. The slab R-value requirements are for unheated slabs. Add an additional R-2 for heated slabs.
- d. The crawl space wall R-value requirements are for walls of unventilated crawl spaces only.
- e. The maximum U-factor for replacement skylights is 0.5 in Zones 5-19.
- f. The area-weighted average solar heat gain coefficient (SHGC) of all windows, glazed doors, and skylights cannot exceed 0.4 in Zones 1-7.

2000
2000

Replacement Windows

Replacement windows that are not part of an addition must meet the prescriptive requirements of Table 1. A replacement window is defined as a replacement of the entire unit, including the frame, sash, and glazing.

Appendix B: Default U-Factors and SHGC Values

1998 IECC and 2000 IECC

Glazing and Door Defaults

The following tables provide default U-factors and SHGC values for glazing and doors based on the glazing or door features. The U-factors and SHGC values in these tables can be used in the absence of NFRC-labeled values.

Glazing and doors cannot receive credit for features that cannot be clearly detected, such as argon gas fills and low-emissivity (low-E) coatings. Windows with these features may achieve much lower U-factors than those listed in Table 1. For example, a double-pane wood or vinyl window with low-E glass may have a U-factor around 0.38. The same window with argon gas may be rated at 0.34. Therefore, it may be advantageous to use NFRC-rated test U-factors for these types of windows.

Where a composite of materials from two different product types is used, the window or door must be assigned the higher U-factor.

Table 1. U-Factors for Windows, Glazed Doors, and Skylights

Frame Material and Product Type(a)	Single Glazed	Double Glazed
Metal Without Thermal Break		
Operable (including sliding and swinging glass doors)	1.27	0.87
Fixed	1.13	0.69
Garden window	2.60	1.81
Curtain wall	1.22	0.79
Skylight	1.98	1.31
Site-assembled sloped/overhead glazing	1.36	0.82
Metal With Thermal Break		
Operable (including sliding and swinging glass doors)	1.08	0.65
Fixed	1.07	0.63
Curtain wall	1.11	0.68
Skylight	1.89	1.11
Site-assembled sloped/overhead glazing	1.25	0.70
Reinforced Vinyl/Metal-Clad Wood		
Operable (including sliding and swinging glass doors)	0.90	0.57
Fixed	0.98	0.56
Skylight	1.75	1.05
Wood/Vinyl/Fiberglass		
Operable (including sliding and swinging glass doors)	0.89	0.55
Fixed	0.98	0.56
Garden window	2.31	1.61
Skylight	1.47	0.84
Glass Block Assemblies	0.60	

Table 2. U-Factors for Non-Glazed Doors

Steel Doors		
Without Foam Core	0.60	
With Foam Core	0.35	
Wood Doors		
	Without Storm	With Storm
Panel With 7/16-in. Panels	0.54	0.36
Hollow Core Flush	0.46	0.32
Panel With 1 1/8-in. Panels	0.39	0.28
Solid Core Flush	0.40	0.26

Table 3. SHGC Values for Windows, Glazed Doors, and Skylights^(a)

Product Description	Single Glazed				Double Glazed			
	Clear	Bronze	Green	Gray	Clear + Clear	Bronze + Clear	Green + Clear	Gray + Clear
Metal frames								
Operable	0.75	0.64	0.62	0.61	0.66	0.55	0.53	0.52
Fixed	0.78	0.67	0.65	0.64	0.68	0.57	0.55	0.54
Nonmetal frames								
Operable								
Fixed	0.63	0.54	0.53	0.52	0.55	0.46	0.45	0.44
	0.75	0.64	0.62	0.61	0.66	0.54	0.53	0.52

a. SHGC values may be adjusted to reflect the effects of any permanent exterior solar shading devices, such as shade screens.