Compliance Forms

Instructions for Building Envelope Compliance Forms

Compliance forms are provided in the User's Manual to assist in understanding and documenting compliance with the building envelope requirements. Copies of the forms are provided both in printed and electronic form. The electronic versions are contained on the CD distributed with the Manual.

The building envelope forms are organized in two parts and on three pages. Part I should be used with all methods of compliance. Part II should be used only with the Prescriptive Building Envelope Option and should be completed separately for each space-conditioning category in the building.

- Part I has header information and a Mandatory Provisions checklist. This page should be filled out for all compliance methods, since the mandatory features apply to all compliance methods.
- Part II, Page 1 has header information that must be completed for each space-conditioning category and a schedule of constructions for opaque surfaces. The schedule is a simple listing of each unique construction type in the building. For each item in the list, you indicate the class of construction, the source of *U*-factor data, the proposed and criteria *U*-factor or *R*-value. Optionally, you may enter the surface area of the building for this construction type.
- Part II, Page 2 of the documentation is a schedule of fenestration construction types. This table contains an item for each unique fenestration construction type. For each item in the table, you indicate the class of construction, the source of data, proposed fenestration data and the performance criteria.

Part I – Header Information

Project Name. Enter the name of the project. This should agree with the name that is used on the plans and specifications or the common name used to refer to the project.

Project Address. Enter the street address of the project, for instance "142 Minna Street".

Date. Enter the date when the compliance documentation was completed.

Designer of Record/Telephone. Enter the name and the telephone number of the designer of record for the project. This will generally be an architecture firm.

Contact Person/Telephone. Enter the name and telephone number of the person who should be contacted if there are questions about the compliance documentation.

City. The name of the city where the project is located.

HDD65. The heating degree-days at base 65°F for the above city. The heating degree-days for most cities are listed in the Standard's Appendix D.

CDD50. The cooling degree-days at base 50°F for the above city. The cooling degree-days for most cities are listed in the Standard's Appendix D.

Criteria Table. Enter the number of the criteria table used for the project (for example, B-12). Appendix B of the Standard has the criteria tables for all climate locations. There are a couple of ways to determine the criteria table for your location. If you city is listed in the Standard's Appendix D, the appropriate criteria table will be shown next to your city. If you know the heating and cooling degree-days, Figure B-1 of the Standard will show you the appropriate criteria table.

Part I – Mandatory Provisions Checklist

This section of the compliance form summarizes the mandatory requirements for the design of the building envelope. The mandatory measures are organized on this form in the same order as they are in the Standard: Insulation, Fenestration and Doors and Air Leakage. Checking a box indicates that the mandatory requirement applies to the building and that the building complies with the requirement. If the requirement is not applicable, leave the box unchecked.

Part II – Header Information

Part II is used with the Prescriptive Building Envelope Option. A separate Part II form should be completed for each space-conditioning category in the building. The Project Name, Contact Person and Telephone should be carried over from Part I. The following additional information is required.

Space Category. Check one of the option buttons to indicate the space-conditioning category for the opaque constructions and fenestration constructions that follow.

5.3.2.3 Exceptions. This section has checkboxes for you to indicate which fenestration exceptions you are using. Three exceptions are available:

- *North Oriented.* When this exception is taken, separate criteria are applied to north-facing windows and windows that face other orientations. The criteria depend on the window-wall ratio so with this exception the window-wall ratio must be calculated separately for north-oriented and other-oriented windows.
- *Overhangs.* When this exception is taken, the shading effect of overhangs can be used to adjust the proposed building's SHGC. This exception can be taken on a window-by-window basis. This box

should be checked if an overhang credit is taken for any window.

■ *Street Level Windows.* When this exception is taken, street level windows are exempt from the SHGC criteria, provided they do not exceed 75% of the gross wall area, the street level floor-to-floor height does not exceed 20 ft, and the street level fenestration is shaded by an overhang that has a projection factor of at least 0.5. With this exception, the street level wall area and window area that qualify for the exception are ignored in the remaining window-wall ratio calculations.

Window-Wall Ratio. How you fill out this section of the form depends on whether you are taking the north-oriented exception. If you do not take this exception, then you only need to complete the first column labeled Total; the North and Other columns can be left blank or marked not applicable. If the north-oriented exception is taken, then the North and Other columns must be completed and the Total column can be left blank or marked not applicable. The following bullets describe the information to be entered.

■ *Gross Wall Area (ft²).* Sum the gross exterior wall area for the space-conditioning category. Only include exterior walls in this summation; do not include semi-exterior walls or interior partitions. The gross wall area includes windows and doors. If you group exterior walls together when you complete Part II – Opaque Surfaces, then this form can be a useful aid in summing the exterior wall area.

■ *Window Area (ft²).* Sum the window area for the exterior walls in the space-conditioning category. Window area should include the frame as well as the glazed area. If you group windows together when you complete Part II – Fenestration, then this form can be a useful aid in summing the window area.

■ *Window-Wall Ratio.* Divide the Window Area by the Gross Wall Area and enter the result in this box. When using the Prescriptive Building Envelope Option, the window-wall ratio must be less than 0.50. If the north-oriented exception is taken, the WWR is calculated separately for north-oriented and other-oriented windows..

Skylight Roof Ratio. This portion of the form should be completed if the space-conditioning category has skylights.

1. Gross Roof Area (ft²). Sum the gross area of all exterior roofs for the space-conditioning category. The gross area should include openings in the roof such as skylights and roof hatches. If you group roofs together when you complete Part II – Opaque Surfaces, then this form can be a useful aid in summing the roof area.

2. Skylight Area (ft²). Sum the skylight area for the space-conditioning category. The skylight area should include the area of the frame. If you group windows together when you complete Part II – Fenestration, then this form can be a useful aid in summing the skylight area.

3. Skylight Roof Ratio. Calculate the skylight-roof ratio by dividing the skylight area by the gross roof area and enter the result in this box. When using the Prescriptive Building Envelope Option, the skylight-roof ratio must be less than 0.05.

Part II – Opaque Surfaces

This portion of Part II summarizes all opaque construction types for the space-conditioning category. An entry should be made in the table for each unique construction. The Part II – Header Information requires data on the exterior wall and roof area, so at a minimum, roofs and exterior walls should be grouped together. You may also have to calculate area separately for north-oriented and other-oriented walls. The Opaque Surfaces form can be used to make these calculations if you group surface types together and use the optional Surface Area column. Finally, you may also want to group constructions for each class if you want to perform area-weighted averaging. The Standard permits proposed area-weighted average *U*-factor to be compared to the criteria, but only within each class of construction.

The following paragraphs describe the information to be entered on this form.

Description/Name. Enter a name for each construction or enter the code used on the drawings and specifications. When the drawings and specifications already have a schedule of constructions, the names or codes should be consistent between the compliance forms and the plans and specifications.

Class. Choose the surface type and class by marking one (and only one) column. This information is used to determine the criteria for the opaque construction.

R-value/U-factor Option. Mark the method used for compliance for this construction. The prescriptive tables give the criteria both as a minimum insulation *R*-value and a maximum *U*-factor. For below-grade walls, the maximum *U*-factor is replaced with a maximum C-factor. For slabs, the *U*-factor is replaced with an F-factor. The *R*-value method is the simplest approach; you only need to document that the insulation in the construction assembly has the required thermal resistance.

Source of U-factor Data. If Appendix A is the source of the *U*-factor or C-factor data, mark "Appendix A Defaults". F-factors can only be taken from Appendix A of the Standard, so this is the only possible choice for slabs. If you have calculated the *U*-factor or C-factor, mark "Calculations." Note that restrictions

apply when you calculate your own *U*-factors or C-factors. Basically, your construction must be significantly different from any of those already contained in Appendix A.

High Reflectance/Emittance Roof. This column only applies to roofs that do not have attics. If the exterior surface of the roof has a reflectance greater than 0.70 and an emittance greater than 0.70, then the *U*-factor of the proposed design can be modified (lowered) to account for surface characteristics of the roof. This is an exception in the Standard and is limited to hot climates that have heating degree-days at base 65°F that are less than or equal to 3600.

Proposed Insulation R-value, U-factor, C-factor, or F-factor. Enter the thermal performance of the construction shown on the plans and specifications. If the *R*-value option is used, then the *R*-value of the insulation should be entered in this column. For some construction types, framed walls for instance, insulation can be placed in the cavity but it can also be applied in a continuous manner on the exterior or interior of the framing. In these instances, both *R*-values should be entered, e.g., "R-13 + R-4 ci." This notation means that R-13 is installed in the cavity and R-4 is installed in a continuous manner. For continuous insulation, the "ci" subscript should be used to distinguish it from cavity insulation.

If the *U*-factor, C-factor or F-factor method is used then the value should be taken from Appendix A of the Standard or calculated using an acceptable method, as defined in Appendix A. C-factor is used for below-grade walls; F-factor for slabs; and *U*-factor for other constructions.

Criteria Insulation R-value, U-factor, C-factor, or F-factor. Enter the required thermal performance of the construction. The criteria are taken from the prescriptive table for the location. The data entered should be consistent with the data entered for the proposed design. If the *R*-value method is used, then the criteria *R*-value should be entered. If the *U*-factor method is used, then the *U*-factor, C-factor or R-factor should be entered. In either case, completing this column is simply a matter of copying information from the criteria table to the compliance form.

Surface Area (ft^2). This column is optional, but useful in summing wall and roof areas, which are needed for the Part II – Header Information. At a minimum, roofs and exterior walls should be grouped together so that the total area can be summed and entered in the header. If you are using the north-facing exception (determining the fenestration criteria separately for north-oriented and other-oriented walls), then you should also group north-oriented and other-oriented walls together.

Part II – Fenestration

This portion of the form is a schedule of each fenestration construction in the building. Skylights and windows should be grouped separately in the list by since the area of each of these types of constructions must be summed and entered in Part II – Header Information. If you are using the north-oriented exception, then you should also group north-oriented windows and other-oriented windows so that the area can be summed separately. If you are taking the overhang exception (calculating an adjusted SHGC to account for the shading effect of overhangs), then you must make separate entries in the table for each window with different overhang dimensions.

Description/Name. Enter a name for each fenestration or enter the code used on the drawings and specifications. When the drawings and specifications already have a schedule of windows, doors, and/or skylights, the names or codes should be consistent between the compliance forms and the plans and specifications.

Class. Choose the fenestration type and class by marking one (and only one) column. This information is used to determine the fenestration criteria.

Source of Data. Indicate the source of the performance data for the proposed fenestration. For fenestration, the performance data must either be taken from NFRC ratings or from Appendix A of the Standard. The Standard permits you to take *U*-factor data from Appendix A but take SHGC and visible light transmission data from manufacturers' literature. When this is the case, mark Appendix A as the source of data.

Area. Enter the area of the proposed fenestration. The area should include the area of the frame as well as the glazing, since the NFRC performance ratings apply to the total area. Separately group skylights and windows and leave a few blank rows at the end of each grouping so that the area of that group can be summed.

U-factor. Enter the *U*-factor of the fenestration. This value should be taken either from NFRC ratings or from Table A-17 or A-19 of the Standard. However, Table A-17 can only be used for unlabeled glazed wall systems (site-built windows, but not operable windows or picture windows) and skylights.

SHGC. Enter the solar heat gain coefficient the fenestration. If you are using an NFRC-rated window, the SHGC is included as part of the rating, and this value should be entered on the compliance form. If you are using Tables A-17 or A-19 for *U*-factor data, then Table A-18 can be used as the source of SHGC. However, the data in Table A-18 is limited to only a few types of glazing types. As an

alternative, you can take the SHGC from manufacturers' literature and use this for compliance purposes (see § 5.2.2.2 of the Standard for more information and limitations on this approach).

Overhang. If an overhang shades the window, make a check in this box. Otherwise, leave the box unchecked. The box should remain unchecked for all skylights, since overhangs cannot shade skylights. In order to qualify for this credit, overhangs must be constructed so that they last as long as the building.

Projection Factor. If an overhang shades the window, enter the overhang projection factor for the window. The projection factor is the ratio of the horizontal distance that the overhang projects from the surface of the window to the vertical distance from the windowsill to the bottom of the overhang. This column is not applicable to skylights.

Overhang Multiplier. If an overhand shades the window, enter the overhang multiplier. This is taken from Table 5.3.2.3 of the standard and depends on the overhang projection factor and the orientation of the window. Table 5.3.2.3 has only two orientation categories: north and other. North-oriented windows are those that face within 45 degrees of true north (not magnetic north). This column is not applicable to skylights.

Adjusted SHGC. Calculate and enter the adjusted SHGC by multiplying the SHGC of the unshaded window by the overhang multiplier. This column is not applicable to skylights.

Criteria U-factor. Enter the criteria *U*-factor for the fenestration by selecting the appropriate criterion from the criteria table. The *U*-factor criterion depends on the window-wall ratio for windows or the skylight-roof ratio for skylights. It also depends on the class of fenestration construction as marked on this form. The proposed *U*-factor must be less than or equal to the criterion.

Criteria SHGC. Enter the SHGC criterion for the fenestration by selecting the appropriate criterion from the criteria table. The SHGC criterion depends on the window-wall ratio for windows or the skylight-roof ratio for skylights. If you are taking the north-oriented exception, the window criterion also depends on whether the window is north or other oriented. The proposed SHGC (or adjusted SHGC) must be less than or equal to the criterion.