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Program Description

A PC Program

WINDOW 5.0 User Manual

For Analyzing Window Thermal Performance

Windows & Daylighting Group
Building Technologies Program
Environmental Energy Technologies Department
Lawrence Berkeley National Laboratory
Berkeley, CA 94720 USA

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WINDOW 5.0 User Manual

Robin Mitchell, Christian Kohler, and Dariush Arasteh
Windows and Daylighting Group
Building Technologies Department
Environmental Energy Technologies Division
Lawrence Berkeley National Laboratory
Berkeley, California 94720
http://windows.lbl.gov/software/software.html

Charlie Huizenga and Tiefeng Yu
Center for Environmental Design Research
University of California
Berkeley, California

Dragan Curcija
Carli, Inc
Amherst, Massachusetts

November 2001

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1. Introduction

1.1. Overview

WINDOW5 is a state-of-the-art, Microsoft Windows™-based computer program developed at Lawrence Berkeley National Laboratory (LBNL) for use by manufacturers, engineers, educators, students, architects, and others to determine the thermal and solar optical properties of glazing and window systems.

WINDOW5, is a significant update to LBNL's WINDOW4.1 computer program and includes all of the WINDOW4.1 capabilities as well as:

- a state of the art MS-Windows interface
- updated algorithms consistent with ASHRAE SPC142 and ISO15099
- a Condensation Resistance Index in accordance with a draft version of NFRC 500.
- a surface temperature map
- an integrated database of properties
- links to other LBNL window analysis software:
  - THERM 5, for calculating 2-D frame and edge effects
  - RESFEN, for calculating the energy effects of windows in typical houses throughout the United States
  - Optics5 for the optical properties of all coated and uncoated glazings, laminates, and applied films.

2. Quick Start

2.1. Main Screen (Window Library)

The WINDOW5 main screen (which is the "detail screen" of the Window Library) for defining a complete window product, shown below, has 4 main screen areas:

- Left hand column for buttons (such as Calc, List, Details) and other common tools
- Input values such as Name, Size, etc.
- Graphic representation of the window. This representation has the various elements (glazing systems, frames, and dividers) which can be selected for a particular window by clicking on the element (this is shown in the following figures).
- Results
- Feedback about currently selected window or window component.

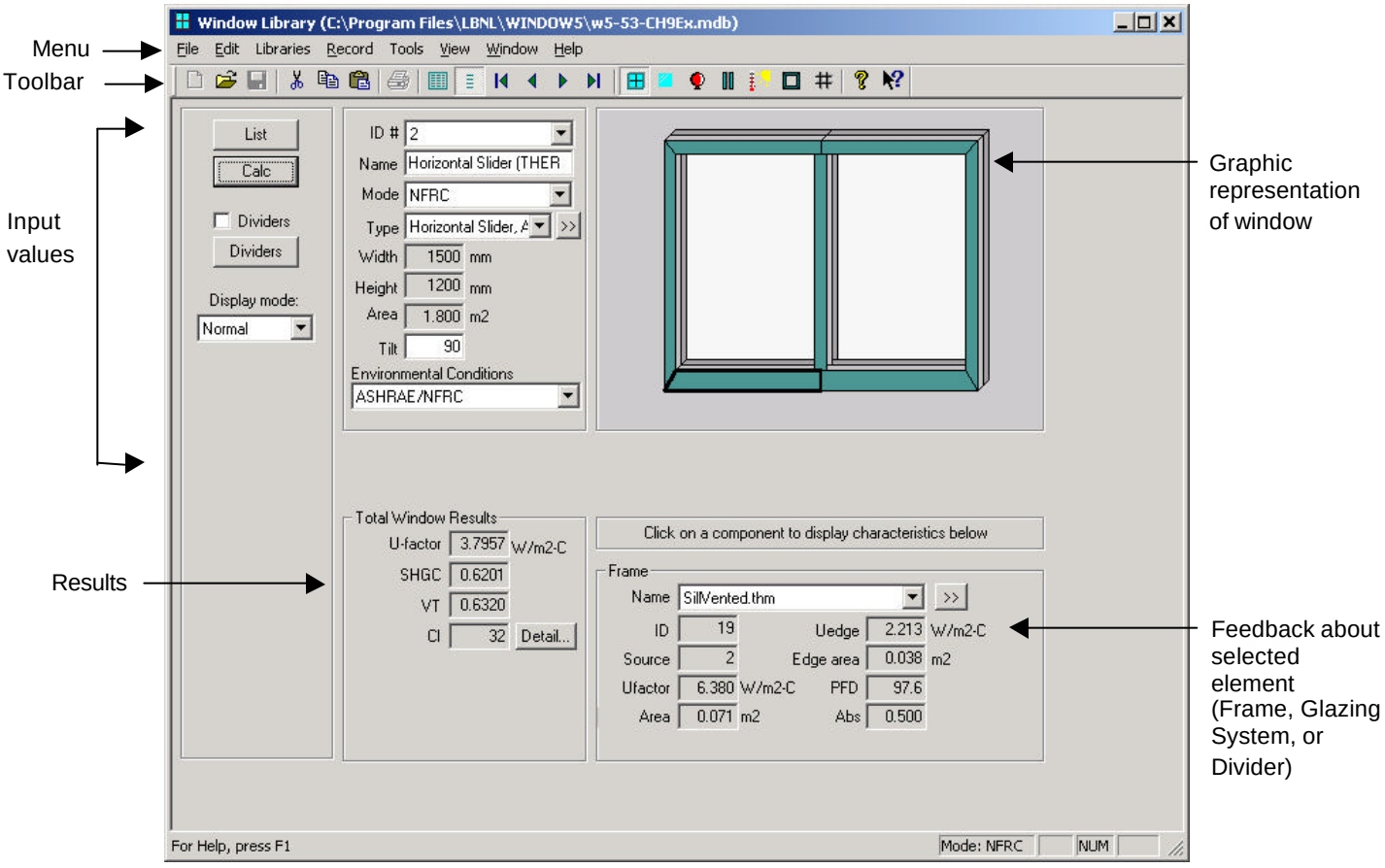


Figure 2-1. Main Screen (Window Library, Detail View).

2.2. Menu System

There are seven menus in the WINDOW program:

File	The File menu is used to open and save WINDOW databases.
Edit	The Edit menu is used to edit information in the input fields
Libraries	The Libraries menu is used to move between the WINDOW libraries
Record	The Record menu is used to move between records in the WINDOW libraries, as well as calculate the results for active records
Tools	The Tools menu is used to activate other programs such as Optics5 and THERM5
View	The View menu is used to move between the list and detailed views in the library, as well as control the display of the toolbar and status bar
Help	The Help menu is used to view the program version number as well as the program Help.

File

The File menu is used to open, save, and print new WINDOW databases. The menu options are:

- New
- Open
- Save
- Save As
- Print
- Print Preview
- Print Setup
- Preferences
- Exit
- Last four databases

Edit

The Edit menu is used to control the editing of individual fields in a record, as well as the record itself. The menu options are:

- Undo
- Cut
- Copy
- Paste
- Delete Record
- Import

Libraries

The Libraries menu is used to access the libraries in the WINDOW program. The menu options are:

- Window

- Glazing System
- Glass
- Gas
- Frame
- Divider
- Environmetnal Conditions

Record

The Record menu is used to move between the records in the currently open library. The menu options are:

- First Record
- Previous Record
- Next Record
- Last Record

Tools

The Tools menu is used to start other programs in the LBNL software suite. The menu options are:

- THERM
- Optics

View

The View menu is used to move between the List and Detailed views of the libraries, as well as control the toolbars for the program. The menu options are:

- List View
- Detailed View
- Toolbar
- Status Bar

Help

The Help menu is used to access the WINDOW help topics, as well as version information. The menu options are:

- Help Topics
- About W5

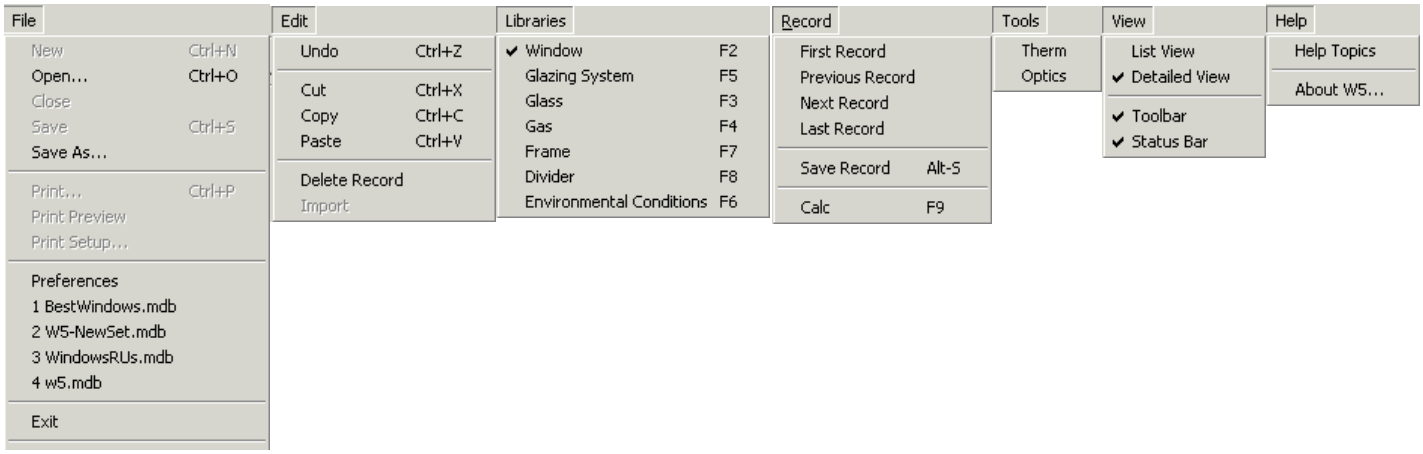


Figure 2-2. File Menu choices.

2.3. Toolbar

The toolbar offers shortcut buttons for several common functions, including navigating between each of the libraries. The figure below shows the toolbar with labels for each button.

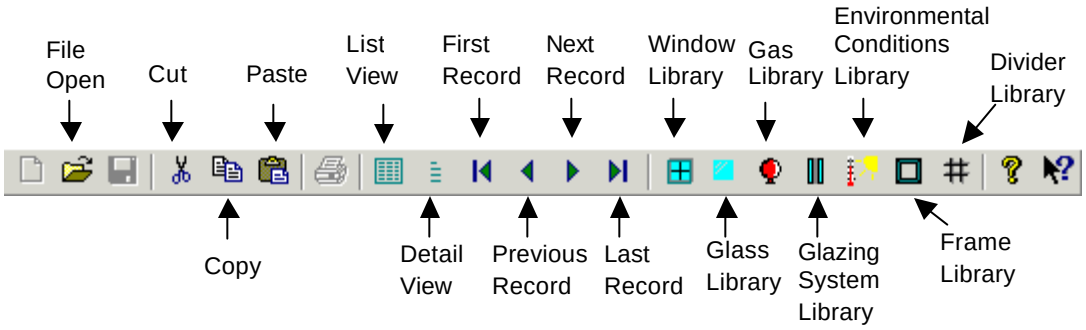


Figure 2-3. Toolbar buttons.

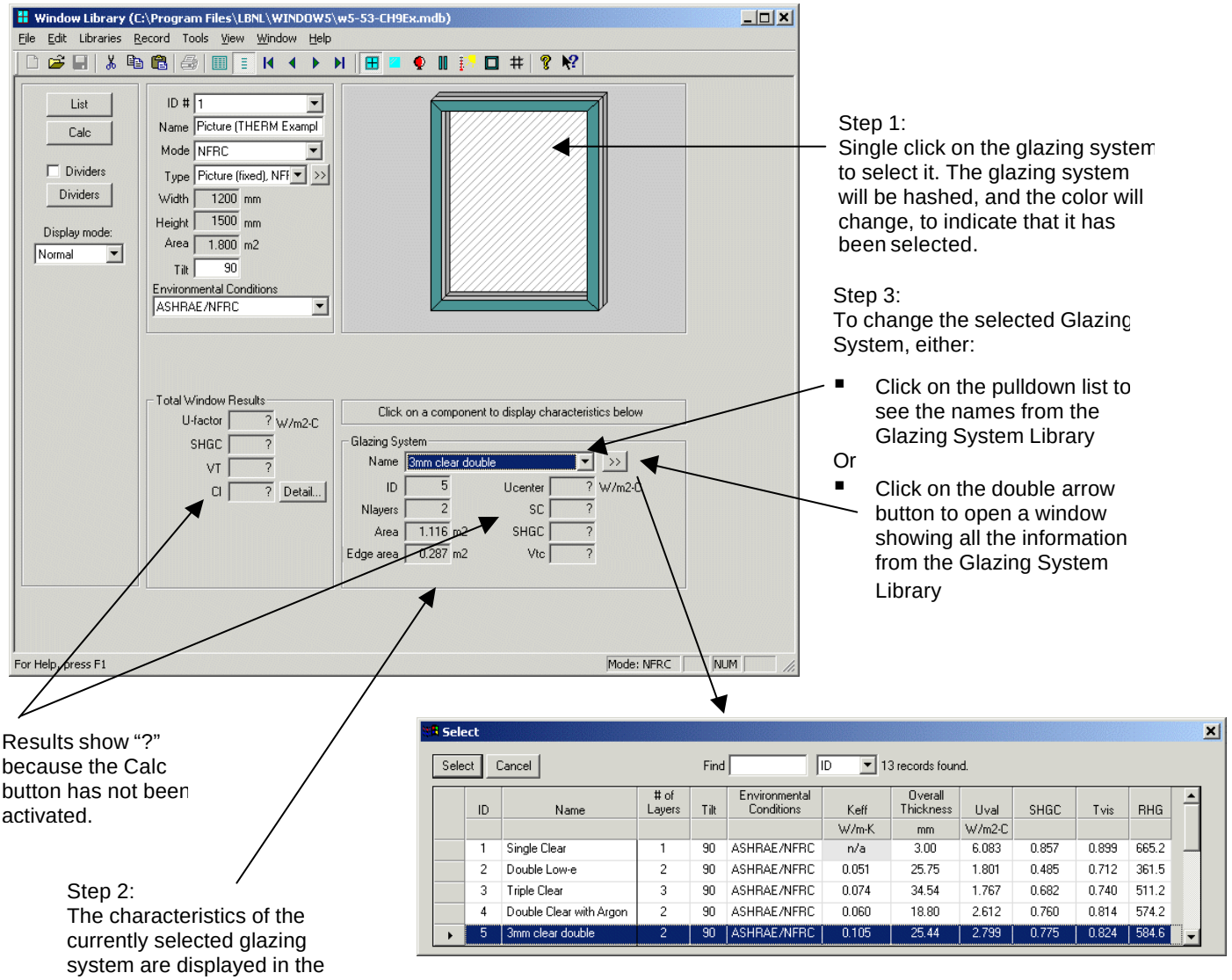
2.4. Construct a Window Product

2.4.1. Select the Glazing System for the Window

To view the characteristics of the glazing system of the window, click on the glazing system component and the information is displayed in the lower right group box, as shown below. This information is from the Glazing System Library.

To select a new glazing system for this window, click on the glazing system to be changed, and either use the pulldown list to see the names of all the records in the Glazing System Library, or click on the double arrow button, and another window will open which displays all the values from the Glazing System Library.

Figure 2-4. Select a Glazing System for the window.



2.4.2. Select the Frame for the Window

To view the characteristics of the frame of the window, click on a frame component and the information is displayed in the lower right group box, as shown below. This information is from the Frame Library.

To select a new frame for this window, click on the frame component to be changed, and either use the pulldown list to see the names of all the frames in the Frame Library, or click on the double arrow button, and another window will open which displays all the values from the Frame Library.

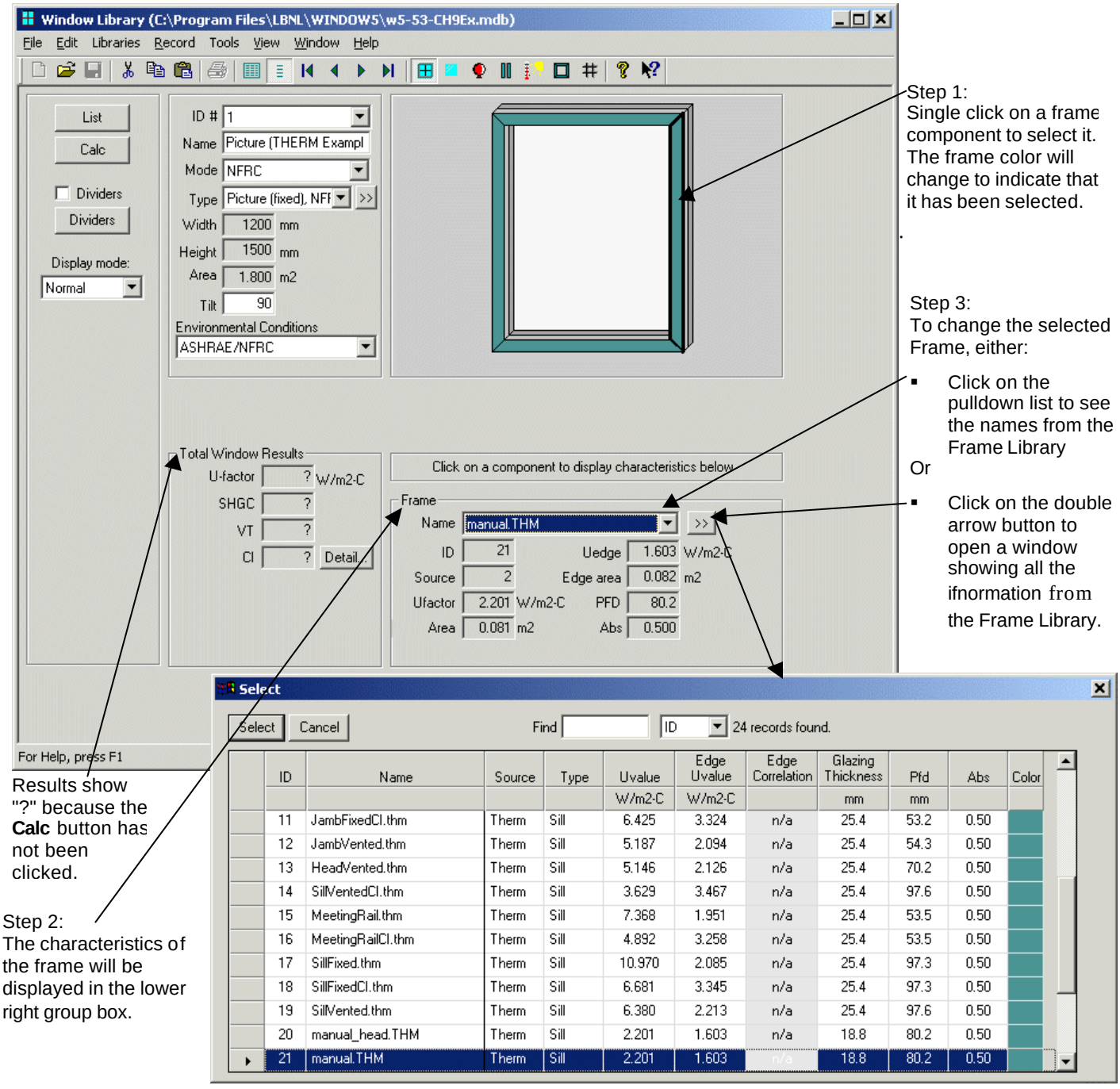
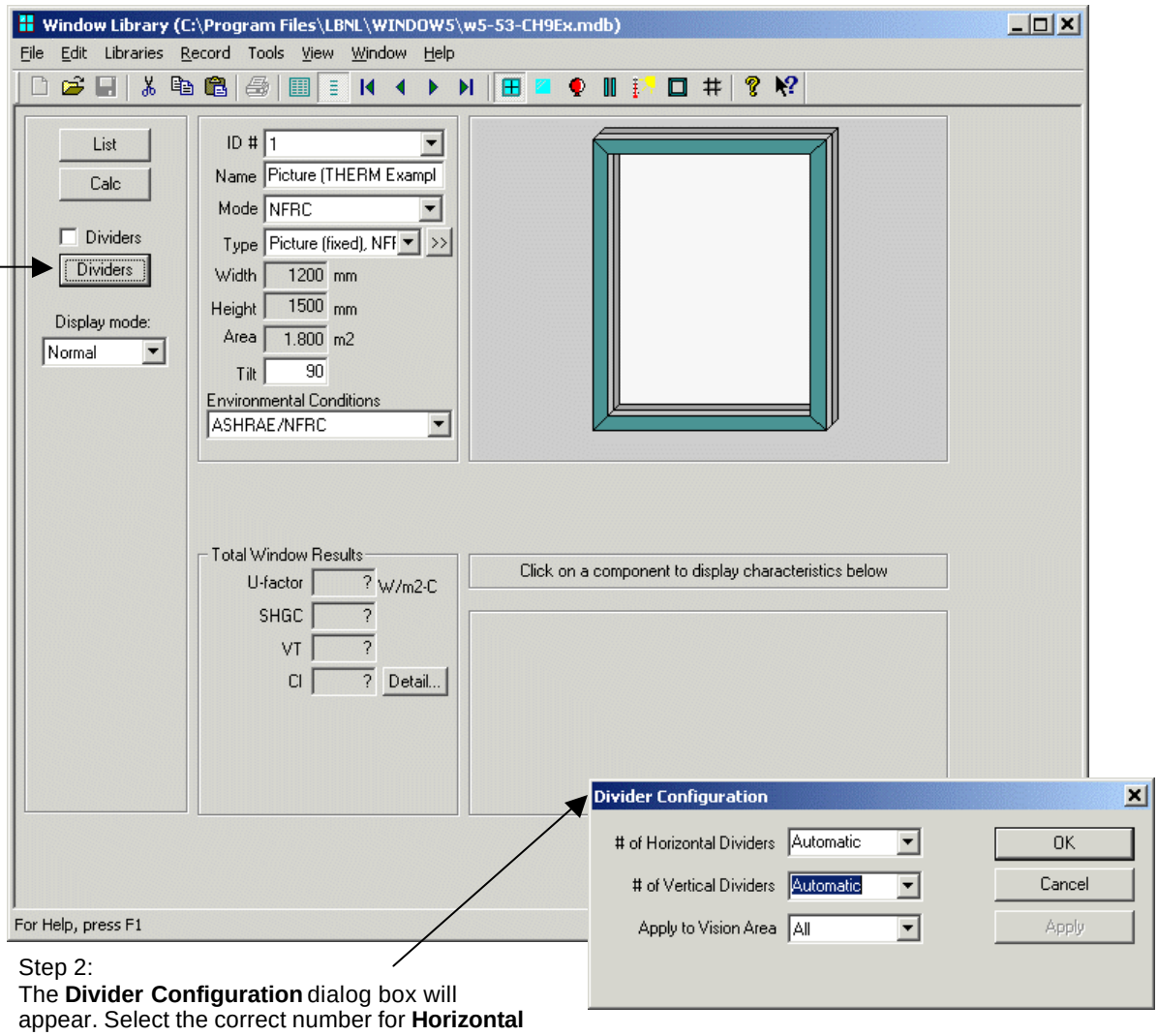


Figure 2-5. Select a Frame for the window.

2.4.3. Add Dividers to the Window

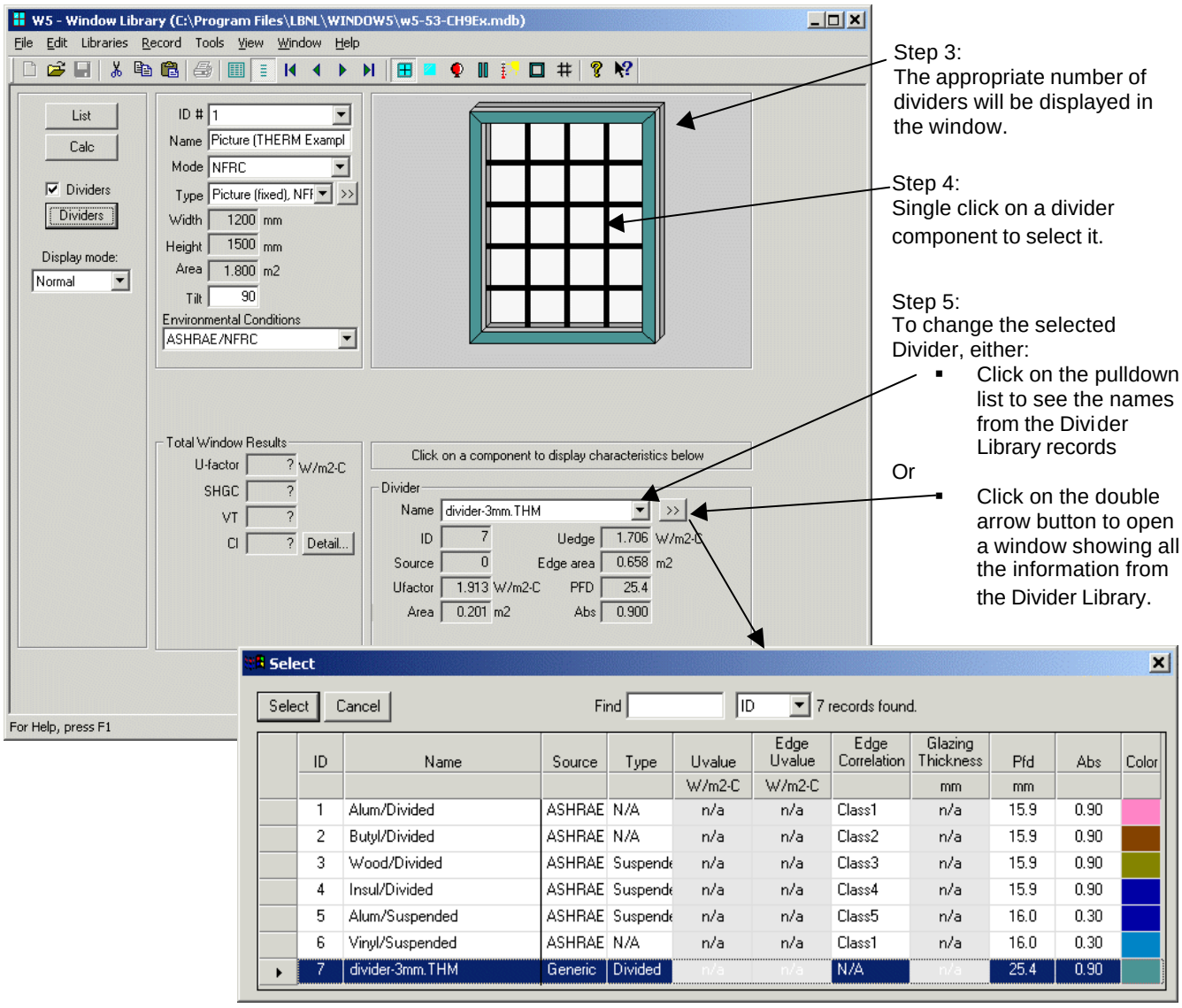
To add dividers to the window without dividers, click on the Divider button above the Results group box.

Step 1:
Click on the **Dividers** button.



Step 2:
The **Divider Configuration** dialog box will appear. Select the correct number for **Horizontal** and **Vertical Dividers**, and click the **OK** button.

Figure 2-6. Specify the number of dividers for the window.



Step 3:
The appropriate number of dividers will be displayed in the window.

Step 4:
Single click on a divider component to select it.

Step 5:
To change the selected Divider, either:

- Click on the pulldown list to see the names from the Divider Library records

Or

- Click on the double arrow button to open a window showing all the information from the Divider Library.

Figure 2-7. Select a Divider for the window.

2.4.4. Calculation

WINDOW will calculate the total product properties for the current record when the **Calc** button is clicked.

Click the **Calc** button and the program will calculate the **Total Window Results**.

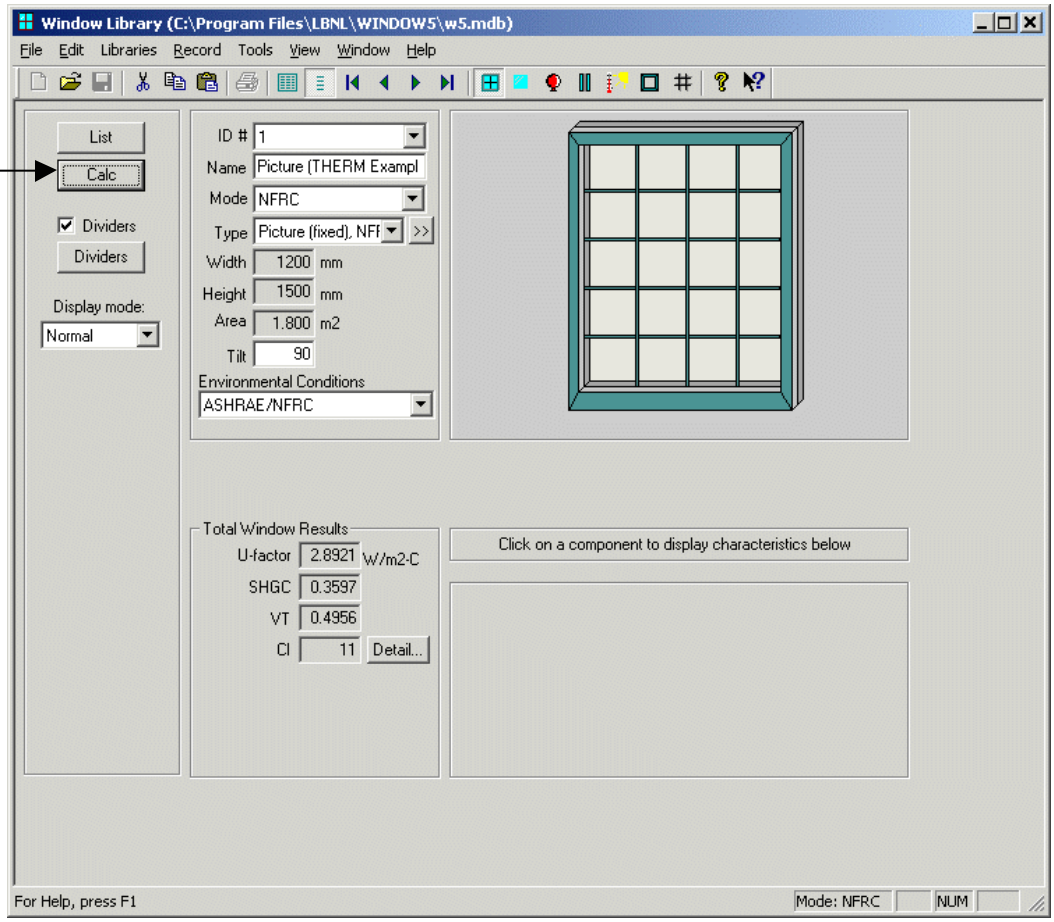


Figure 2-8. Calculate the whole product properties.

2.4.5. Results

WINDOW calculates the following values for the Total Window Results:

U-value	Total Product U-value
SHGC	Solar Heat Gain Coefficient.
VT	Visible Transmittance
CI	Condensation Index, calculated according to NFRC 500 Procedures (Draft). It is possible to see the intermediate values used for the CI calculation by pressing the Detail button, explained in detail in Chapter 4 of this manual.

2.4.6. Temperature Map for Window

Click on the **Temperature Map** button in the **Total Window Results** group box to display a temperature map of the window, as shown below.

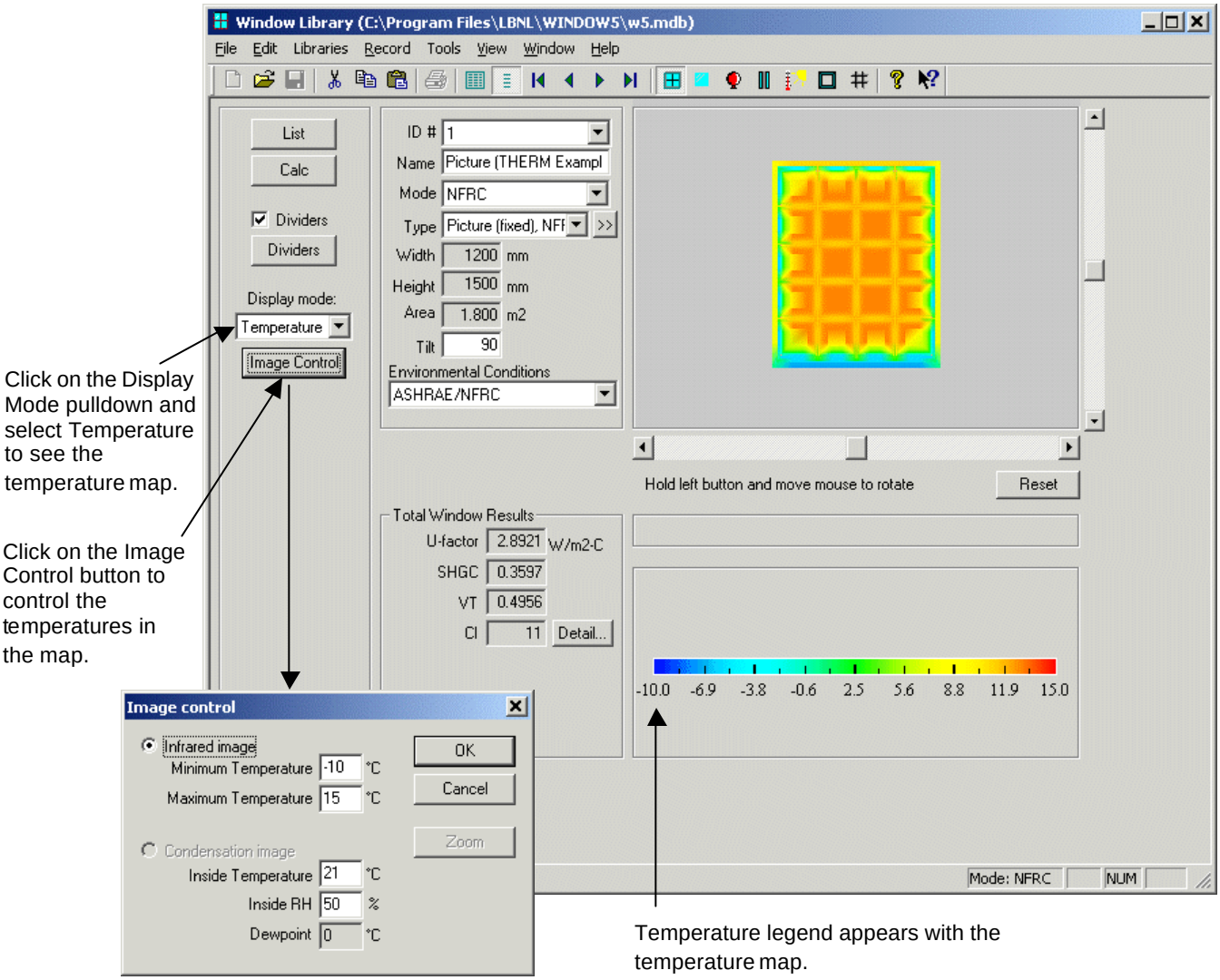


Figure 2-9. Click on the Temperature Map radio button to see the temperature map for the current window.

Note the following (see also *Section 4.3,* "Window Library" and *Section 4.7,* "Frame Library") about the Temperature Map data:

- It is necessary to use THERM 5 Alpha in order to get the proper temperature data. Older versions of the program will not have the correct data.
- It is necessary to model the THERM profiles with the CI feature turned on (this is turned on when importing the glazing system, or can be turned on after the glazing system is imported in the Options / Preferences menu, Therm File Options tab).

2.5. Saving Projects

It is possible to save the results and associated data (for each library) into different WINDOW5 databases for different projects.

For example, after having created the glazing systems, imported the THERM files into the Frame Library, and constructed the desired Windows in the Window Library, this set of data can be saved into a project database with a unique name.

The **File/Save As** menu can be used to save the data currently in the working project database as a different name. The project database that is shipped with the WINDOW is called W5.mdb, but a database can be saved with any name.

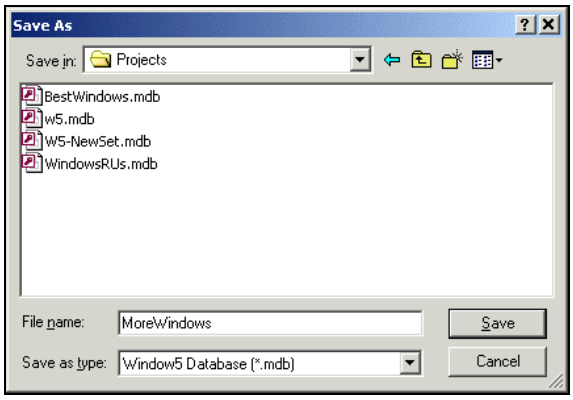


Figure 2-10. Use the File/Save menu to save the current data into a different project database

The **File/Open** menu can be used to open a previously saved project database located in any directory, as shown below:

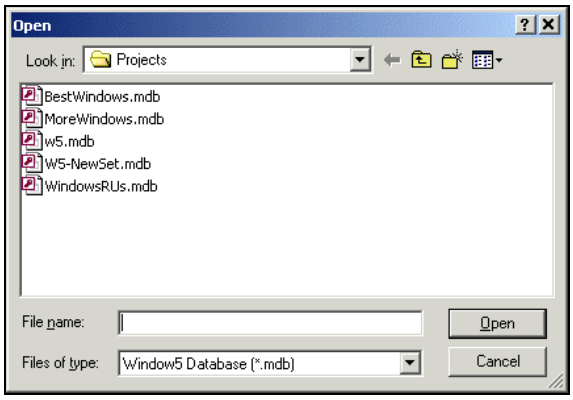


Figure 2-11. Use the File/Save menu to save the current data into a different project database

3. Installation

3.1. System Requirements

WINDOW5 requires the following minimum computer requirements:

- Pentium class or better.
- At least 32 MB of random access memory (RAM). For optimal operation, 64 MB or more of RAM is preferrable.
- Microsoft Windows 98™, Windows 2000™, Windows ME™, or Windows NT™. (The program WILL NOT run with Windows 3.1™, Windows NT 3.51™ or Windows 98™).
- Hard disk drive with at least 40 MB of available disk space
- Printer supported by Microsoft Windows (serial, parallel, or shared over a network).

3.2. Installation Procedures

3.2.1. Before Installing WINDOW

Close all programs before installing WINDOW and uninstall and previous versions of the WINDOW program before starting the installation of this version.

3.2.2. Installing WINDOW

Put the program installation CD in the appropriate drive.

The installation program should automatically start when the CD is inserted, but if not, browse to the CD with MS Windows Explorer and double click on:

Window5FPRsetup.exe

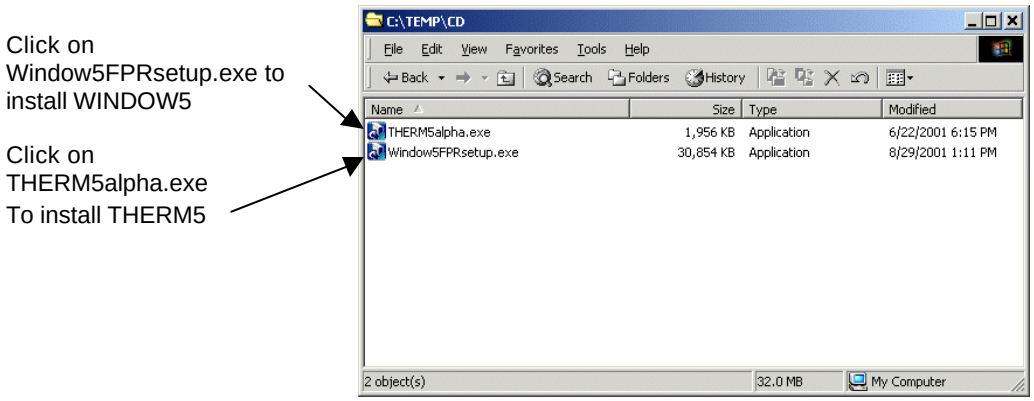


Figure 3-1. Run the setup.exe file on the WINDOW installation CD.

An **Installshield Wizard** window will appear saying that the installation program preparing the installation. Wait for this window to disappear, and then proceed to the next step. To cancel the installation, click in the **Cancel** button.

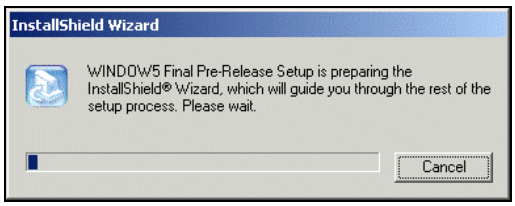


Figure 3-2. The InstallShield Wizard window.

Another InstallShield window will appear. Wait until this window disappears, and then proceed to the next step. To cancel the installation, click in the **Cancel** button.

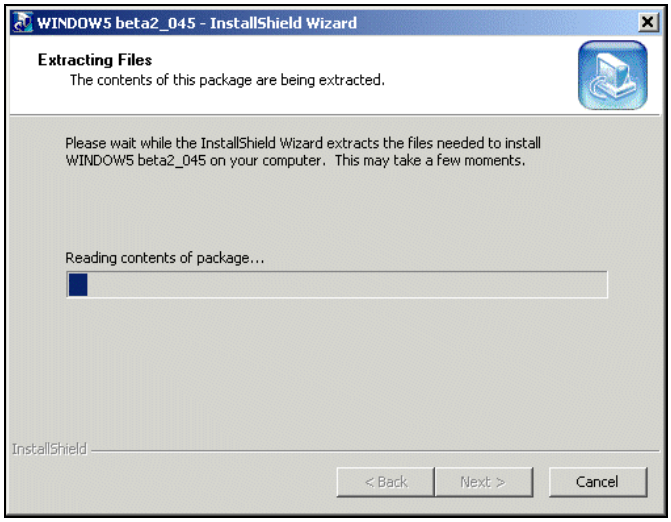


Figure 3-3. The Windows Installer window.

The WINDOW Welcome window will appear. Click the **Next** button to proceed, or cancel the installation by clicking on the **Cancel** button.

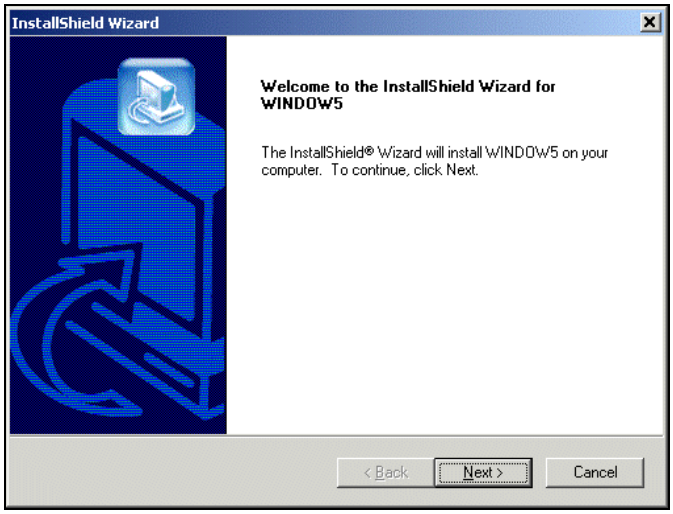


Figure 3-4. The Welcome window.

The **License Agreement** window will appear. After reading and agreeing to the terms of the license, click on **Yes** button to proceed with the installation. Click the **Back** button to go to the previous screen, or cancel the installation by clicking on the **No** button.

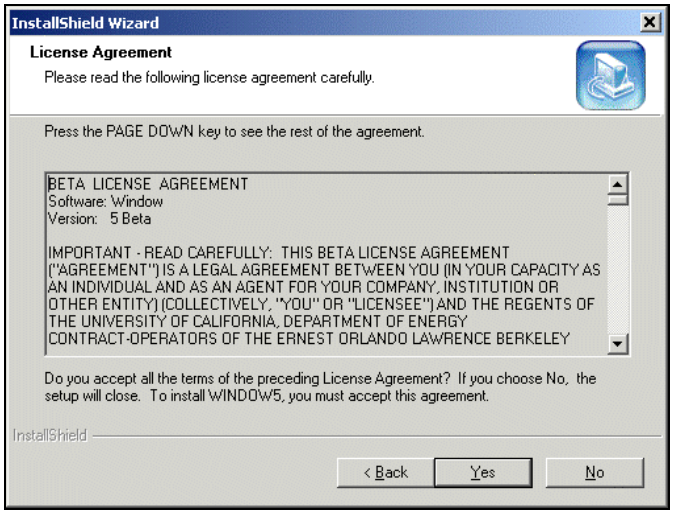


Figure 3-5. The License Agreement window.

The **Customer Information** window will appear. Type the appropriate information into the fields, and click the **Next** button to proceed, or cancel the installation by clicking on the **Cancel** button.

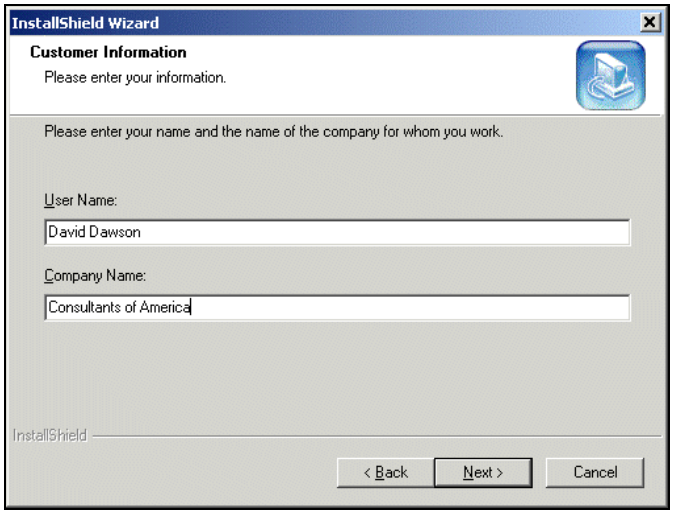


Figure 3-6. The Customer Informaiton window.

The **Choose Destination Folder** window will appear. The default folder for the program is C:\Program Files\LBNL\WINDOW5. NOTE: It is important to keep this directory structure in order for the WINDOW5 installation to be compatible with the Optics5 installation. Extreme caution is advised if this structure is changed. Click the **Next** button to proceed. Cancel the installation by clicking on the **Cancel** button.

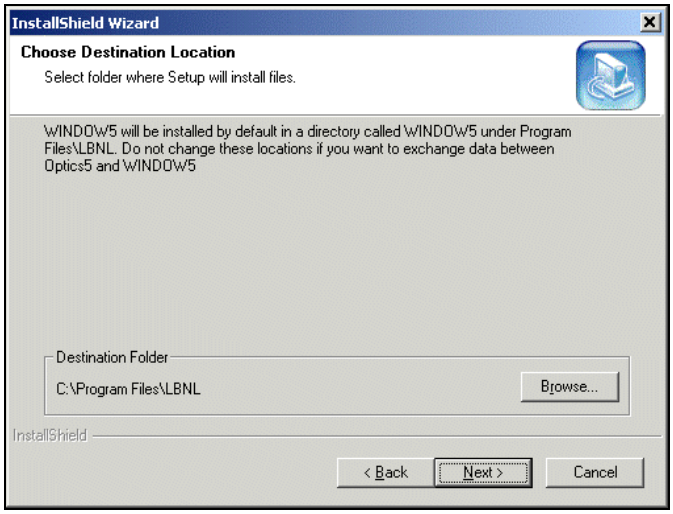


Figure 3-7. The WINDOW Destination Folder window.

The installation program will display all the setting specified in the previous steps in the **Start Copying Files** window. Any of these settings can be changed by clicking on the **Back** button, or they can be accepted by clicking the **Next** button. The installation can be cancelled by clicking on the **Cancel** button.

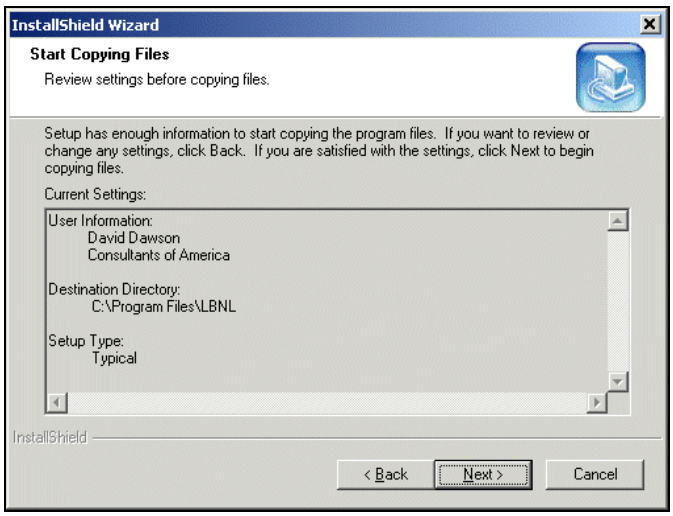


Figure 3-8. The selected installation settings are displayed in the Start Copying Files window.

The installation program will install WINDOW, and show a bar with the completion status in the **Setup Status** window. The installation can be cancelled by clicking on the **Cancel** button.

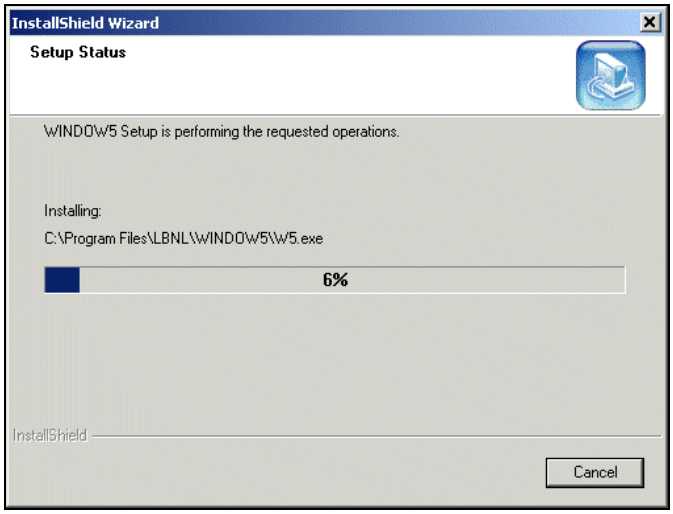


Figure 3-9. WINDOW is being installed.

When the installation is complete, the **Installation Wizard Complete** window will appear. Click on the **Finish** button to finalize the installation.

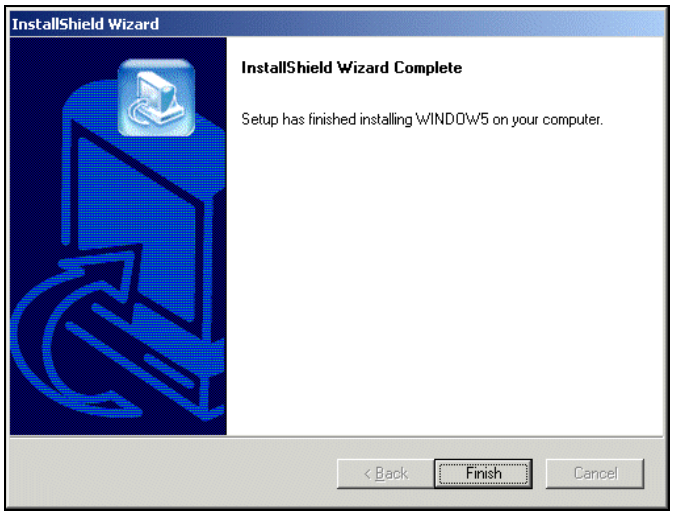


Figure 3-10. Click on the Finish button to complete the installation.

The program can be started from the Start button, Programs, LBNL Software, WINDOW5 FPR, as shown below.

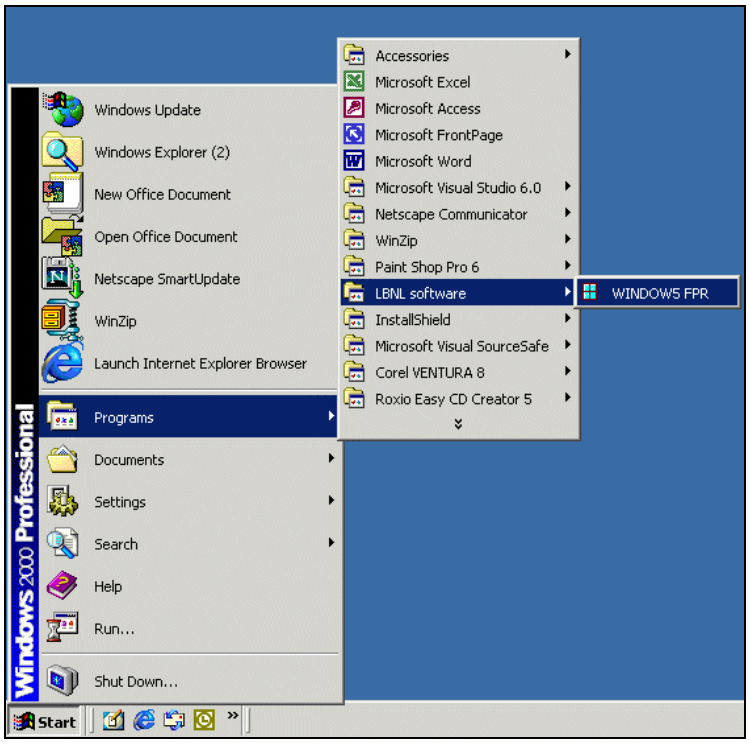


Figure 3-11. Start the program from the Start button.

3.3. Links to THERM and Optics Programs

In order to be able to use the THERM button in the Frame and Divider Libraries detail view (which launches the THERM program), and the Edit Glazing button in the Glass Library detail view (which launches Optics), it is necessary to have the THERM5alpha and Optics5 programs installed on your computer.

If you already have these programs installed on your machine, you do not have to do this step.

These two programs can be installed from the following sources:

- WINDOW5 Beta2 CD contains an installation file for the THERM5 Alpha version, called THERM5alphaSetup.exe, which can be run by double clicking on them from the Microsoft Windows Explorer.
- Optics can be downloaded from http://windows.lbl.gov/materials/optics5/default.htm.

WINDOW5 will assume that the THERM and Optics5 programs are installed in the following default directories:

- For THERM 5:

  C:\Program Files\LBNL\THERM5alpha\Therm5alpha.exe

- For Optics5:

  C:\Program Files\LBNL\Optics5\Optics5.exe

If these programs are not installed in these directories, when you click on the buttons that fire up the programs, WINDOW5 will put up a message saying that it can't find the programs, and an Open dialog box will appear, where you can browse to the program location. WINDOW5 will remember the location you specify, so you will only have to do this once.

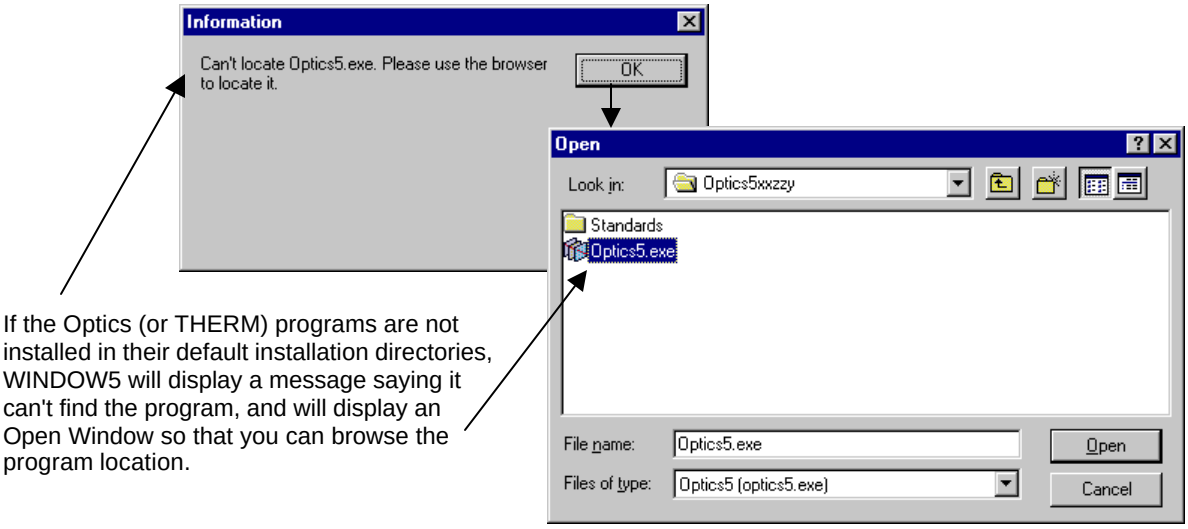


Figure 3-12. WINDOW5 will ask for the Optics5 and THERM program locations if those programs are notinstalled in their default directories.

3.4. Installation Problems

3.4.1. Not enough disk space

If the installation program detects that there is not enough disk space, a screen showing how much is needed will appear.

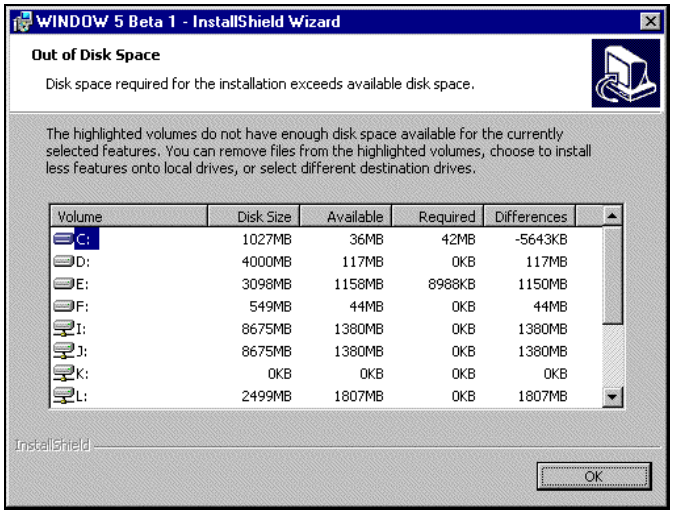


Figure 3-13. Window showing necessary disk space for WINDOW installation

3.4.2. Previous Version Detected

The installation will detect if WINDOW has been previously installed and will require that it be uninstalled before the new installation can proceed (see Section 3.4, "Uninstalling WINDOW").

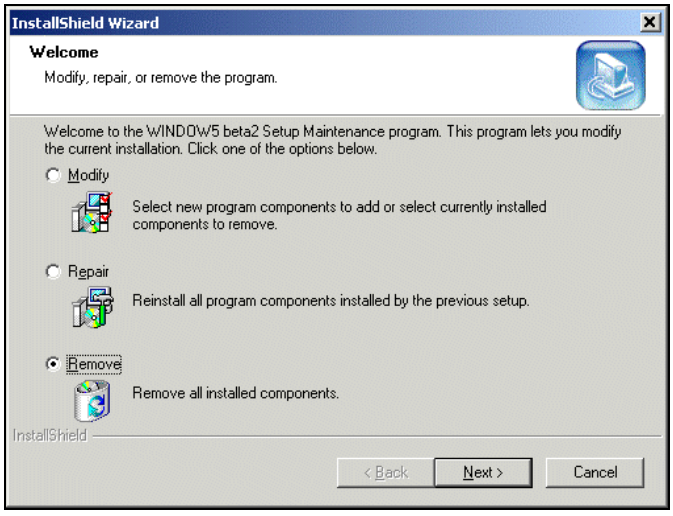


Figure 3-14. Remove the previous version before installing a newer version.

3.5. Uninstalling WINDOW

To uninstall WINDOW, either run the original installation setup.exe which will display the **Program Maintenance** window (Figure 3-18) and click on the **Remove** option, or open the Microsoft Windows™ Control Panel.

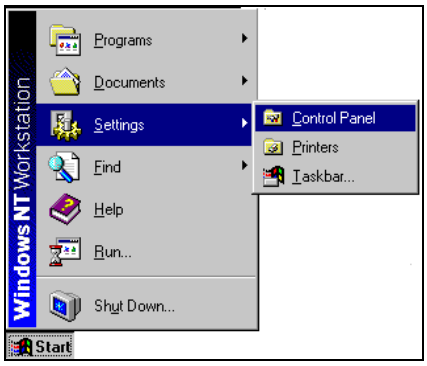


Figure 3-15. To uninstall WINDOW, run Control Panel

Click on the **Add/Remove Programs** icon in the Microsoft Windows™ Control Panel.

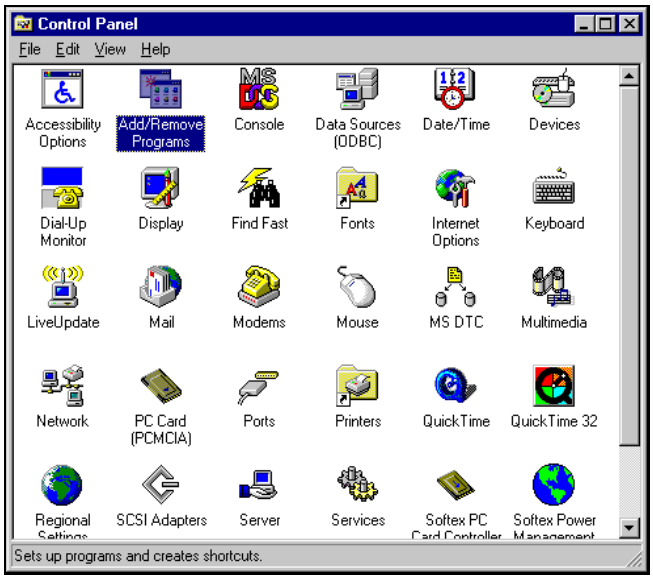


Figure 3-16. Click on the Add/Remove Programs icon.

In the **Add/Remove Programs Properties** dialog box, under the **Install/Uninstall** tab, select the **WINDOW 5 Beta 1** program, and click the **Add/Remove** button.

Figure 3-17. Select the WINDOW 5 Beta 1 program and click the Add/Remove button

The **Welcome** window will appear. Click the **Remove** radio button, and then the **Next** button to proceed, or click the **Back** button to go back to the previous step. To cancel the program removal click on the **Cancel** button.

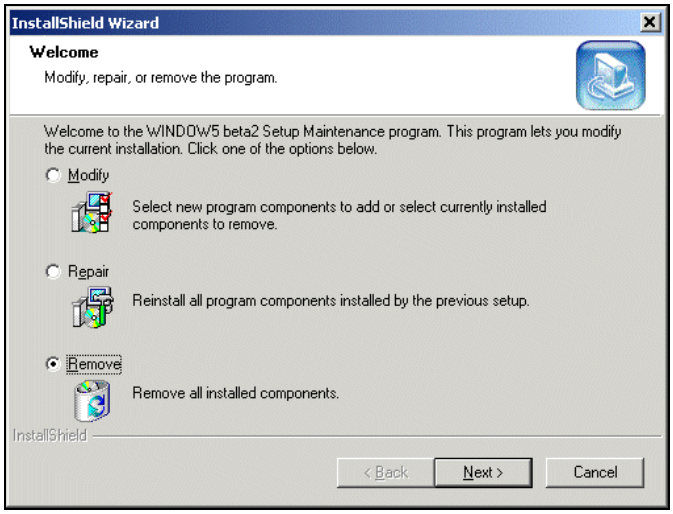


Figure 3-18. Click on the Remove radio button, and then click on the Next button.

The **Confirm File Deletion** window will appear to verify that you want to remove the program. Click the **OK** button to remove the program, or click the **Cancel** button to cancel the program removal.

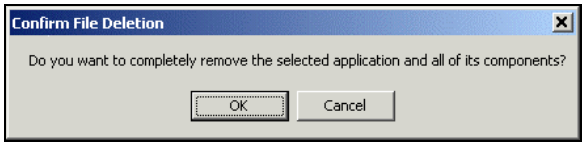


Figure 3-19. Click on the OK button to confirm the removal of the program.

The **Setup Status** window will appear to show the progress of the program removal. To cancel the program removal click on the **Cancel** button.

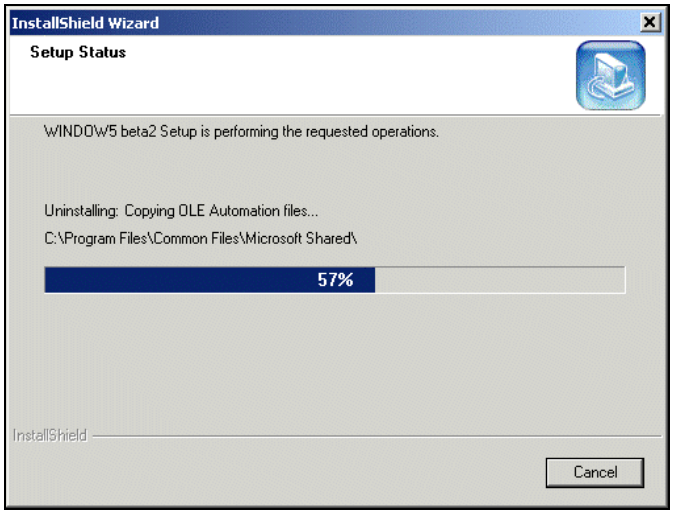


Figure 3-20. The progress of the program removal is displayed in the Uninstalling WINDOW 5 Beta 1 window.

When the removal is complete the **InstallShield Wizard Completed** window will appear. Click the **Finish** button to complete the procedure.

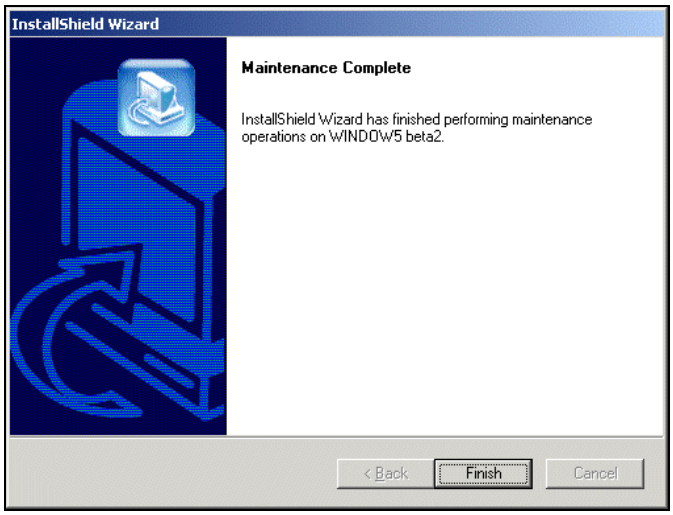


Figure 3-21. Click the Finish button to complete the program removal.

4. Program Description

4.1. Overview

WINDOW consists of a series of the following libraries which are described in detail in this chapter:

- Window Library
- Glazing System Library
- Glass Library
- Gas Library
- Frame Library
- Divider Library
- Environmental Conditions Library

4.2. Libraries in General

Libraries are the main components of the WINDOW5 program, and each library contains characteristics necessary for the calculations.

4.2.1. List and Detail Views

There is a “List” and a “Detail” view of the data in each library. The List View shows all the records (rows) in the library but only some of the fields (columns with data), and the Detail View shows all the data (or fields) for one record. Most changes to the library records are made in the Detail View.

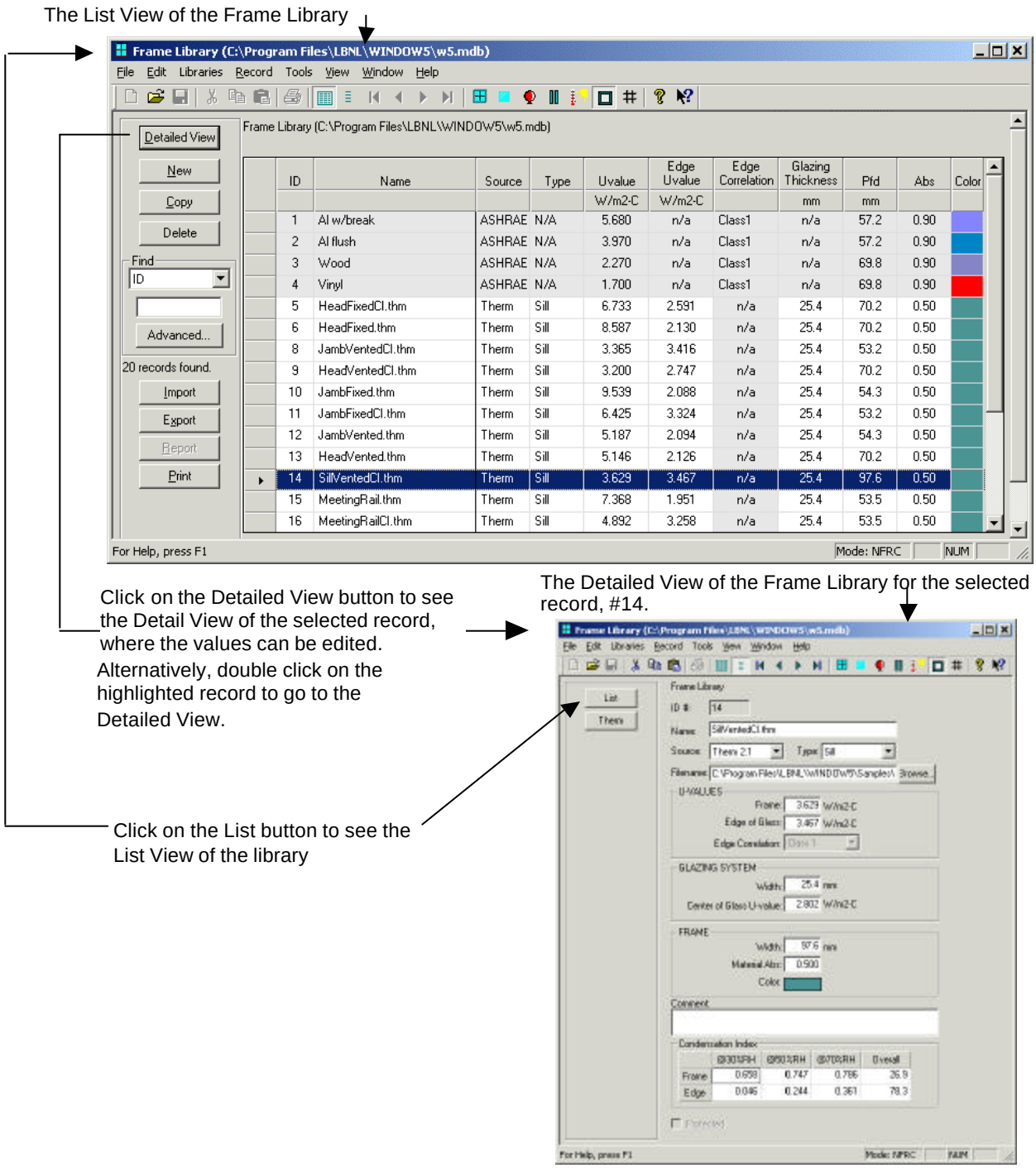


Figure 4-1. Switching between the List View and Detail View in a Library.

4.2.2. Selecting Records from Libraries

From many of the libraries, it is necessary to select records from other libraries. For example, in the Window Detail View, in order to define a window, it is necessary to select records from the Frame Library, the Glazing System Library, and possibly the Divider Library. From the Glazing System Library, it is necessary to select records from the Glass Library and the Gas Library.

There are several different options for selecting records from other libraries, as discussed below.

One method is to click on the double arrow icon where it appears. This will open a small dialog box with a listing showing all the records and their associated fields from that library.

The double arrow select button can be used to open a view into the Glass Library to select glass layers.

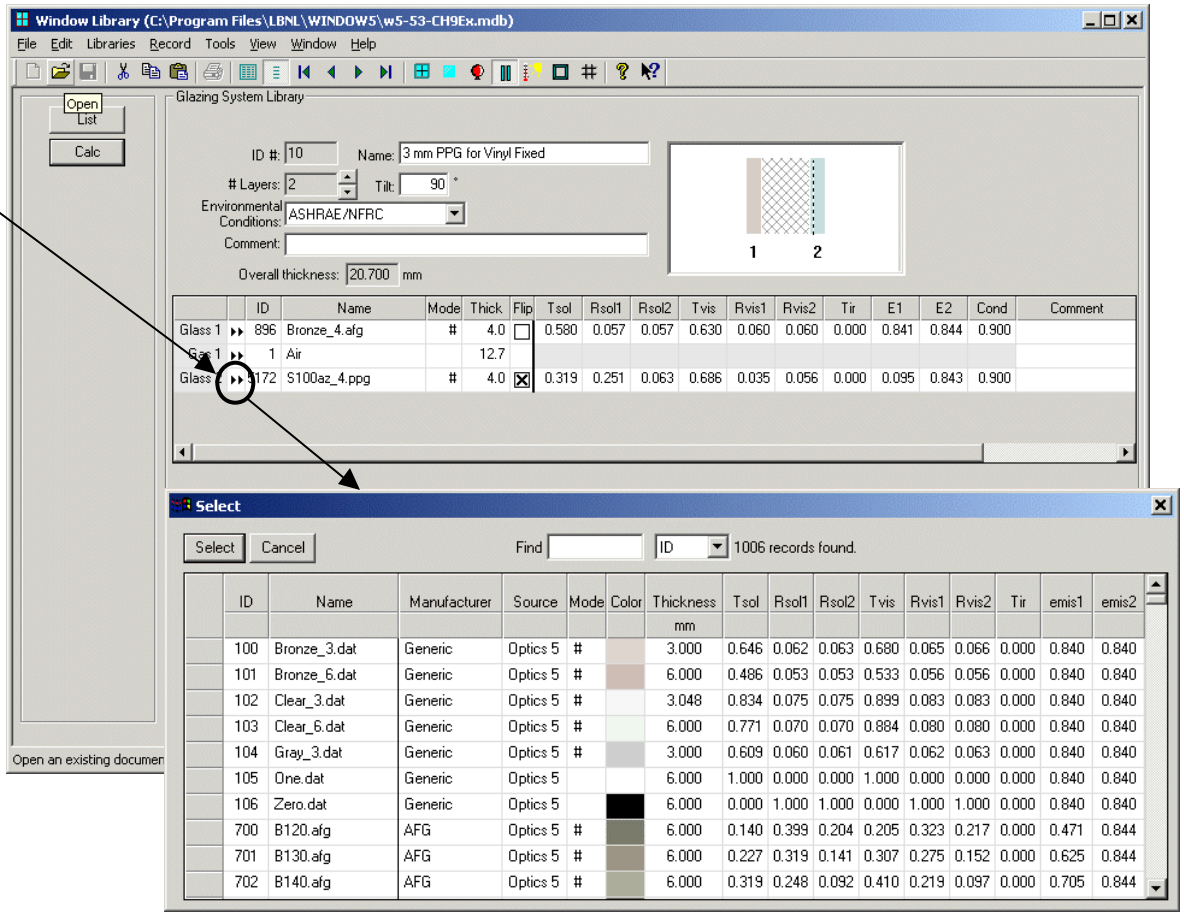


Figure 4-2. Selecting a record from another library.

4.2.3. Moving Between Records in Detail View

There are several ways to move between records in the Library Detail View:

- The **Record Menu** contains choices for First Record, Previous Record, Next Record, Last Record
- The **Toolbar** has buttons for first , previous , next , and last record to move between records.

4.2.4. Creating New Records

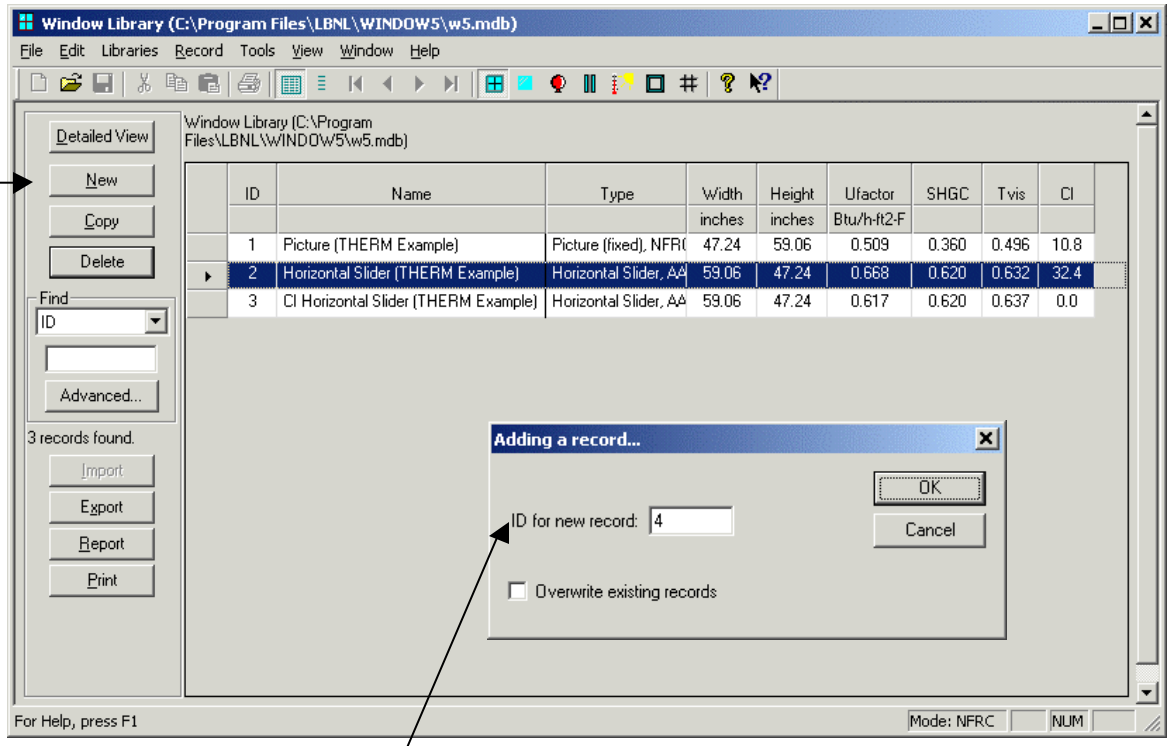
New records are created in the List View of any of the libraries. From the List View, there are two methods for creating new records, either:

- Use the **Copy** button to copy an existing record and change the data that is different for the new record.
- Use the **New** button to create a new record, based on a default record that is automatically included in the program for each library.

Creating New Records Using New Button

New records can be created in the List View using the **New** button, which will make a new record based on the values in the WINDOW default record for that Library. Go to the **Detailed View** of the new record and make the desired changes to the input values.

Step 1: Click on the **New** button to copy the highlighted record.

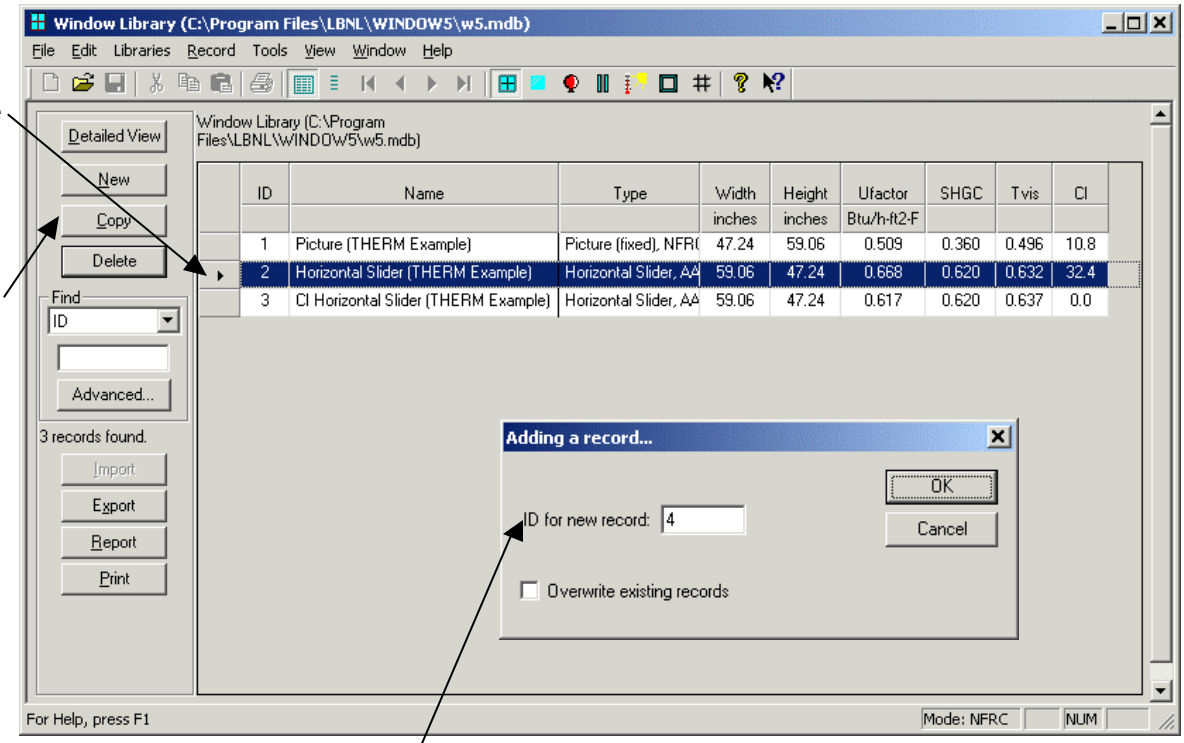


Step 3: WINDOW5 will automatically assign a unique ID for the new record. A different ID number can be typed, as long as it is unique. Click **OK** to add the new record.

Figure 4-3. Create a new record using the New button.

Creating New Records Using Copy Button

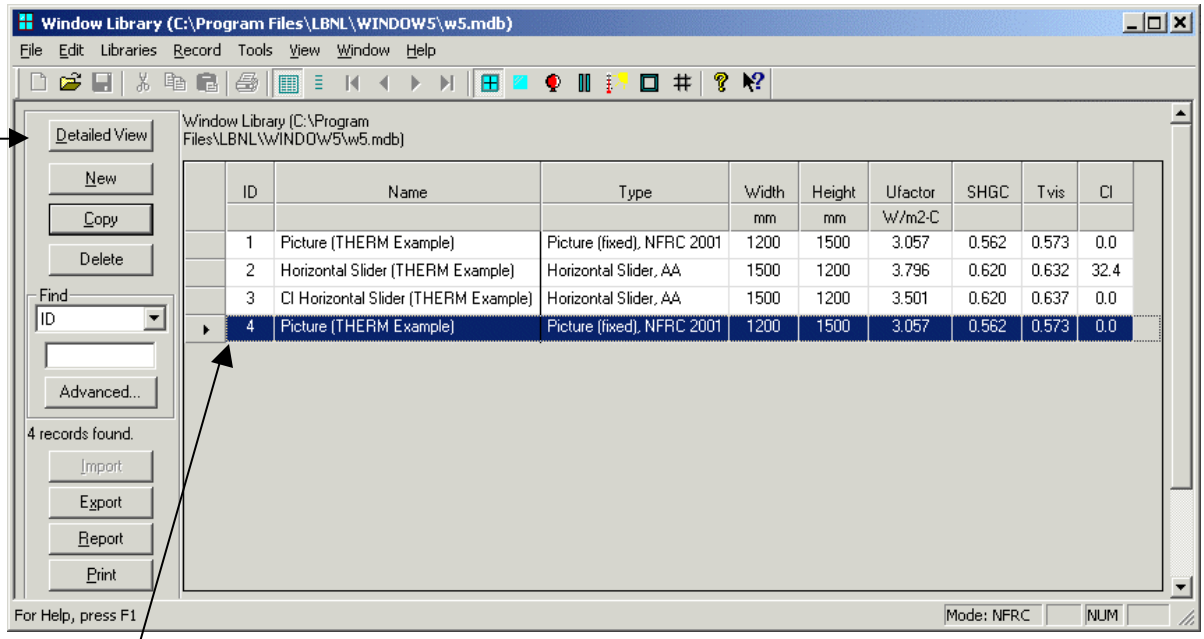
New records can be created in all the libraries by copying an existing record (by highlighting it and clicking on the **Copy** button in the **List** View) and then editing the new record with the desired values in the **Detailed View**.



Step 3:
WINDOW5 will automatically assign a unique ID for the new record. A different ID number can be typed, as long as it is unique. Click OK to add the new record.

Figure 4-4. Create a new record by copying an existing record.

Step 5:
Click on the Detailed View button to edit the values of the newly created record.



Step 4:
Highlight the record to be edited, then either click on the Detailed View button to make changes to the new record, or double click on the highlighted record.

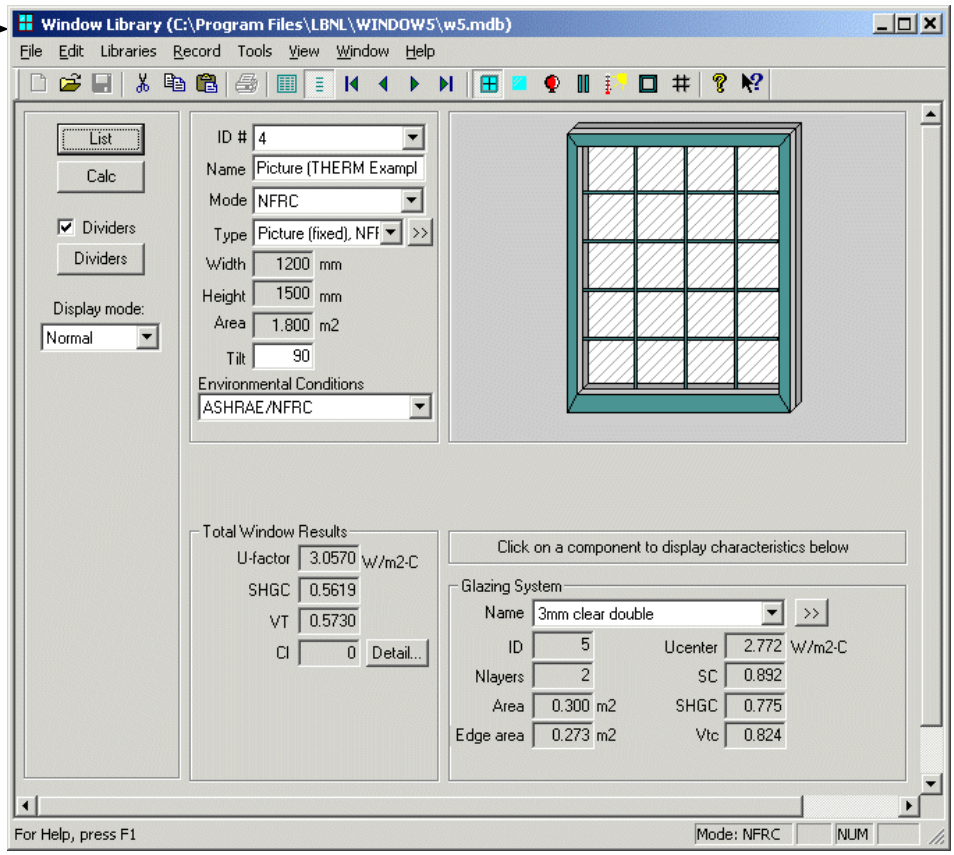


Figure 4-5. Edit the newly created record in the Library Detail View.

4.3. Window Library

The Window Library is where the whole product is constructed from each of the components (frames, glazing systems, dividers, environmental conditions). The calculation results will be for the entire product.

4.3.1. Window Library Detail View

The Detail View shows details of individual windows in the Window Library. The upper left section of the screen is used to input the window characteristics. The upper right section of the screen shows a graphic representation of the window based on the input values. It is possible to see the selected components for frames, glazing systems, and dividers by clicking on the specific graphic elements; this will cause information about that element to appear in the lower right corner. The lower left section of the screen shows the calculation results for the whole product. These results become "?" when any of the input values change, and can be recalculated by clicking in the **Calc** button. To define the number of dividers in a window, click on the **Dividers** button, and input the correct number of horizontal and vertical dividers.

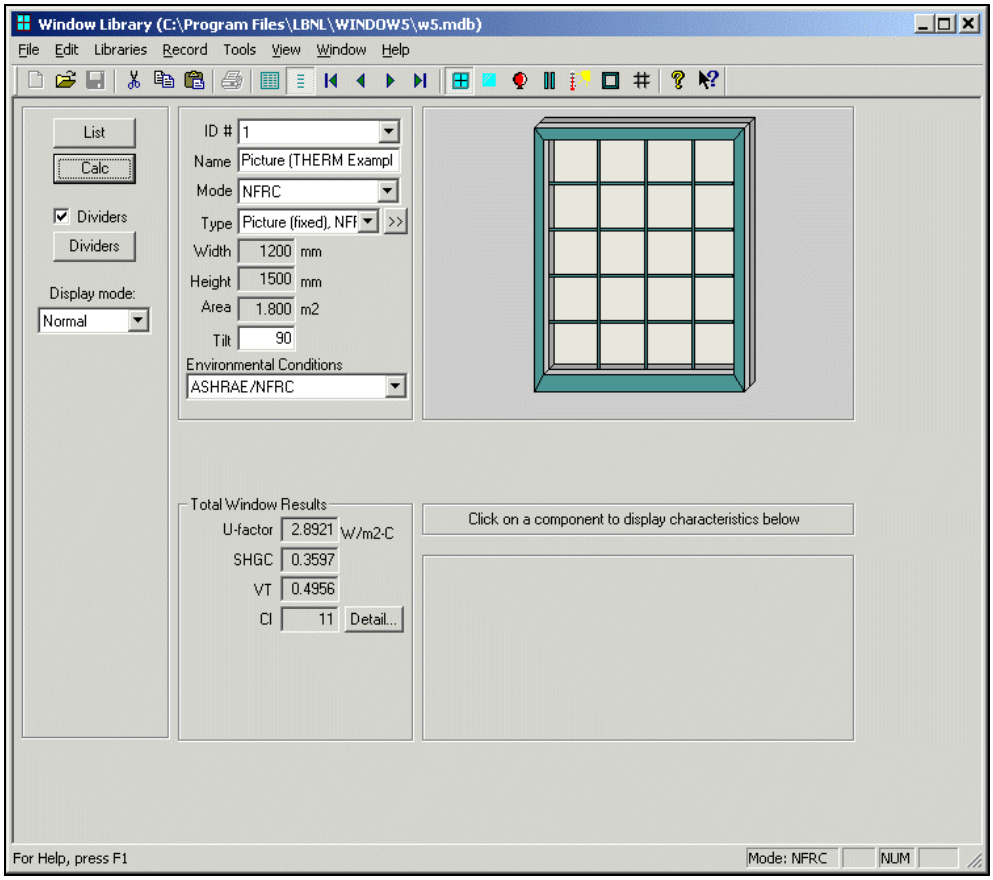


Figure 4-6. Window Library, Detail View.

The following section describes the input and results fields in the Window Library Detail Screen.

ID The unique ID associated with each window record. This value is automatically assigned when a new record is created in List View, and can be changed at that time by the user as long as the value is unique.

Name The name of the glass layer. If the record was imported from the Optics5 database, this name will automatically come from that database.

#Layers	The number of layers for the glazing system. The layers are increased or decreased using the up and down arrows to the right of this field. The program will automatically adjust the number of layers in the layers detail section of the screen based on this number
Tilt	The tilt of the glazing system. **Default:** 90°
Environmental Conditions	The name of the appropriate environmental condition from the Environmental Condition Library, selected using the arrow to the right of the field. **Default:** ASHRAE / NFRC.
ID#	The unique ID associated with each glazing system record.
Name	The name of the window, defined by the user.
Mode	The Mode of the calculation. **Default:** NFRC
Type	The Type of window product, from the pulldown list. The Type determines the display to the right and the number of lites and frame sections available for definition.
Tilt	Tilt of the product. **Default:** 90
Size	Overall size of the product, based on the **Type** input value.
Width	Overall width of the product, based on the Type input value. Units: mm (SI); inches (IP).
Height	Overall height of the product, based on the Type input value. Units: mm (SI); inches (IP)
Area	Overall area of the product, based on the Height and Width. Units: mm (SI); inches (IP).
Environmental Conditions	Environmental conditions to be applied to the whole product calculations. The pulldown list shows the records in the Environmental Conditions Library.

Total Window Results

U-factor	The whole product U-factor.
SHGC	The whole product Solar Heat Gain Coefficient.
VT	The whole product Visible Transmission.
CI	The whole product Condensation Index.
Detail	This button displays detailed values for the Condensation Index calculation.

Display Modes

Normal	Normal display of the product, showing the geometry
Temperature Map	Temperature map display of the product. This will only be displayed if the frame cross sections were calculated with THERM 5.

4.3.2. Window Library List View

The List View shows all the records in the Window Library.

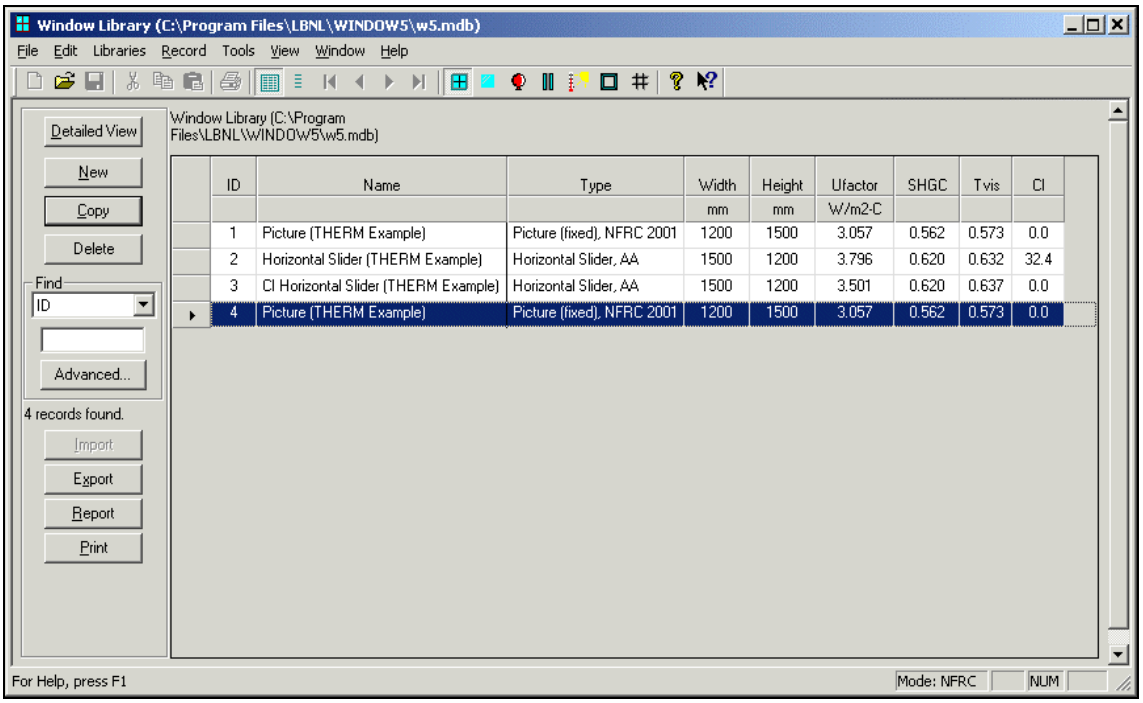


Figure 4-7. Window Library, List View.

The buttons on the left hand side of the List View have the following functions:

Detailed View goes to the detailed view of the record, where the input values can be edited.

New Used to make a new record, based on a default record.

Copy Used to copy an existing record (including name and all associated input values) into a new record.

Delete Used to delete the highlighted record(s).

Find Used to find a record based on the field selected from the pulldown list, and a value typed into the input box.

Advanced Used to access a more advanced method of searching the list

Import Currently disabled.

Export Used to create a comma-separated text file of the Window Library list.

Report Used to create one of the following reports:

- Window 4.1: a report in the same format as Window 4.1, with all the data associated with the window.
- DOE-2: a report (text file) that contains input data to be used with the DOE-2 hourly simulation program. Currently, this file can only be written for windows with one light

Print Used to print a report which contains a list of all the records in the library.

4.3.3. Select the Glazing System for the Window

To view the characteristics of the glazing system of the window, click on the glazing system component and the information is displayed in the lower right group box, as shown below. This information is from the Glazing System Library.

To select a new glazing system for this window, click on the glazing system to be changed, and either use the pulldown list to see the names of all the records in the Glazing System Library, or click on the double arrow button, and another window will open which displays all the values from the Glazing System Library.

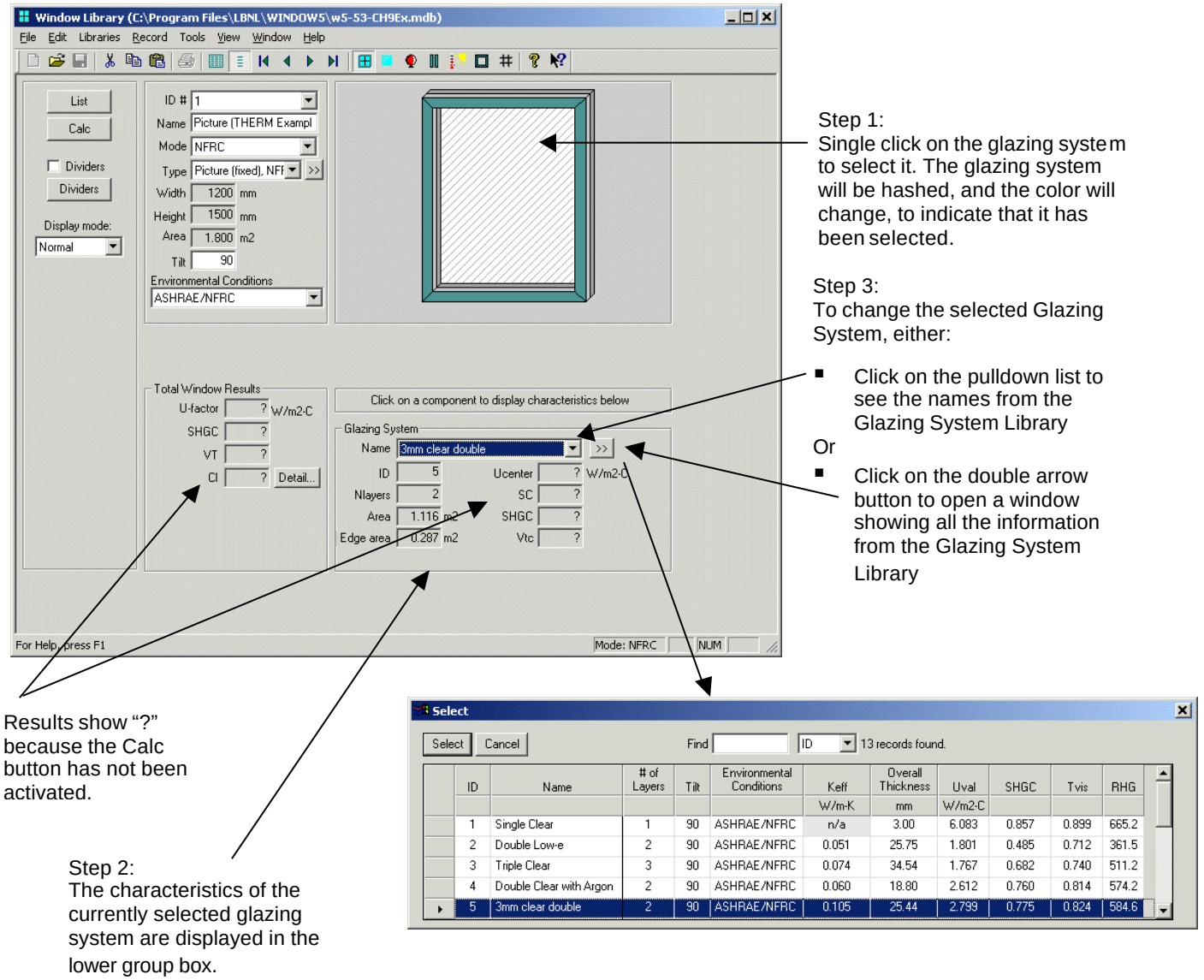


Figure 4-8. Select a Glazing System for the window.

4.3.4. Select the Frame for the Window

To view the characteristics of the frame of the window, click on a frame component and the information is displayed in the lower right group box, as shown below. This information is from the Frame Library.

To select a new frame for this window, click on the frame component to be changed, and either use the pulldown list to see the names of all the frames in the Frame Library, or click on the double arrow button, and another window will open which displays all the values from the Frame Library.

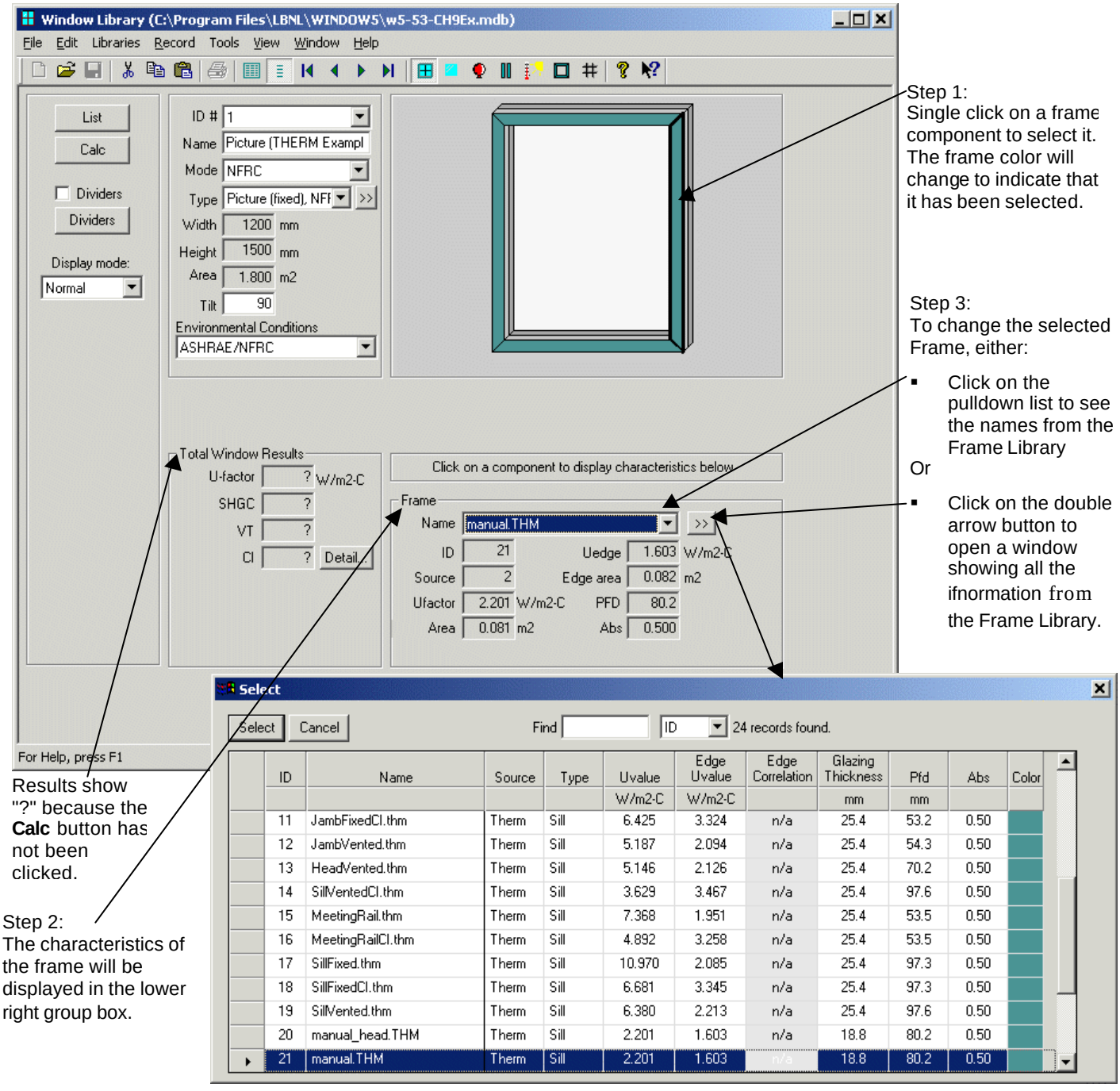
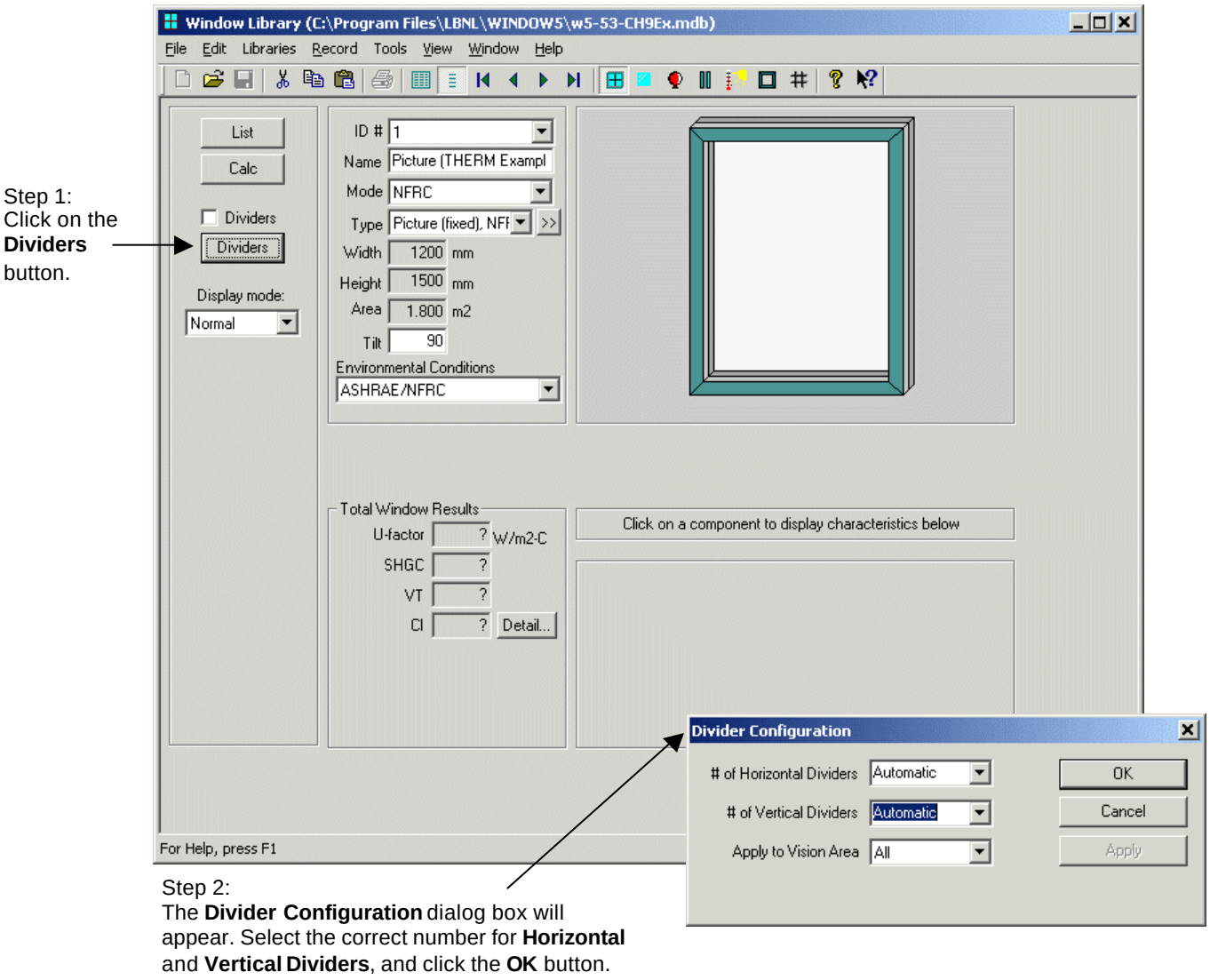


Figure 4-9. Select a Frame for the window.

4.3.5. Add Dividers to the Window

To add dividers to the window without dividers, click on the Divider button above the Results group box.



Step 1:
Click on the **Dividers** button.

Step 2:
The **Divider Configuration** dialog box will appear. Select the correct number for **Horizontal** and **Vertical Dividers**, and click the **OK** button.

Figure 4-10. Specify the number of dividers for the window.

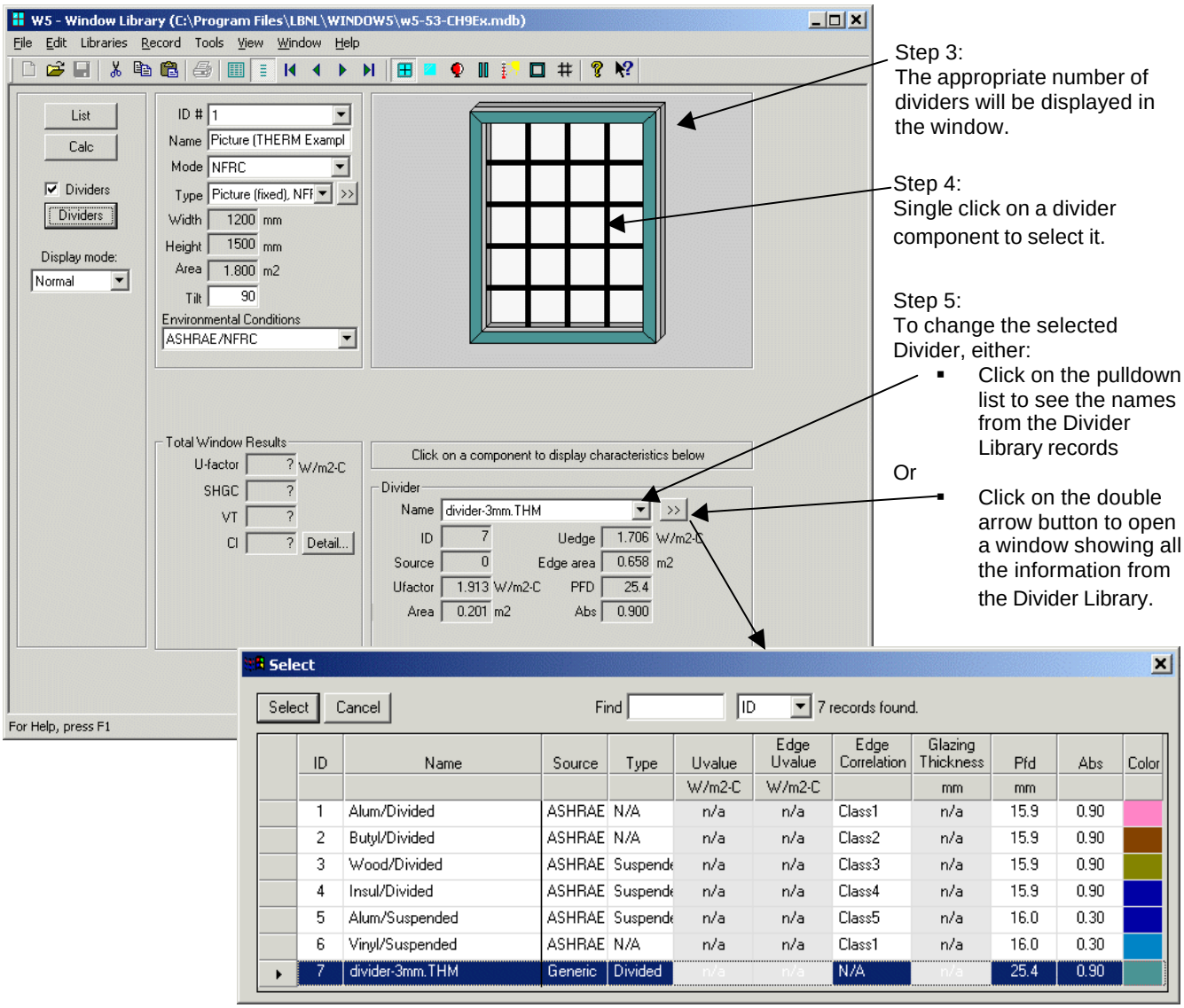


Figure 4-11. Select a Divider for the window.

4.3.6. Calculate

When all the components for the product have been defined, the total product values can be calculated by clicking on the Calc button.

4.3.7. Condensation Index (CI) Calculation

WINDOW5 includes a feature which calculates the whole product Condensation Index (CI) using the methodology presented in NFRC 500. This process involves importing files from THERM5 into the Frame and Divider library that have been modeled in THERM with the Condensation Index feature. See the THERM5 User's Manual and the NFRC THERM5 / WINDOW5 Simulation Manual for the specifics of modeling these THERM files. The modeling procedures for CI are slightly different from those for U-factor, and will mostly likely mean that different THERM files must be created for the CI and U-factor calculations. This will also mean that in WINDOW, separate

surface temperatures from THERM for each cross-section (see Section 4.7.4, "Condensation Index Calculations"); surface temperatures are then area weighted in accordance with NFRC 500 which considers the areas covered with condensation at three different relative humidities. The resulting total product CI value is presented on the Total Window Results section of the Window Library Detailed View. The Detail button to the right of the CI rating on the Window Library Detail View shows intermediate component specific values used in the CI calculation.

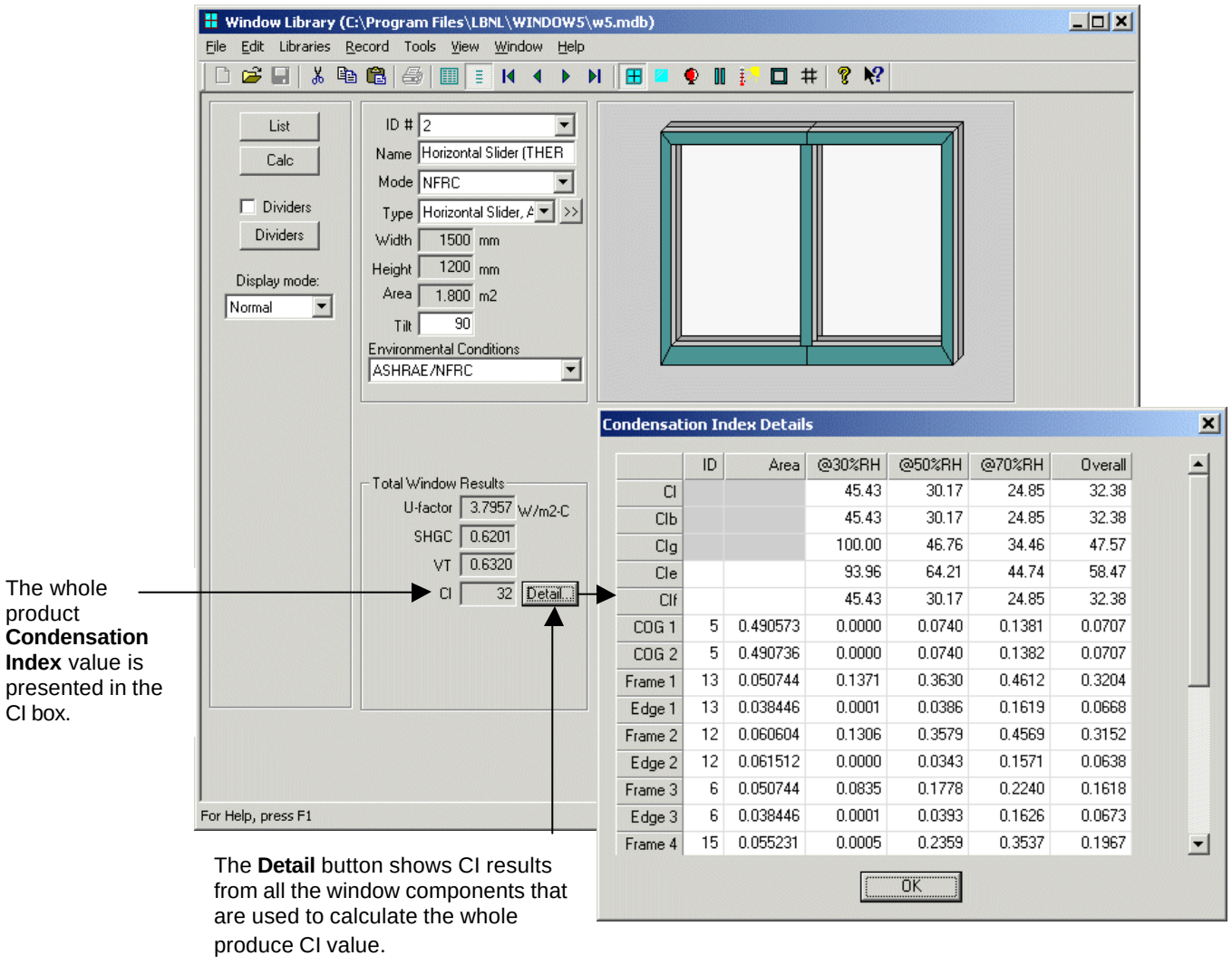


Figure 4-12. Condensation Index results for the whole window product.

4.3.8. Temperature Map

WINDOW5 displays a Temperature Map for the whole product, based on detailed temperature from THERM. Therefore, this feature requires that the frame components of the whole product are referencing THERM 5.0 Alpha files (modeled with the Condensation Index feature turned on).

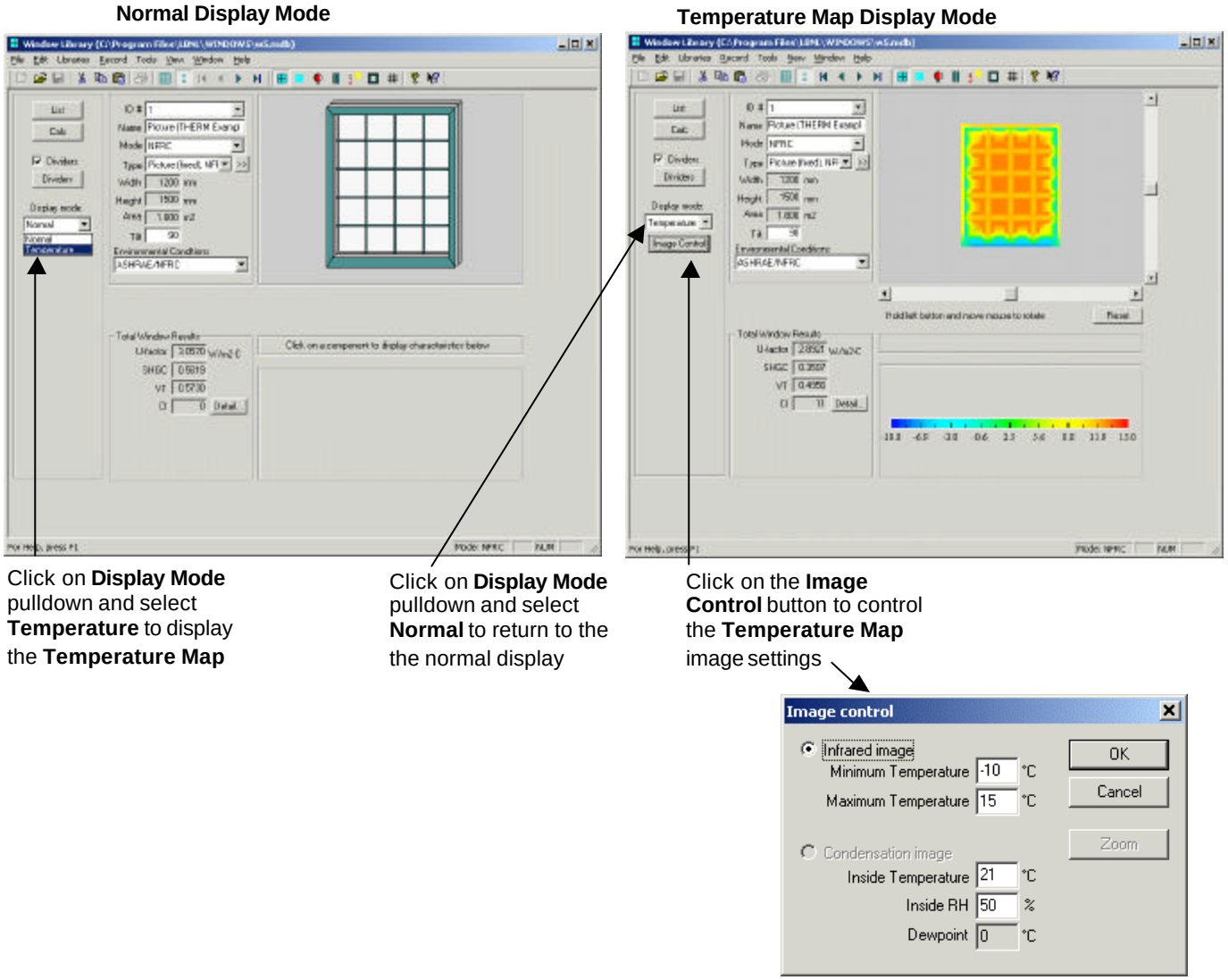


Figure 4-13. The Temperature Map.

4.4. Glazing System Library

The Glazing System Library is used to construct glazing systems to determine the center of glass U-factor, which can be used in the Window library to construct a whole product. Glazing Systems consist of glass layers selected from the Glass Library (which are from the Optics5 database) and definitions of the gaps between the glass layers, which are defined by a thickness and selections from the Gas Library. When the glass layers and gaps have been defined, the results are calculated using the **Calc** button.

4.4.1. Glazing System Library Detail View

The Detail View shows details of individual glazing systems in the Glazing System Library.

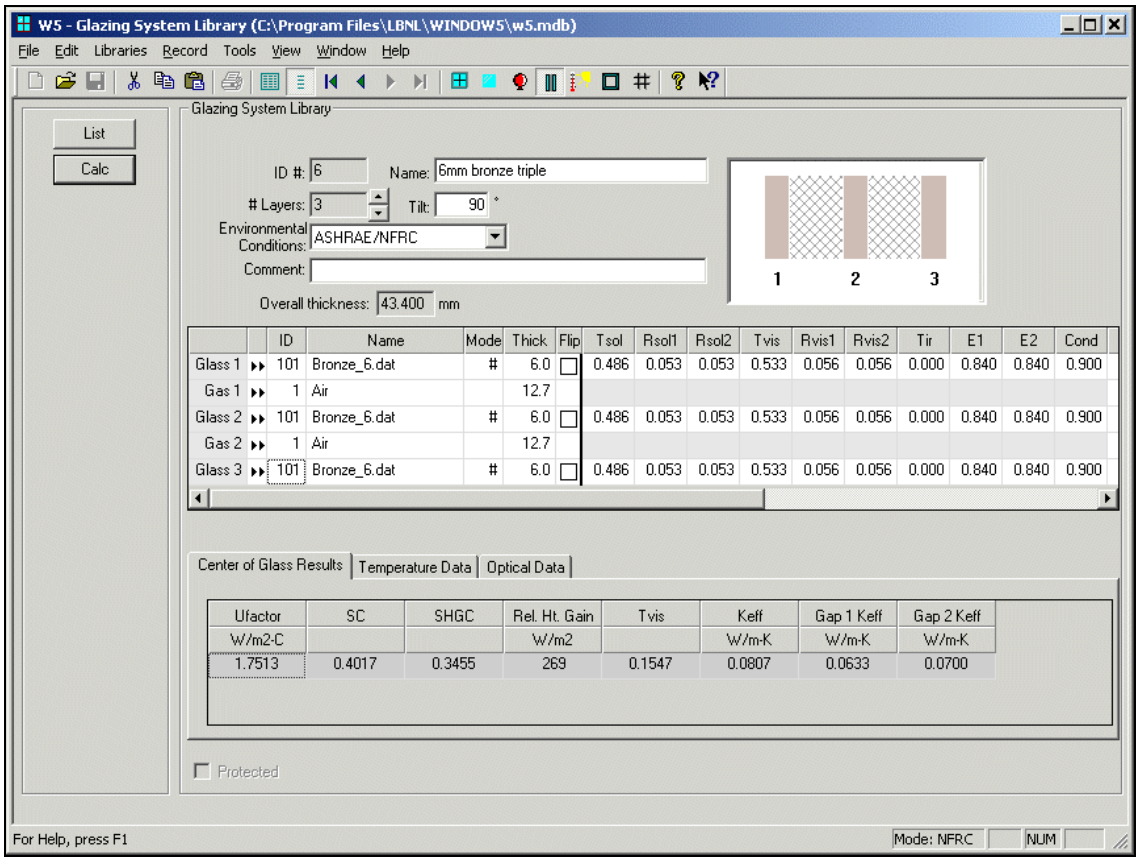


Figure 4-14. Glazing System Library, Detail View.

The following section describes the input fields for the overall glazing system.

ID — The unique ID associated with each glazing system record.

Name — The name of the glass layer. If the record was imported from the Optics5 database, this name will automatically come from that database.

#Layers — The number of layers for the glazing system. The layers are increased or decreased using the up and down arrows to the right of this field. The program will automatically adjust the number of layers in the layers detail section of the screen based on this number

Tilt — The tilt of the glazing system. **Default:** 90°

Environmental

Conditions	The name of the appropriate environmental condition from the Environmental Condition Library, selected using the arrow to the right of the field. **Default:** ASHRAE / NFRC.
Comment	A user entered comment.
Overall Thickness	The overall thickness of the glazing system. Units: mm (SI); inches (IP).

The following section describes the input fields for the layers in the glazing system.

ID	The unique ID associated with each glazing system record.
Name	The name of the glass layer. If the record was imported from the Optics5 database, this name will automatically come from that database.
Mode	An identifier to determine the glass layer approval status. At this time, the only approval mode implemented is NFRC, indicated by "#", and only records with "#" in this field can be used for NFRC simulations.
Thick	Thickness Glass thickness. Units: mm (SI); inches (IP).
Flip	A checkbox to indicate whether or not the glass layer is flipped. Click the box to put an 'x' in it, which indicates that the layer is flipped. This will cause the values for emissivities on the 1 and 2 surfaces to be interchanged.
Tsol	Solar transmittance of the glazing layer.
Rsol1	Solar reflectance of the glazing layer, exterior-facing side.
Rsol2	Solar reflectance of the glazing layer, interior-facing side.
Tvis	Visible transmittance of the glazing layer.
Rvis1	Visible reflectance of the glazing layer, exterior-facing side.
Rvis2	Visible reflectance of the glazing layer, interior-facing side.
Tir	Thermal infrared (longwave) transmittance of the glazing layer.
E1	Infrared (longwave) emittance of the glazing layer, exterior-facing side
E2	Infrared (longwave) emittance of the glazing layer, interior-facing side
Cond	Conductance of glass. Units: W / m-K (SI); Btu / h-ft-^{o}F (IP)

4.4.2. Glazing System Library List View

The List View shows all the records in the Glazing System Library and some of the characteristics of the glazing system from the Detailed View.

The list can be sorted by any column by double clicking on the desired column.

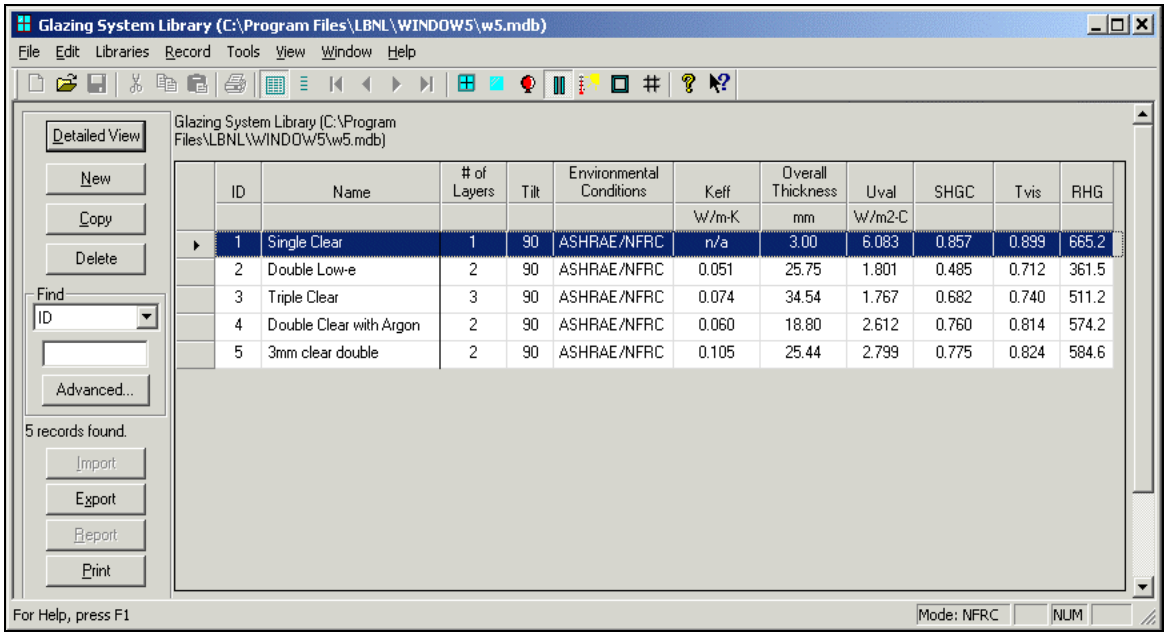


Figure 4-15. Glazing System Library, List View.

The buttons on the left hand side of the List View have the following functions:

Detailed View	Used to access the detailed view of the record, where the input values can be edited.
New	Used to make a new record, based on a default record.
Copy	Used to copy an existing record (including name and all associated input values) into a new record.
Delete	Used to delete the highlighted record(s).
Find	Used to find a record based on the field selected from the pulldown list, and a value typed into the input box.
Advanced	Used to access a more advanced method of searching the list
Import	Currently disabled.
Export	Used to create a Window 4.1 file of glazing system records, called glzsys.w4. This file can then be imported into THERM or Window 4.1.
Report	Currently disabled.
Print	Used to print a report which contains a list of all the records in the library.

4.4.3. Create a New Glazing System

To create a new glazing system using the **Copy** button, follow these steps:

- In the **Glazing System Library List View**, copy an existing record by highlighting the record to be copied and clicking on the **Copy** button.
- Click on the **Detailed View** button to edit the glazing system information as needed, including the **Name**.
- Save the record using the **Record/Save** menu (or **Alt-S**).

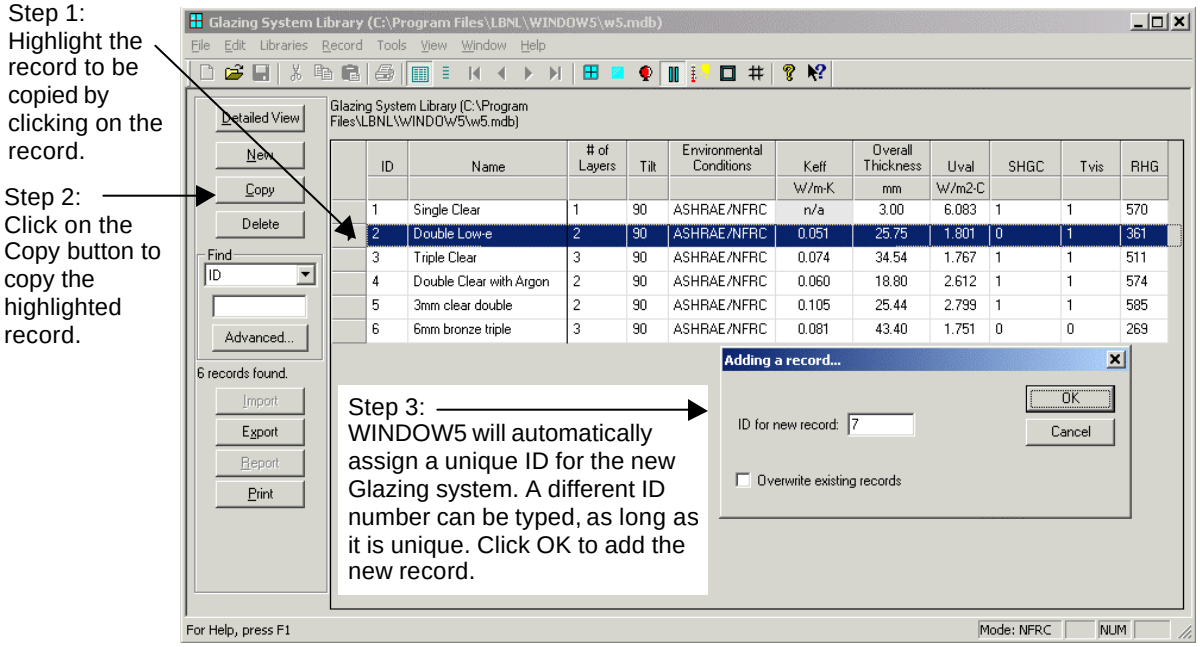


Figure 4-16. Use the button to copy an existing record to a new record.

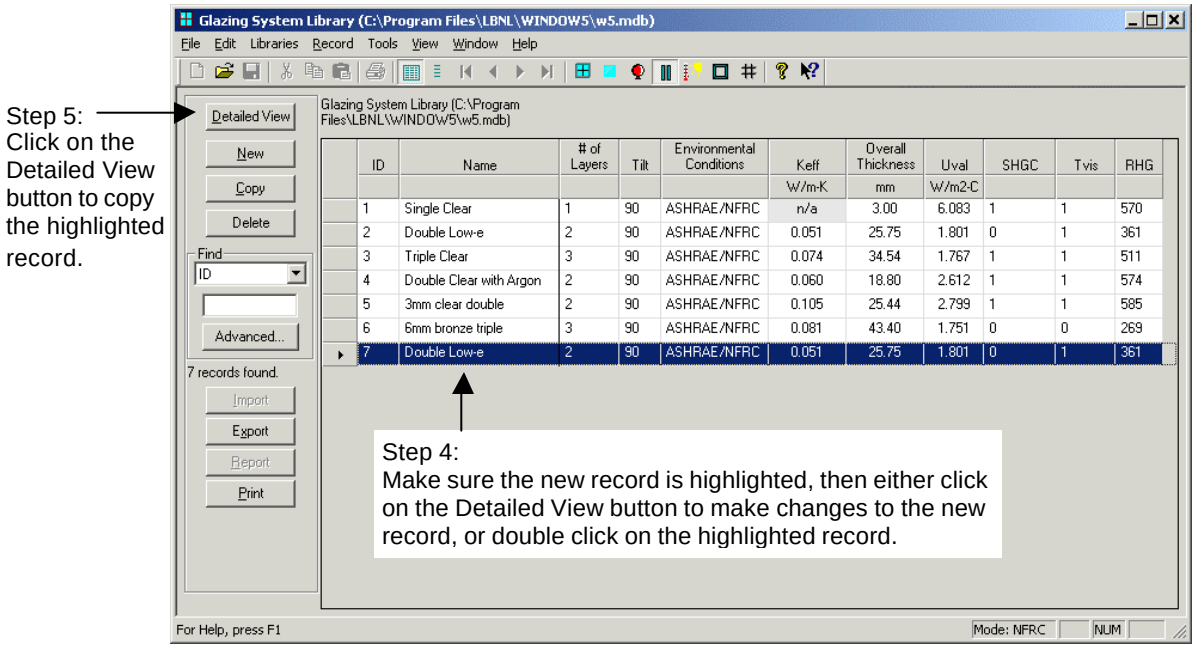
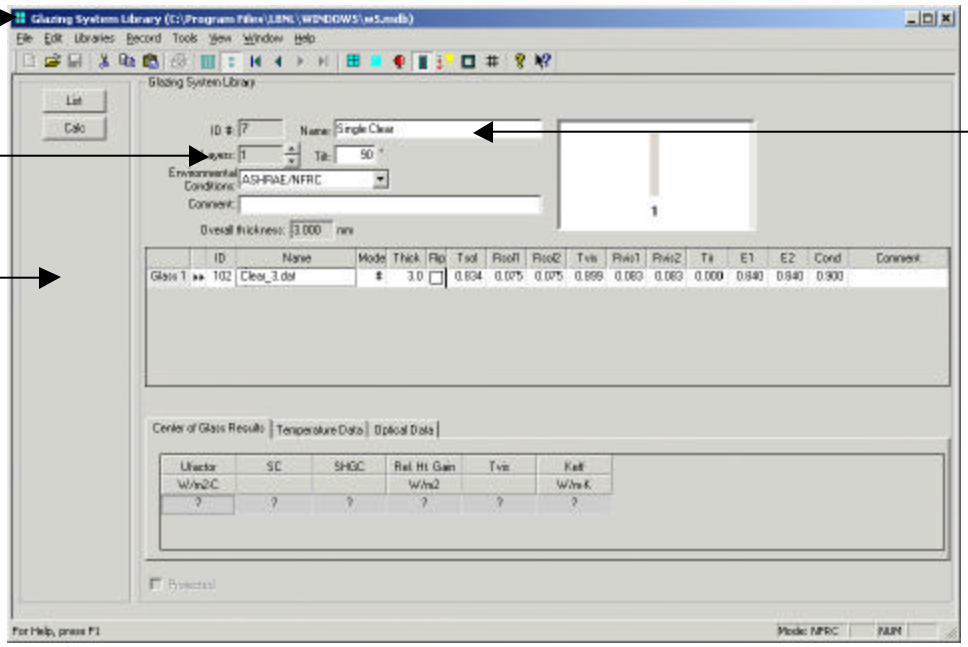


*Figure 4-17. Highlight the newly copied record and click on the **Detailed View** button.*

When the **Detailed View** is first opened, all the fields will be identical to the copied record.

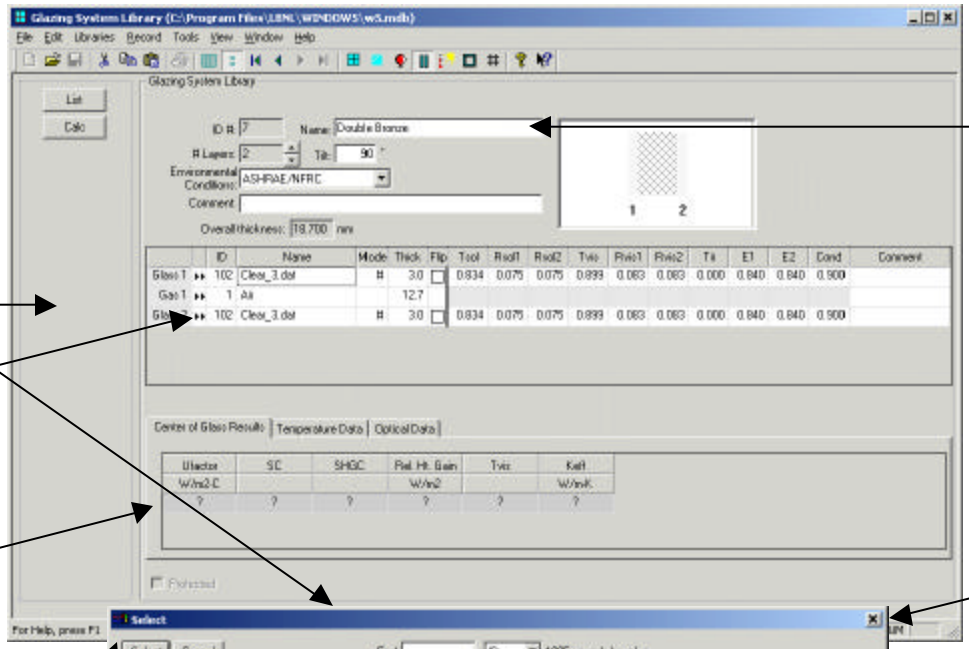
The copied record before changes have been made.



Use the **up/down arrows** to add or delete glass layers.

Type a new name for the glazing system.

The copied record after changes have been made.



Click on the **Select** arrows to pick a new glass layer from the **Glass Library**.

The results fields will become **"?"** when values change. Click on the **Calc** button to recalculate the results.

The **Select** screen displays the records from the **Glass Library**.

Click on the column names to sort by that column.

Highlight the desired glass library record, then click on the **Select** button to use it in the glazing system.

Type a value in the Find box (and select either ID or Name from the pulldown list) to go to a specific record.

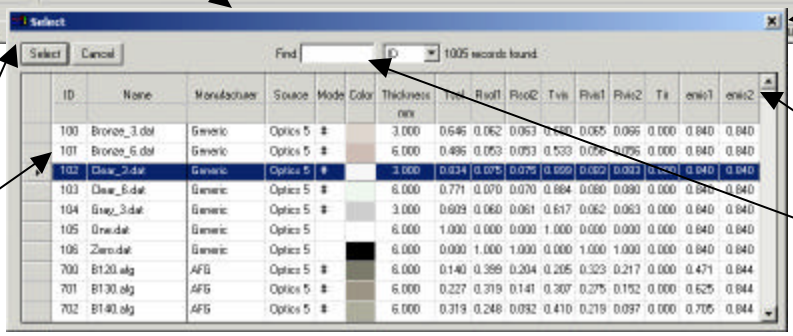


Figure 4-18. Editing the Glazing System characteristics in the Detailed View.

4.5. Glass Library

The Glass Library contains the thermal and optical properties of glazing materials. The total solar, visible, and thermal infrared optical properties of a glazing as well as the thickness and thermal conductivity are displayed. The WINDOW5 Glass Library is linked to the Optics5 glass database, and is shipped with the most current Optics5 database, as discussed in *Section 4.5.3*, "The Optics5 Connection".

4.5.1. Glass Library Detail View

The Detail View shows details of individual glass layers in the Glass Library

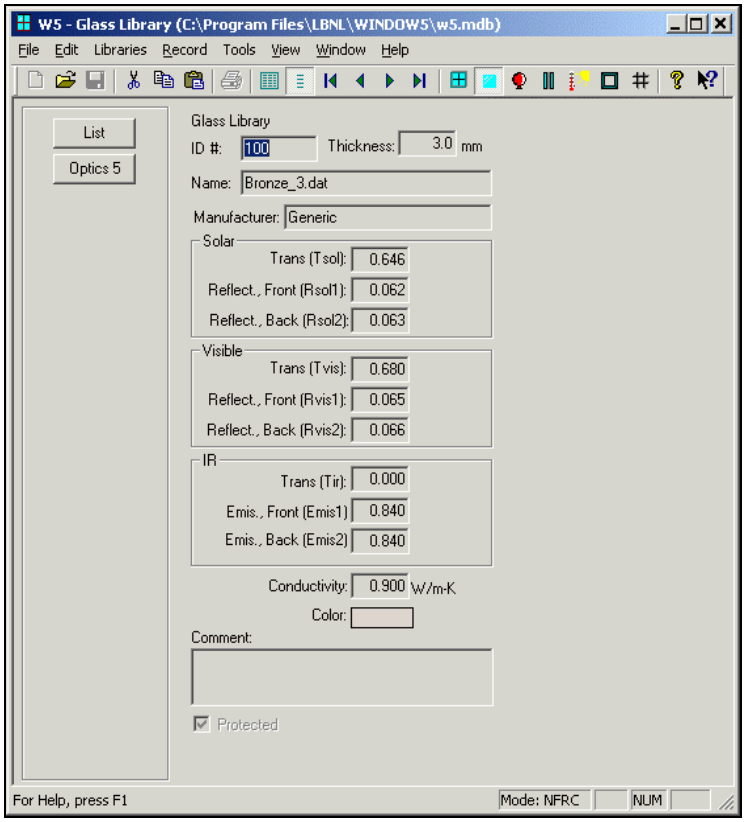


Figure 4-19. Glass Library, Detail View.

The optical properties defined for each glass entry are listed below:

ID — The unique ID associated with this record. For records whose **Source** is "Optics", this ID is assigned by the Optics5 database. For records whose **Source** is "User", this ID is assigned automatically by WINDOW but can be overwritten by the user as long as it is unique.

Name — The name of the glass layer. If the record was imported from the Optics5 database, this name will automatically come from that database.

Manufacturer — The name of the glass manufacturer. If the record was imported from the Optics5 database, this name will autmoatically come from that database.

Source — Source of the optical data. Current options are:

- **Optics:** Indicates that the data was imported from the Optics5 database. These records will have the spectral data information from the Optics5 database.

- **User:** Indicates that the data was created when the user copyied an existing record into a new record. User defined records will not have associated spectral data values.

Mode	An identifier to determine if the glass layer is approved by NFRC. Only records with "#" in this field can be used for NFRC simulations.
Color	A graphic representation of the color of the glass.
Thickness	Glass thickness. Units: mm (SI); inches (IP).
Tsol	Solar transmittance of the glazing layer.
Rsol1	Solar reflectance of the glazing layer, exterior-facing side.
Rsol2	Solar reflectance of the glazing layer, interior-facing side.
Tvis	Visible transmittance of the glazing layer.
Rvis1	Visible reflectance of the glazing layer, exterior-facing side.
Rvis2	Visible reflectance of the glazing layer, interior-facing side.
Tir	Thermal infrared (longwave) transmittance of the glazing layer.
emis1	Infrared (longwave) emittance of the glazing layer, exterior-facing side
emis2	Infrared (longwave) emittance of the glazing layer, interior-facing side
Cond	Conductance of glass. Units: W / m-K (SI); Btu / h-ft-^{o}F (IP)

4.5.2. Glass Library List View

The List View shows all the records in the Glass Library.

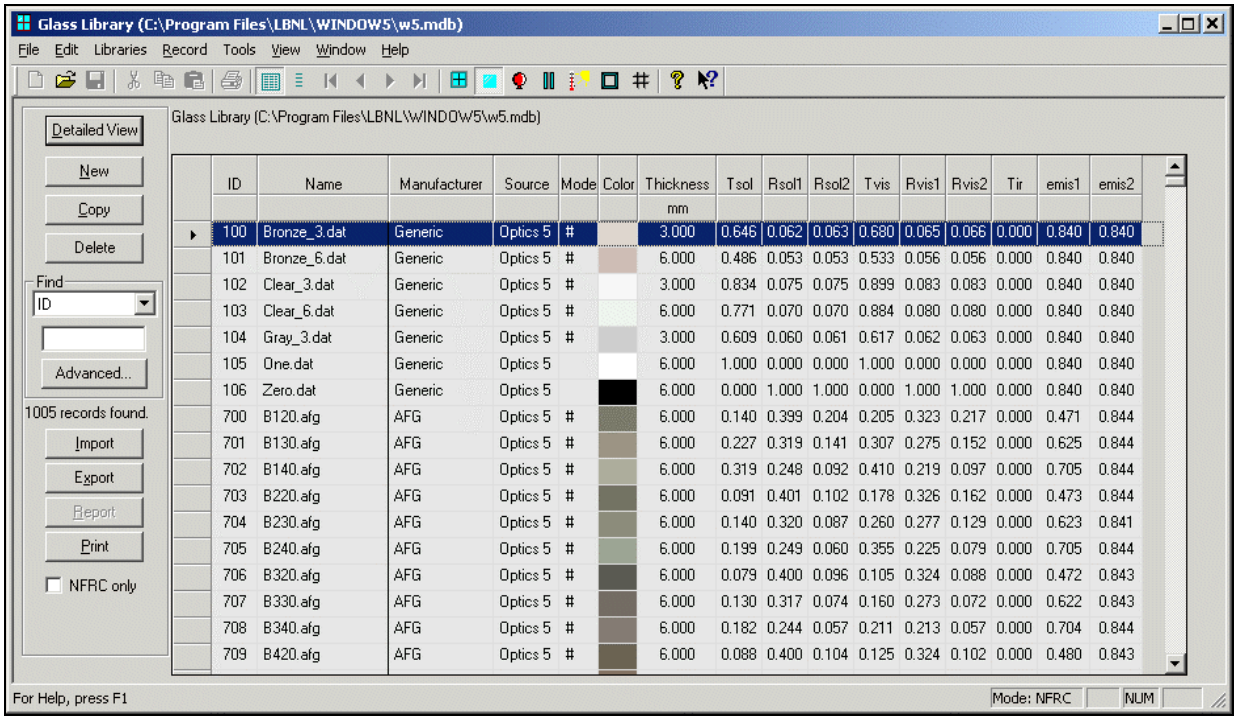


Figure 4-20. Glass Library, List View.

The buttons on the left hand side of the List View have the following functions:

Detailed View	goes to the detailed view of the record, where the input values can be edited.
New	Used to make a new record, based on a default record.
Copy	Used to copy an existing record (including name and all associated input values) into a new record.
Delete	Used to delete the highlighted record(s).
Find	Used to find a record based on the field selected from the pulldown list, and a value typed into the input box.
Advanced	Used to access a more advanced method of searching the list
Import	Used to import records from an Optics5 database, either the standard database or the user database. The database to be referenced can be specified in the **File/Preferences** menu, **Optics 5** tab.
Export	Used to create a comma-separated text file of the library records, which can be imported into a spreadsheet or database program.
Report	Currently disabled.
Print	Used to print a report which contains a list of all the records in the library.

4.5.3. The Optics5 Connection

The WINDOW5 Glass Library is based on the Optics5 glass database, and is contains records from the most current Optics5 database available at the time of the program creation. The Source field indicates that the records are from the Optics5 program, and all these records are protected from editing (they have a gray background in the list view, and cannot be deleted or edited in the detailed view). All data that comes from the Optics5 database has detailed spectral data associated with it, equivalent to the "*" and "#" in WINDOW 4.1. The optical properties displayed (transmittance, reflectance, emittance) are average values calculated from the Optics5 spectral data.

As the Optics database is updated, the new records can be download from the following website and then imported into the WINDOW5 Glass Library:

http://windows.lbl.gov/software

4.5.4. Updating the Glass Library from Optics5

If a new version of the Optics5 database is released, these new records can be imported into the WINDOW5 Glass Library using the Import button on the Glass Library list view. It is possible to import one or more records at a time, or all the records.

To import Optics 5 records from the Optics5 database, follow these steps:

- In the **File/Preferences** menu, **Optics 5** tab, use the **Browse** button to select the “Optics 5 database” or the “Optics 5 User database”, which will then be the default Optics 5 database that WINDOW will use for importing.

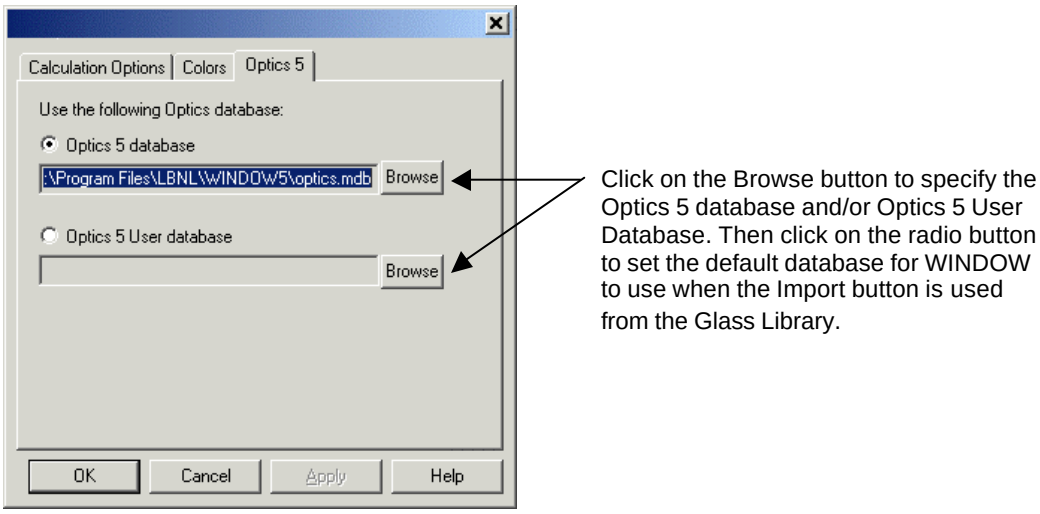


Figure 4-21. Glass Library, List View.

- From the **Glass Library List View**, click on the **Import** button
- The **Select** dialog box will show the records from the Optics 5 database.
- Highlight one or more records (**Shift-left mouse click** to select multiple contiguous records, **Ctrl-left mouse click** to select multiple non-contiguous records)
- Click on the **Select** button and the highlighted records will be imported into the WINDOW5 Glass Library. This may take a few minutes. If the records already exist, a dialog box will appear asking whether to overwrite existing records. The records will come in with the Source field set to Optics5, and they will be protected (not editable).
- OR, click on the Select All button and all the Optics5 records will be imported.

- If the selected records already exist in the WINDOW5 Glass Library, the program will ask if you want to overwrite the existing records. These can be overwritten one at a time, or you can click on the "Yes to All" option, and all the records will be overwritten without any more warning messages.

Step 1:
Click on the **Import** button to open the **Select** dialog box, which shows the records in the Optics5 database.

Step 2:
Highlight the reocrds to be imported into the **Glass Library** and click on the **Select** button to begin the import process.

Or use the **Select All** button to import all the records from the Optics database. This import can take several minutes.

Use **Shift-left-mouse-click** to select multiple contiguous records, and **Ctrl-left-mouse-click** to select multiple non-contiguous records.

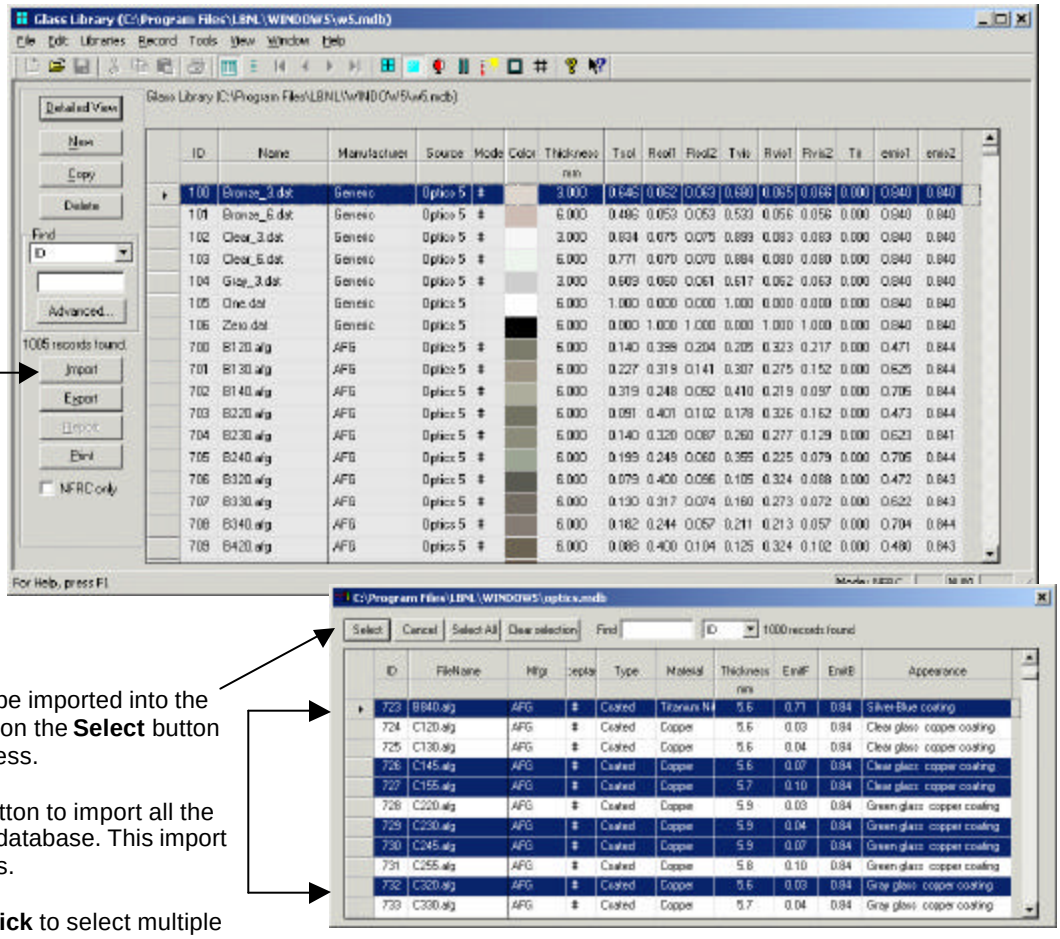


Figure 4-22. Importing records from the Optics5 database.

4.5.5. Creating a User-Defined Glass Layer

In most modeling situations, the Optics5 data provided in the WINDOW5 library (discussed in the previous sections) will be used for glass layer definitions because it contains detailed spectral data. However, it is possible to create a "user-defined" glass library record. This type of glass record will not be protected, will have the **Source** field set to "User", and will NOT have spectral data associated with it, and therefore WINDOW5 will only be able to do a single-band calculation. (Use the Optics5 program to make a new glass layer with spectral data and then import it into WINDOW5 with the method described above for importing data from the Optics5 database). In the case of a user-defined glass library created in WINDOW5, the values input for the optical properties will represent average data supplied by the user rather than calculated by WINDOW5 from the spectral data in the Optics5 database.

To create a user-defined glass record in the **Glass Library**, follow these steps:

- In the **Glass Library List View**, copy an existing record by highlighting the record to be copied and clicking on the **Copy** button. This will create an unprotected record with **Source** set to "User", so that the fields can be changed in the **Detailed View**.
- Click on the **Detailed View** button to edit the glass information as needed, including the **Name**.
- Save the record using the **Record/Save** menu (or **Alt-S**).

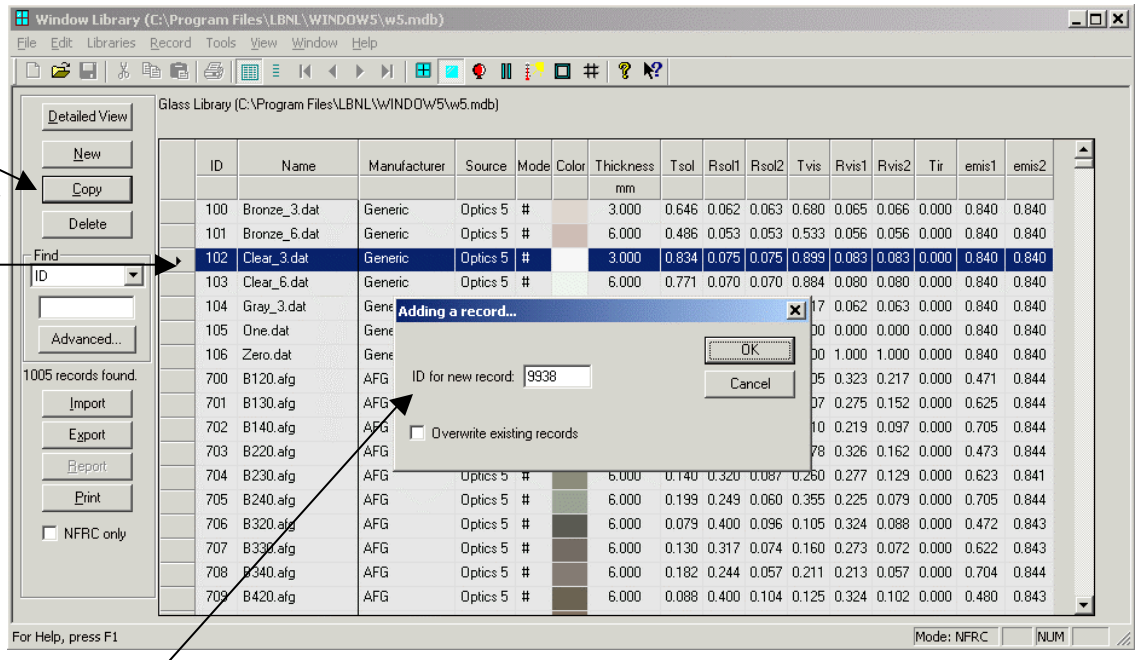


Figure 4-23. Creating a user-defined glass layer which will not have spectral data associated with it.

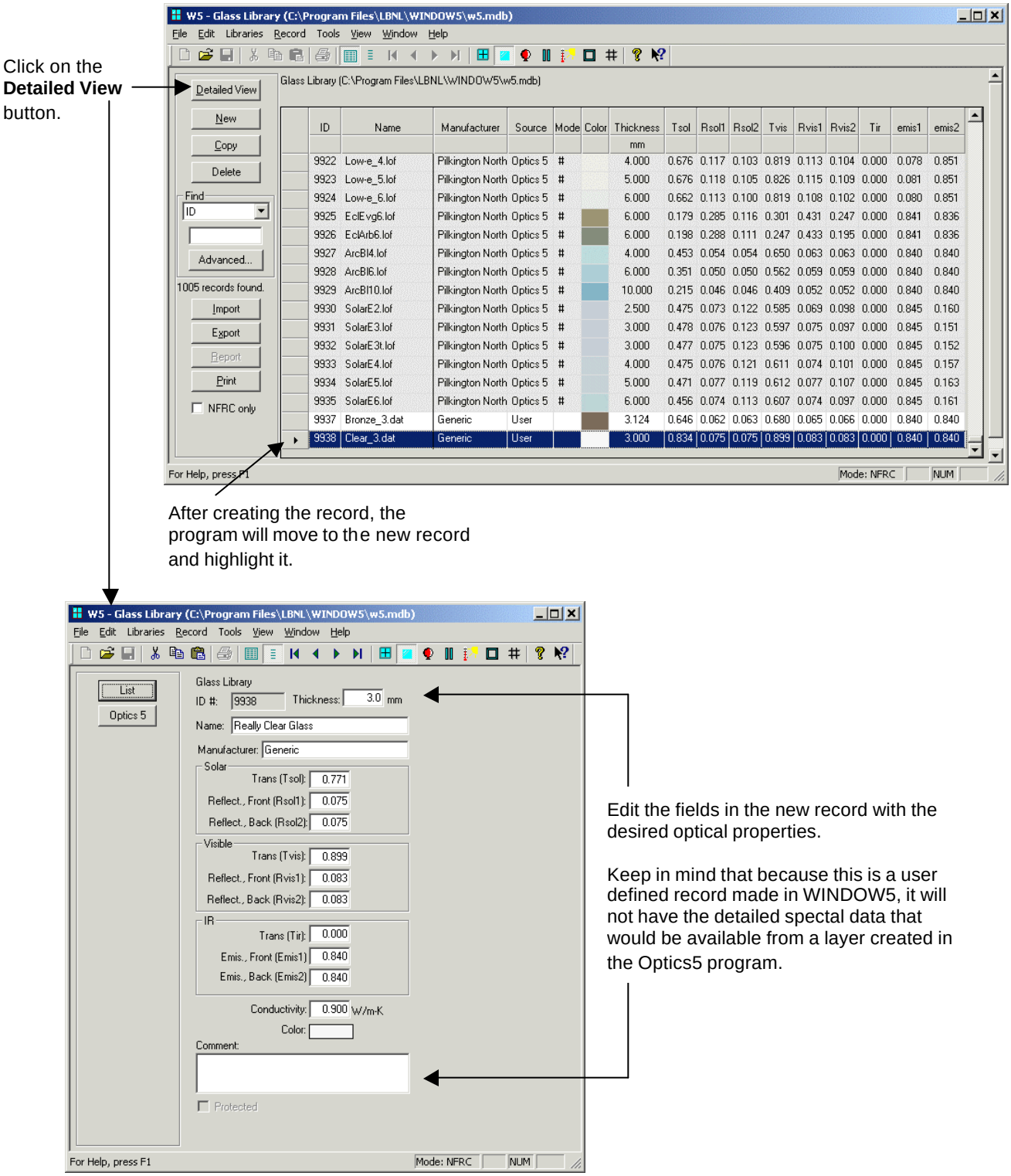


Figure 4-24. The user defined glass layers must have the averaged optical properties input, rather than automatically calculated by the Optics5 spectral data files.

4.6. Gas Library

4.6.1. Gas Library Detail View

The Detail View shows details of individual gasses in the Gas Library. WINDOW5 is shipped with several "protected" gas records, but it is also possible to create user defined records.

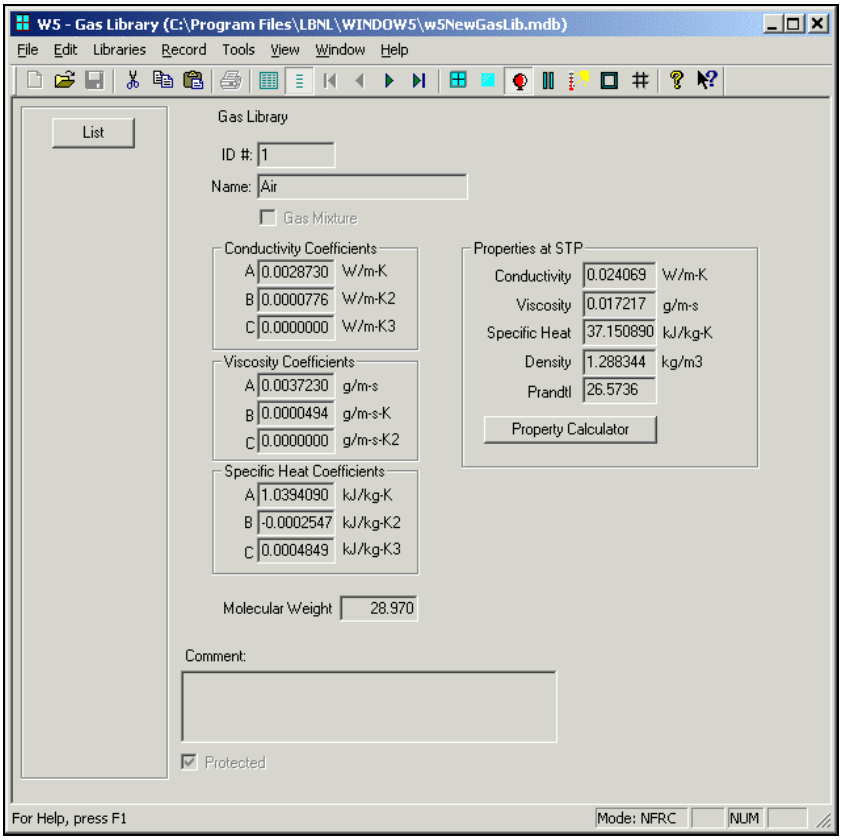


Figure 4-25. Gas Library, Detail View.

The properties defined for each gas entry are listed below:

ID Unique ID number associated with each gas record. The ID is automatically assigned when a record is added in the List View, but can be changed by the user at that time as long as the ID is unique.

Name Name of the gas record, input by the user.

Conductivity Coefficients

The conductivity calculation is based on the following formula from ISO 15099:

$$Cond = A + B*T + C*T^2$$

Where T = Temperature in degrees Kelvin

WINDOW has input values for each of the coefficients in that formula:

A Coefficient A for Conductivity from ISO 15099
Units: W / m-K (SI); Btu / h-ft-^{o}F (IP)

B Coefficient B for Conductivity from ISO 15099
Units: W / m-K^2 (SI); Btu / h-ft-^{o}F^2 (IP)

C Coefficient C for Conductivity from ISO 15099
Units: W / m-K^3 (SI); Btu / h-ft-^{o}F^3 (IP)

Viscosity Coefficients

The viscosity calculation is based on the following formula from ISO 15099:

$$\text{Viscosity} = A + B*T + C*T^2$$

Where T = Temperature in degrees Kelvin

WINDOW has input values for each of the coefficients in that formula:

A Coefficient A for Viscosity from ISO 15099
Units: g / m-s (SI); lb-s / ft^2 (IP)

B Coefficient B for Viscosity from ISO 15099
Units: g / m-s-K; (SI); lb-s / ft^2-^{o}F(IP)

C Coefficient C for Viscosity from ISO 15099
Units: g / m-s-K^2; (SI); lb-s / ft^2-^{o}F^2(IP)

Specific Heat Coefficients

The specific heat calculation is based on the following formula from ISO 15099:

$$\text{Specific Heat} = A + B*T + C*T^2$$

Where T = Temperature in degrees Kelvin

WINDOW has input values for each of the coefficients in that formula:

A Coefficient A for Specific Heat from ISO 15099
Units: Kj / kg-K (SI); Btu / lb-^{o}F (IP)

B Coefficient B for Specific Heat from ISO 15099
Units: Kj / kg-K^2 (SI); Btu / lb-^{o}F^2 (IP)

C Coefficient C for Specific Heat from ISO 15099
Units: Kj / kg-K^3 (SI); Btu / lb-^{o}F^3 (IP)

Molecular Weight Molecular weight of the gas.

Properties at STP

Gas properties at Standard Temperature and Pressure.

Conductivity Conductivity of the gas, based on the Conductivity Coefficients and formula above. Units: W / m-K (SI); Btu / h-ft-^{o}F (IP)

Viscosity Viscosity of the gas, based on the Viscosity Coefficients and formula above. Units: g / m-s (SI); lb-s / ft^2 (IP)

Specific Heat Specific heat of the gas, based on the Specific Heat Coefficients and formula above. Units: kJ / kg-K (SI); Btu / lb-^{o}F (IP)

Density Density of the gas. Units: kg / m^3 (SI); lb-ft^3 (IP)

Prandtl Prandtl number of the gas. Unitless.

Property Calculator Property calculator for values at different pressures and temperatures other than the standard values.

It is also possible to define gas records in the **Gas Library** which are mixtures of other gases, as shown in the figure below. Section 4.6.3., "Gas Mixtures", discusses how to creat new records composed of multiple gases.

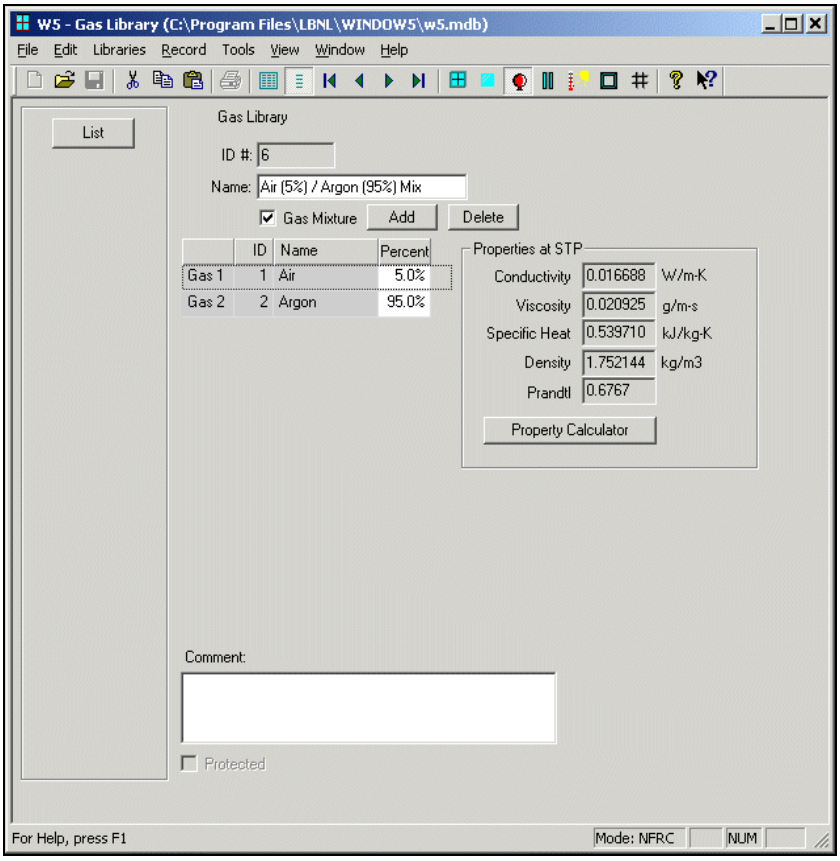


Figure 4-26. Gas Library, Detail View showing a gas mixture.

4.6.2. Gas Library List View

The List View shows all the records in the Gas Library.

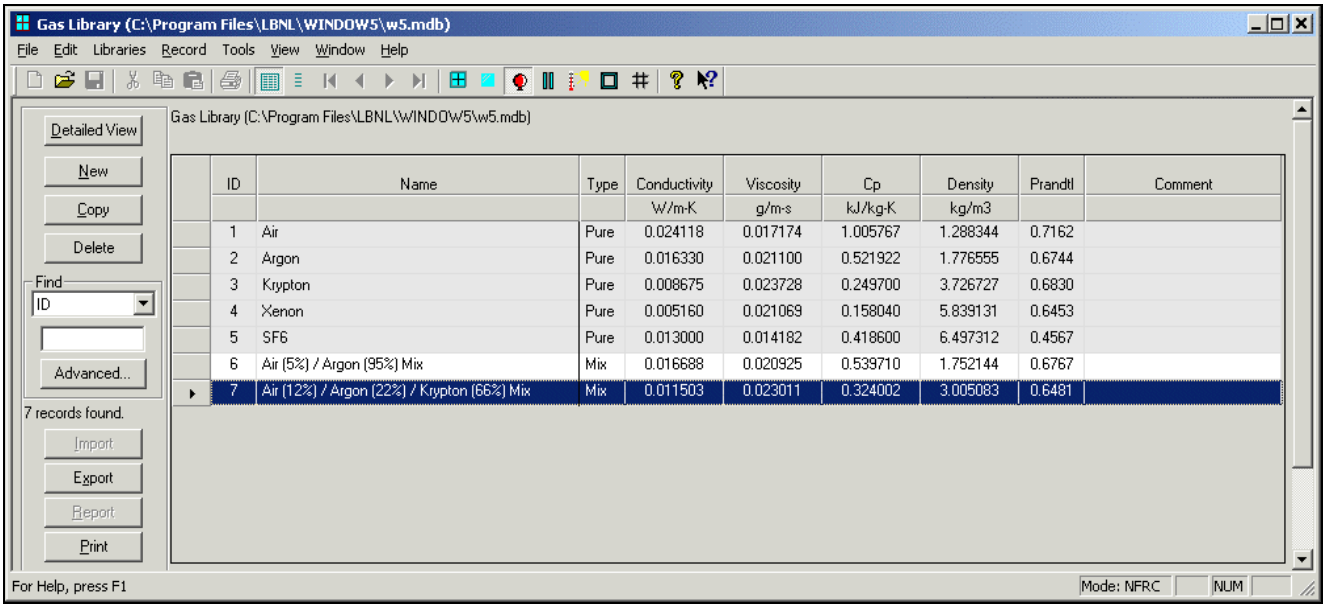


Figure 4-27. Gas Library, List View.

The buttons on the left hand side of the List View have the following functions:

Detailed View	goes to the detailed view of the record, where the input values can be edited.
New	Used to make a new record, based on a default record.
Copy	Used to copy an existing record (including name and all associated input values) into a new record.
Delete	Used to delete the highlighted record(s).
Find	Used to find a record based on the field selected from the pulldown list, and a value typed into the input box.
Advanced	Used to access a more advanced method of searching the list
Import	Currently disabled.
Export	Used to create a comma-separated text file of library records, which can be imported into a spreadsheet or database program.
Report	Currently disabled.
Print	Used to print a report which contains a list of all the records in the library.

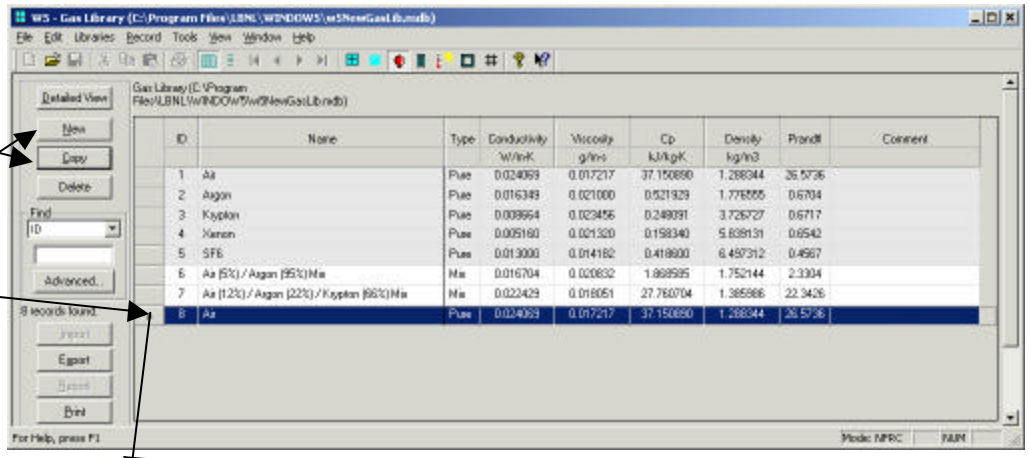
4.6.3. Gas Mixtures

To create a record that has a combination of gasses, follow these steps:

- Make a new record by using the Copy or New button (either a single gas record or a mixture).
- Double click on the newly created record, or highlight it and click on the **Detailed View** button, to access the **Detailed View**
- Click on the **Mixture** checkbox if the gas is not already a mixture.
- Click on the **Add** button to add a new gas, then select the gas and type in the gas percentage in the **Gas Mixture** dialog box. A new line will appear in the gas mixtures section.
- Use the **Add** and / or **Delete** buttons create the desired gas mixture.

Step 1:
Make a new record using either the Copy button to copy an existing record or then New button to create a new record based on a default record.

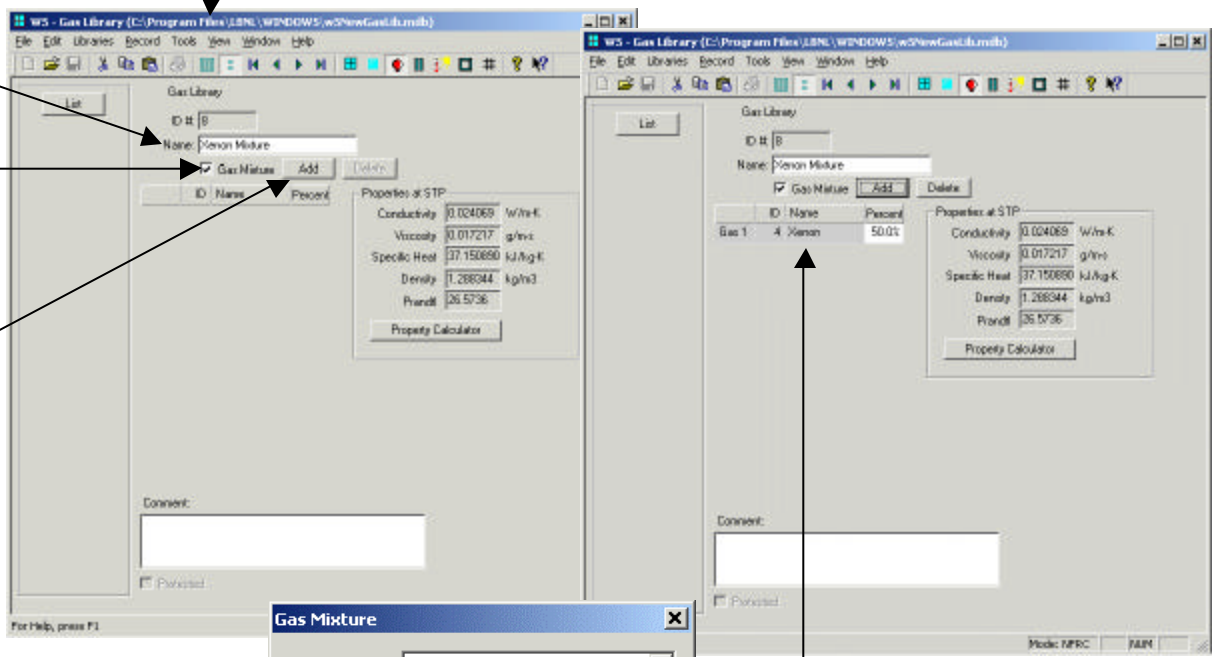
Step 2:
Go to the Detailed View of the newly created record.



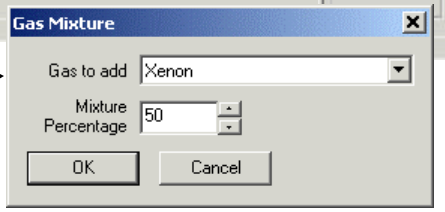
Step 3:
Change the name of the new record.

Step 4:
Click the Gas Mixture box so that a checkmark appears.

Step 5:
Click the **Add** Button, and the **Gas Mixtures** dialog box appears.



Step 6:
The **Gas Mixture** dialog box appears. Select the gas from the pulldown and type in the mixture percentage, then click the **OK** button.



Step 7:
A new line will appear with the added gas. Continue to add gases as necessary.

Figure 4-28. Creating a new gas that is a mixture.

4.7. Frame Library

The **Frame Library** consists of frame elements (such as headers, jambs, sills, and meeting rails) and their associated frame and edge-of-glass properties for use in constructing a whole product in the **Window Library**.

4.7.1. Frame Library Detail View

The **Frame Library Detail View** shows all the data for an individual record.

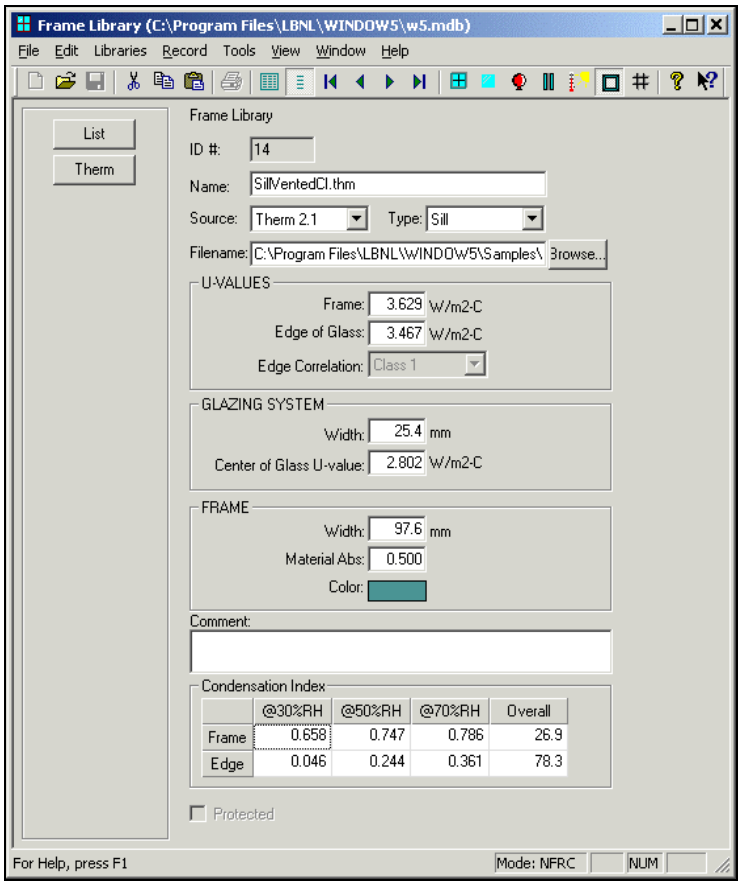


Figure 4-29. Frame Library, Detail View.

The properties defined for each gas entry are listed below:

ID #	The unique ID associated with this record. **Default:** WINDOW automatically assigns this number when creating a new record. When making a new record in the List View, it is possible to change the ID number as long as it is unique.
Name	The name of the frame record. **Default:** for imported THERM files, WINDOW automatically sets the name field to the name of the THERM file. In any case, this name is editable by the user.
Source	The source of the frame information, from the following list:

- **Generic:** The Generic choice is used when not importing a THERM file. When this selection is made, the Edge Correlation pulldown becomes enabled.
- **ASHRAE/LBL:** The ASHRAE/LBNL choice is used for the five protected records that are shipped with WINDOW for consistency with previous versions of the program. They are based on the Edge Correlation methodology.
- **THERM:** The THERM choice is automatically set by WINDOW when a THERM file is imported into the Frame Library from the List View. This setting will cause the Edge Correlation pulldown to become disabled.

Filename The THERM file filename, including the path. Type in the value or use the **Browse** button to select it. **Default:** The complete filename of the THERM file if the Import button was used from the **List View**.

Browse Button Use the **Browse** button to select the THERM file associated with this **Frame Library** record.

Type The type of cross section of the THERM file, based on the **Cross Section Type** value specified in the **Properties** dialog box (accessed from the **File/Properties** menu) in the THERM program.

U-VALUES

Frame U-factor of the frame, either imported from the THERM file or input by the user if source is "Generic".

Edge of Glass U-factor of the edge of glass, either imported from the THERM file or input by the user if source is "Generic".

Edge Correlation Edge correlation for frames with Source set to either "Generic" or "ASHRAE/LBL". Correlation choices are:

Edge Correlation Number	Spacer Material
1	Aluminum – ASHRAE Metallic
2	Stainless stell; dual seal
3	Butyl/Metal (also Fiberglass, Wood, Glass Edge)
4	Insulated
5	U-edge = U-center-of-glass (Used when modeling single glazing)

GLAZING SYSTEM

Width Width of the glazing system, either from an imported THERM file or input by the user. **Default:** if the record is from an imported THERM file, this is the width of the glazing system from that file.

Center of Glass

U-value U-factor of the center-of-glass, either from an imported THERM file or input by the user. **Default:** if the record is from an imported THERM file, this is the U-factor of the glazing system from that file.

FRAME

Width Width of frame (projected frame dimension), which is the width of the fram element in the plane of the glazing. **Default:** if the record is from an imported THERM file, the

width is the Frame Length which is displayed in the THERM U-factor dialog box when a file has results.

Material Abs Absorptivity of the frame, editable by the user. This value does not come from the THERM file. **Default:** 0.500.

Color Frame color, input by the user. This value does not come from the THERM file. Click on the color block and a Color dialog box will appear, where the desired color can be selected.

Comment Comment about the frame, input by the user. **Default:** blank.

Condenstation Index Condensation index of the frame components, if the record was imported from a THERM file. The Condensation Index values are:

- **@30% RH, @50%RH, @70% RH:** the S components of the Condensation Index equation for each of the three relative humidity (RH) points in the *NFRC 500: Procedure for Determining Fenestration Product Condensation Index* document for the Frame and Edge components of the THERM file.
- Overall: the overall CI value calculated from the intermediate relative humidity values, for the Frame and Edge components of the THERM file, based on the formula in the the *NFRC 500: Procedure for Determining Fenestration Product Condensation Index* document.

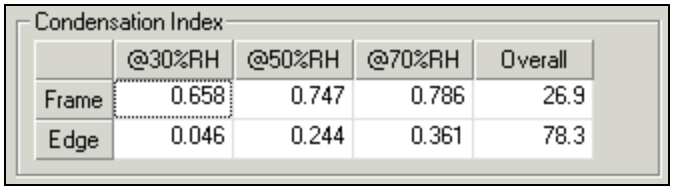
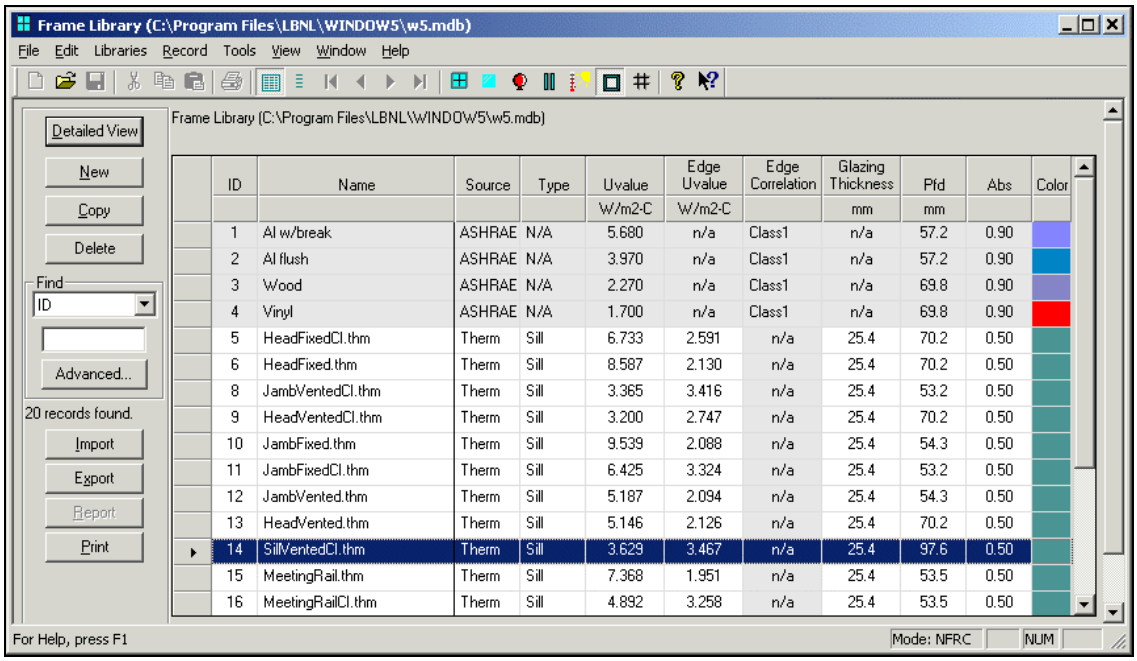


Figure 4-30. Condensation Index details on Frame Library record.

4.7.2. Frame Library list View

The Frame Library List View shows all the records in the library.



ID	Name	Source	Type	Uvalue W/m2-C	Edge Uvalue W/m2-C	Edge Correlation	Glazing Thickness mm	Pfd mm	Abs	Color
1	Al w/break	ASHRAE	N/A	5.680	n/a	Class1	n/a	57.2	0.90	
2	Al flush	ASHRAE	N/A	3.970	n/a	Class1	n/a	57.2	0.90	
3	Wood	ASHRAE	N/A	2.270	n/a	Class1	n/a	69.8	0.90	
4	Vinyl	ASHRAE	N/A	1.700	n/a	Class1	n/a	69.8	0.90	
5	HeadFixedCl.thm	Therm	Sill	6.733	2.591	n/a	25.4	70.2	0.50	
6	HeadFixed.thm	Therm	Sill	8.587	2.130	n/a	25.4	70.2	0.50	
8	JambVentedCl.thm	Therm	Sill	3.365	3.416	n/a	25.4	53.2	0.50	
9	HeadVentedCl.thm	Therm	Sill	3.200	2.747	n/a	25.4	70.2	0.50	
10	JambFixed.thm	Therm	Sill	9.539	2.088	n/a	25.4	54.3	0.50	
11	JambFixedCl.thm	Therm	Sill	6.425	3.324	n/a	25.4	53.2	0.50	
12	JambVented.thm	Therm	Sill	5.187	2.094	n/a	25.4	54.3	0.50	
13	HeadVented.thm	Therm	Sill	5.146	2.126	n/a	25.4	70.2	0.50	
14	SillVentedCl.thm	Therm	Sill	3.629	3.467	n/a	25.4	97.6	0.50	
15	MeetingRail.thm	Therm	Sill	7.368	1.951	n/a	25.4	53.5	0.50	
16	MeetingRailCl.thm	Therm	Sill	4.892	3.258	n/a	25.4	53.5	0.50	

Figure 4-31. Frame Library, List View.

The buttons on the left hand side of the List View have the following functions:

Detailed View	goes to the detailed view of the record, where the input values can be edited.
New	Used to make a new record, based on a default record.
Copy	Used to copy an existing record (including name and all associated input values) into a new record.
Delete	Used to delete the highlighted record(s).
Find	Used to find a record based on the field selected from the pulldown list, and a value typed into the input box.
Advanced	Used to access a more advanced method of searching the list
Import	Used to import THERM files into the Frame Library.
Export	Used to create a comma-separated text file of library records, which can be imported into a spreadsheet or database program.
Report	Currently disabled.
Print	Used to print a report which contains a list of all the records in the library.

4.7.3. Importing THERM files

The THERM program is used to generate frame (and divider) profiles which can then be imported into the WINDOW5 Frame Library, and then referenced in the Window Library.

There are two different methods for importing a THERM file into the Frame Library:

- From the **Frame Library List View**, use the **Import** button to select a THERM file.
- From the **Frame Library Detail View**, use the **Browse** button to select a THERM file to be associated with the current frame record.

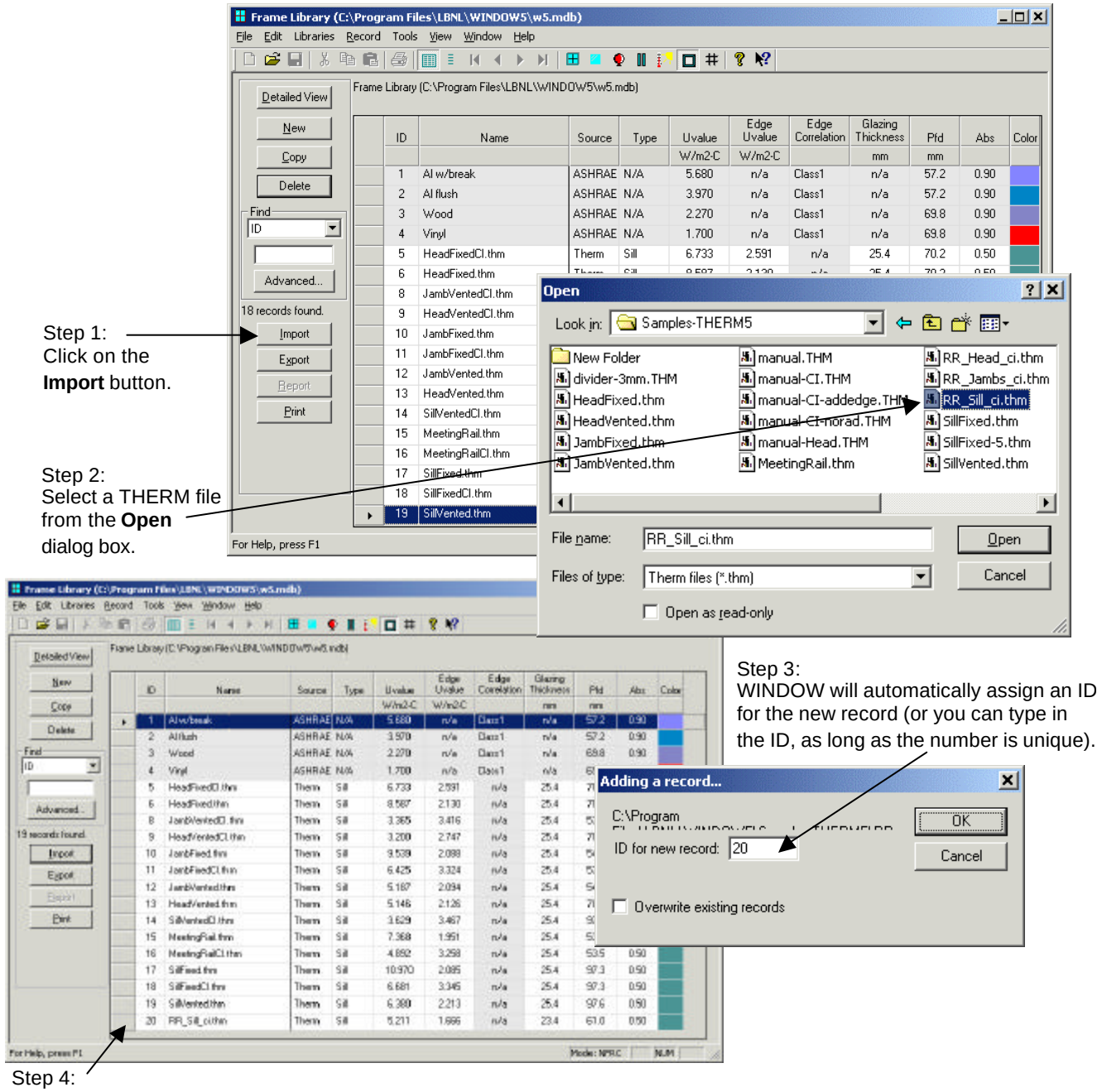
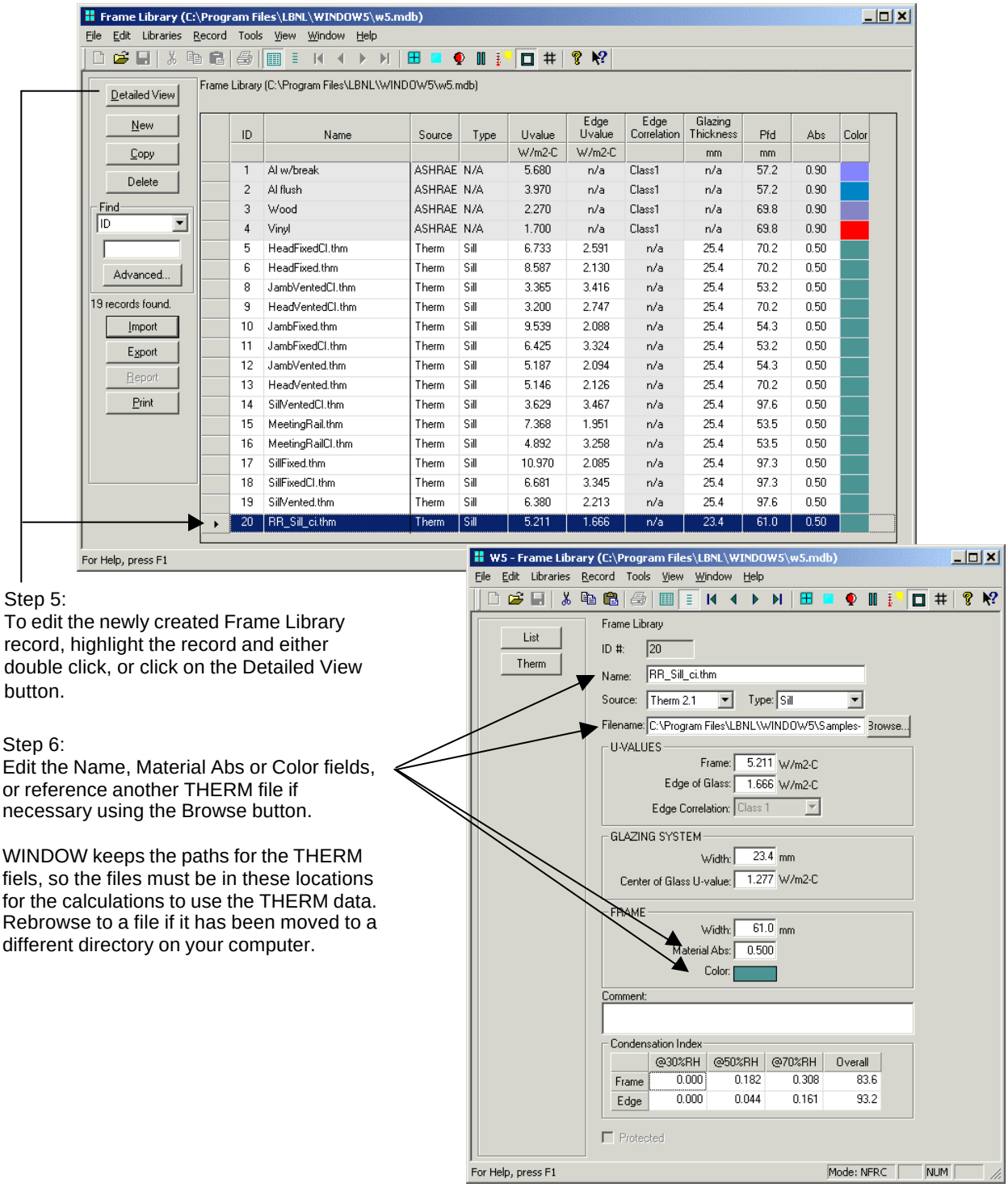


Figure 4-32. Use the Import button to create Frame Library records from THERM files.

In order to make change to the newly imported THERM file, click on the Detailed View button and change the input values as needed.

Note: In order for the CI (Condensation Index) values to be imported from the THERM file into the WINDOW Frame Library, it is necessary to check the "Save Simulation Results in THM files" in the THERM program under the ***Options/Preferences*** *menu, the* ***Simulation*** *tab.*



Step 5:
To edit the newly created Frame Library record, highlight the record and either double click, or click on the Detailed View button.

Step 6:
Edit the Name, Material Abs or Color fields, or reference another THERM file if necessary using the Browse button.

WINDOW keeps the paths for the THERM fiels, so the files must be in these locations for the calculations to use the THERM data. Rebrowse to a file if it has been moved to a different directory on your computer.

Figure 4-33. Edit the THERM file frame record if neccessary.

4.7.4. Condensation Index (CI) Calculation

WINDOW5 includes a feature which calculates the whole product Condensation Index (CI) using the methodology presented in NFRC 500. This process involves importing surface temperatures from THERM for each frame cross-section. When performing CI calculations with this Beta1 version of WINDOW5, note the following:

- It is necessary to use THERM5 in order to get the proper temperature data. Older versions of THERM will not have the correct data.
- The THERM modeling procedures are outlined in the *THERM5 / WINDOW5 NFRC Simulation Manual*. As discussed in that manual, it is necessary to model the THERM profiles with the CI feature turned on (when importing the glazing system, or after the glazing system is imported in the **Options/Preferences** menu**, Therm File Options** tab). Modeling THERM profiles with the CI feature NOT turned on will result in U-factors that are not calculated in accordance with standard NFRC procedures. Therefore, it is necessary to do two THERM calculations (and save them to two separate files):
  - one for U-factor values with CI turned off
  - one for CI with CI turned on.

The CI values from the THERM files are shown in WINDOW in the Condensation Index section of the Frame Library Detailed View, as discussed in *Section 4.7.1*, "Frame Library Detail View".

4.8. Divider Library

The Divider Library is very similar to the Frame Library. The **Divider Library** has frame and edge-of-glass properties, which can be input by the user or imported from THERM files, for use in constructing a whole product in the **Window Library**.

4.8.1. Divider Library Detail View

The Detail View shows details of individual dividers in the Divider Library

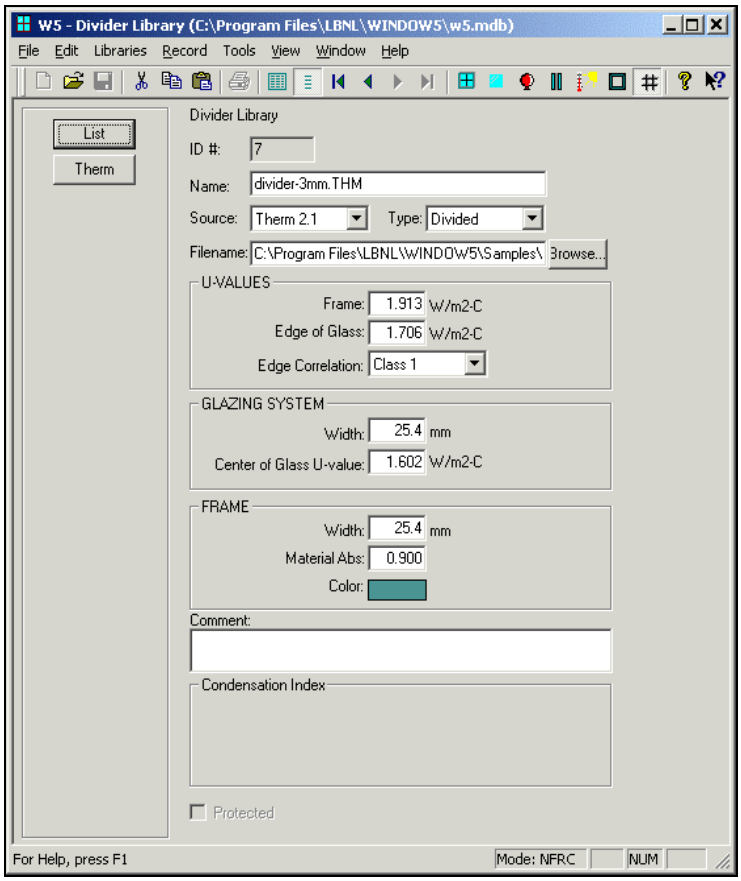


Figure 4-34. Divider Library, Detail View.

The properties defined for each gas entry are listed below:

ID # The unique ID associated with this record. **Default:** WINDOW automatically assigns this number when creating a new record. When making a new record in the **List View**, it is possible to change the ID number as long as it is unique.

Name The name of the divider record. **Default:** for imported THERM files, WINDOW automatically sets the name field to the name of the THERM file. In any case, this name is editable by the user.

Source The source of the divider information, from the following list:

- **Generic:** The Generic choice is used when not importing a THERM file. When this selection is made, the Edge Correlation pulldown becomes enabled.
- **ASHRAE/LBL:** The ASHRAE/LBNL choice is used for the protected records that are shipped with WINDOW for consistency with previous versions of the program. They are based on the Edge Correlation methodology.
- **THERM:** The THERM choice is automatically set by WINDOW when a THERM file is imported into the Divider Library from the List View. This setting will cause the Edge Correlation pulldown to become disabled.

Filename The THERM file filename, including the path. Type in the value or use the **Browse** button to select it. **Default:** The complete filename of the THERM file if the Import button was used from the **List View**.

Browse Button Use the **Browse** button to select the THERM file associated with this **Divider Library** record.

Type The type of cross section of the THERM file, based on the **Cross Section Type** value specified in the **Properties** dialog box (accessed from the **File/Properties** menu) in the THERM program, from the following list:

- Divided: for "true" divided lite dividers
- Suspended: for dividers suspended between the glass layers of the glazing system

U-VALUES

Frame U-factor of the divider, either imported from the THERM file or input by the user if source is "Generic".

Edge of Glass U-factor of the edge of glass, either imported from the THERM file or input by the user if source is "Generic".

Edge Correlation Edge correlation for dividers with Source set to either "Generic" or "ASHRAE/LBL". Correlation choices are:

Edge Correlation Number	Spacer Material
	Divided Lights:
1	Aluminum, hollow
2	Butyl, solid, with aluminum backing
3	Wood, solid
4	Insulating material, solid (k=0.012 Btu/hr-ft-^{o}F
	Divided Lights:
5	Aluminum, hollow
6	Vinyl, hollow

GLAZING SYSTEM

Width Width of the glazing system, either from an imported THERM file or input by the user. **Default:** if the record is from an imported THERM file, this is the width of the glazing system from that file.

Center of Glass

U-value U-factor of the center-of-glass, either from an imported THERM file or input by the user. **Default:** if the record is from an imported THERM file, this is the U-factor of the glazing system from that file.

FRAME

Width Width of divider (projected dimension), which is the width of the divider element in the plane of the glazing. **Default:** if the record is from an imported THERM file, the width is the Frame Length which is displayed in the THERM U-factor dialog box when a file has results.

Material Abs Absorptivity of the divider, editable by the user. This value does not come from the THERM file. **Default:** 0.500.

Color Frame color, input by the user. This value does not come from the THERM file. Click on the color block and a Color dialog box will appear, where the desired color can be selected.

Comment Comment about the divider, input by the user. **Default:** blank.

Condenstation *Index* Condensation index of the divider components, if the record was imported from a THERM file. The Condensation Index values are:

- **@30% RH, @50%RH, @70% RH:** the S components of the Condensation Index equation for each of the three relative humidity (RH) points in the *NFRC 500: Procedure for Determining Fenestration Product Condensation Index* document for the Frame and Edge components of the THERM file.
- **Overall:** the overall CI value calculated from the intermediate relative humidity values, for the Frame and Edge components of the THERM file, based on the formula in the the *NFRC 500: Procedure for Determining Fenestration Product Condensation Index* document.

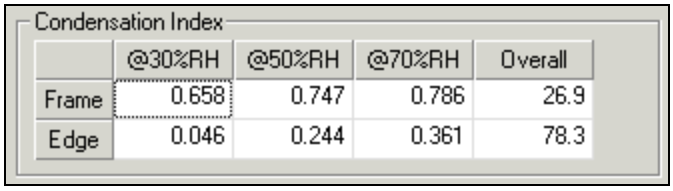


Figure 4-35. Condensation Index details on Frame Library record.

4.8.2. Divider Library List View

The List View shows all the records in the Divider Library.

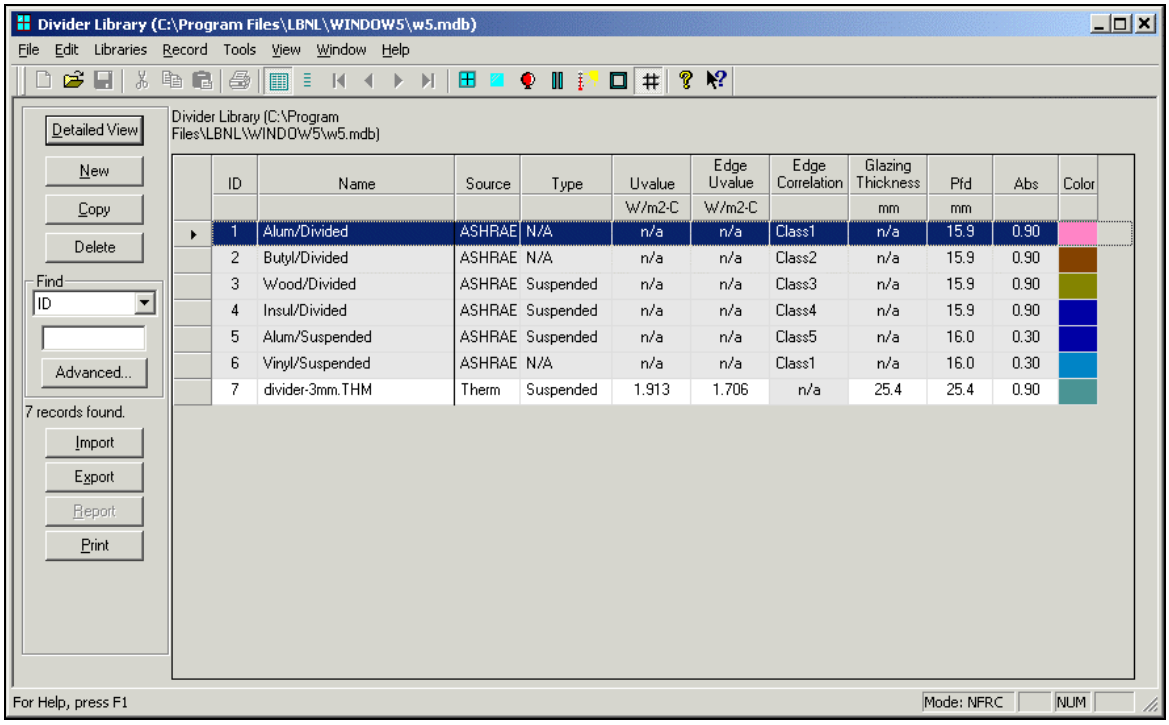


Figure 4-36. Divider Library, List View.

The buttons on the left hand side of the List View have the following functions:

Detailed View	goes to the detailed view of the record, where the input values can be edited.
New	Used to make a new record, based on a default record.
Copy	Used to copy an existing record (including name and all associated input values) into a new record.
Delete	Used to delete the highlighted record(s).
Find	Used to find a record based on the field selected from the pulldown list, and a value typed into the input box.
Advanced	Used to access a more advanced method of searching the list
Import	Used to import THERM files into the Divider Library.
Export	Used to create a comma-separated text file of library records, which can be imported into a spreadsheet or database program.
Report	Currently disabled.
Print	Used to print a report which contains a list of all the records in the library.

4.8.3. Importing THERM Files

The technique for importing THERM files into the Divider Library is the same as for the Frame Library (see *Section 4.7.3*, "Importing THERM Files").

There are two different methods for importing a THERM file into the Divider Library:

- From the Divider Library List View, use the Import button to select a THERM file.
- From the Divider Library Detail View, use the Browse button to select a THERM file to be associated with the current frame record.

4.9. Environmental Conditions Library

The Environmental Conditions Library contains sets of environmental conditions for the U-factor and Solar Heat Gain Coefficient (SHGC) calculations. U-factor environmental conditions are typically defined for winter, night-time conditions while solar heat gain environmental conditions are defined for summer, daytime conditions.

4.9.1. Environmental Conditions Library Detail View

The Detail View shows details of individual environmental condition records in the Environmental Conditions Library. One environmental condition record consists of definitions for all four tabs in the detailed view, which consists of two tabs for U-factor (Inside and Outside) and two tabs for SHGC (Inside and Outside).

U-factor Inside tab

The U-factor Inside tab of the Environmental Conditions library is used to define the conditions for the U-factor calculations for the inside surface of the window.

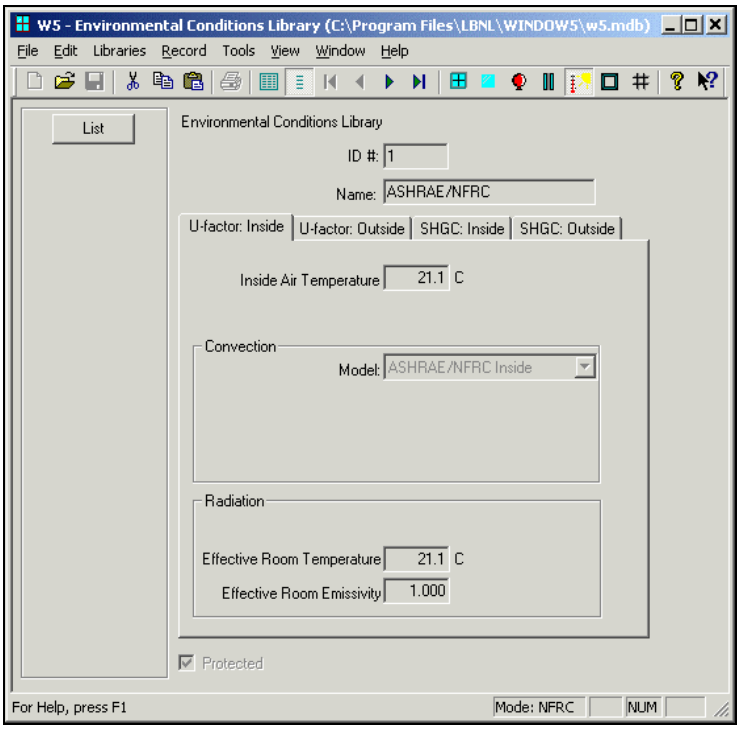


Figure 4-37. Environmental Conditions Library, Detail View, U-factor Inside Tab.

The input values are the following:

Inside Air Temperature Inside air temperature. Units: °C (SI); °F (IP)

Convection

Model The convection model, which controls what other input values appear in this section, from the following choices:

Model	Convection Coeff	Outside Wind Speed	Wind Direction
ASHRAE / NFRC Outside	User Input	User input	Choices: Windward Leeward
ASHRAE / NFRC Inside	N / A	N / A	N / A
Fixed Convection Coefficient	User Input	N / A	N / A
Fixed Combined Coefficient	User Input	N / A	N / A
Yazdanian-Klems	N / A	N / A	N / A
Kimura	User Input	User input	Choices: Windward Leeward

Radiation

Model The radiation model, which controls what other input values appear in this section:

Model	Effective Room Temperature	Effective Room Emissivity
ASHRAE / NFRC Outside	User Input	User input
ASHRAE / NFRC Inside	User Input	User input
Fixed Convection Coefficient	User Input	User input
Fixed Combined Coefficient	N / A	N / A
Yazdanian-Klems	User Input	User input
Kimura	User Input	User input

U-factor Outside tab

The U-factor Inside tab of the Environmental Conditions library is used to define the conditions for the U-factor calculations for the outside surface of the window.

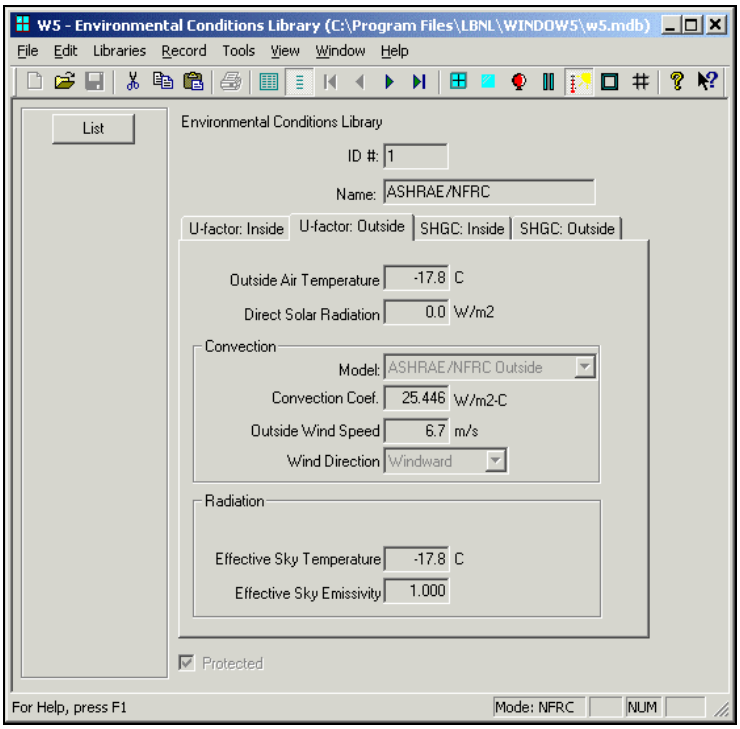


Figure 4-38. Environmental Conditions Library, Detail View, U-factor Outside Tab.

The input values are the following:

Outside Air Temperature Outside air temperature. Units: °C (SI); °F (IP)

Convection

Model The convection model, which controls what other input values appear in this section:

Model	Convection Coeff	Outside Wind Speed	Wind Direction
ASHRAE / NFRC Outside	User Input	User input	Choices: Windward Leeward
ASHRAE / NFRC Inside	N / A	N / A	N / A
Fixed Convection Coefficient	User Input	N / A	N / A
Fixed Combined Coefficient	User Input	N / A	N / A
Yazdanian-Klems	N / A	N / A	N / A
Kimura	User Input	User input	Choices: Windward Leeward

Radiation

Model The radiation model, which controls what other input values appear in this section:

Model	Effective Sky Temperature	Effective Sky Emissivity
ASHRAE / NFRC Outside	User Input	User input
ASHRAE / NFRC Inside	User Input	User input
Fixed Convection Coefficient	User Input	User input
Fixed Combined Coefficient	N / A	N / A
Yazdanian-Klems	User Input	User input
Kimura	User Input	User input

SHGC Inside tab

The SHGC (Solar Heat Gain Coefficient) Inside tab of the Environmental Conditions library is used to define the conditions for the SHGC calculations for the inside surface of the window.

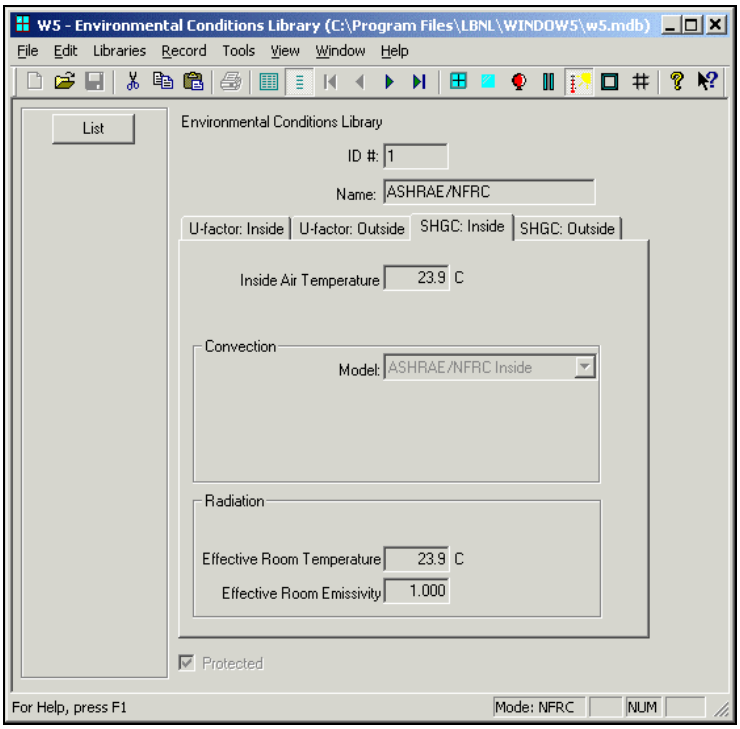


Figure 4-39. Environmental Conditions Library, Detail View, Solar Heat Gain Coefficient Inside tab.

The input values are the following:

Inside Air Temperature Inside air temperature. Units: °C (SI); °F (IP)

Convection

Model The convection model, which controls what other input values appear in this section, from the following choices:

Model	Convection Coeff	Inside Air Velocity	Air Direction
ASHRAE / NFRC Outside	User Input	User input	Choices: Windward Leeward
ASHRAE / NFRC Inside	N / A	N / A	N / A
Fixed Convection Coefficient	User Input	N / A	N / A
Fixed Combined Coefficient	User Input	N / A	N / A
Yazdanian-Klems	N / A	N / A	N / A
Kimura	User Input	User input	Choices: Windward Leeward

Radiation

Model The radiation model, which controls what other input values appear in this section:

Model	Effective Room Temperature	Effective Room Emissivity
ASHRAE / NFRC Outside	User Input	User input
ASHRAE / NFRC Inside	User Input	User input
Fixed Convection Coefficient	User Input	User input
Fixed Combined Coefficient	N / A	N / A
Yazdanian-Klems	User Input	User input
Kimura	User Input	User input

SHGC Outside tab

The SHGC (Solar Heat Gain Coefficient) Inside tab of the Environmental Conditions library is used to define the conditions for the SHGC calculations for the inside surface of the window.

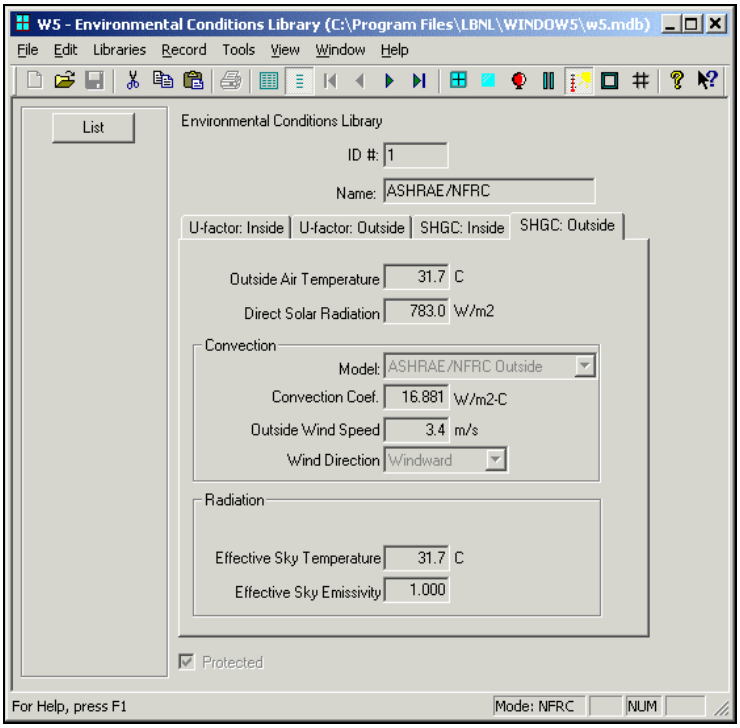


Figure 4-40. Environmental Conditions Library, Detail View, Solar Heat Gain Coefficient Outside tab.

The input values are the following:

Outside Air Temperature — Inside air temperature. Units: ^{o}C (SI); ^{o}F (IP)

Direct Solar Radiation — Direct solar radiation. Units: W / m^2 (SI); Btu / ft^2 (IP)

Convection

Model The convection model, which controls what other input values appear in this section, from the following choices:

Model	Convection Coeff	Inside Air Velocity	Air Direction
ASHRAE/NFRC Outside	User Input	User input	Choices: Windward Leeward
ASHRAE/NFRC Inside	N/A	N/A	N/A
Fixed Convection Coefficient	User Input	N/A	N/A
Fixed Combined Coefficient	User Input	N/A	N/A
Yazdanian-Klems	N/A	N/A	N/A
Kimura	User Input	User input	Choices: Windward Leeward

Radiation

Model The radiation model, which controls what other input values appear in this section:

Model	Effective Sky Temperature	Effective Sky Emissivity
ASHRAE/NFRC Outside	User Input	User input
ASHRAE/NFRC Inside	User Input	User input
Fixed Convection Coefficient	User Input	User input
Fixed Combined Coefficient	N/A	N/A
Yazdanian-Klems	User Input	User input
Kimura	User Input	User input

4.9.2. Environmental Conditions Library List View

The List View shows all the records in the Environmental Conditions Library.There are three pre-defined, protected records provided, and it is possible to copy these records and create other (unprotected) records with any conditions that need to be defined.

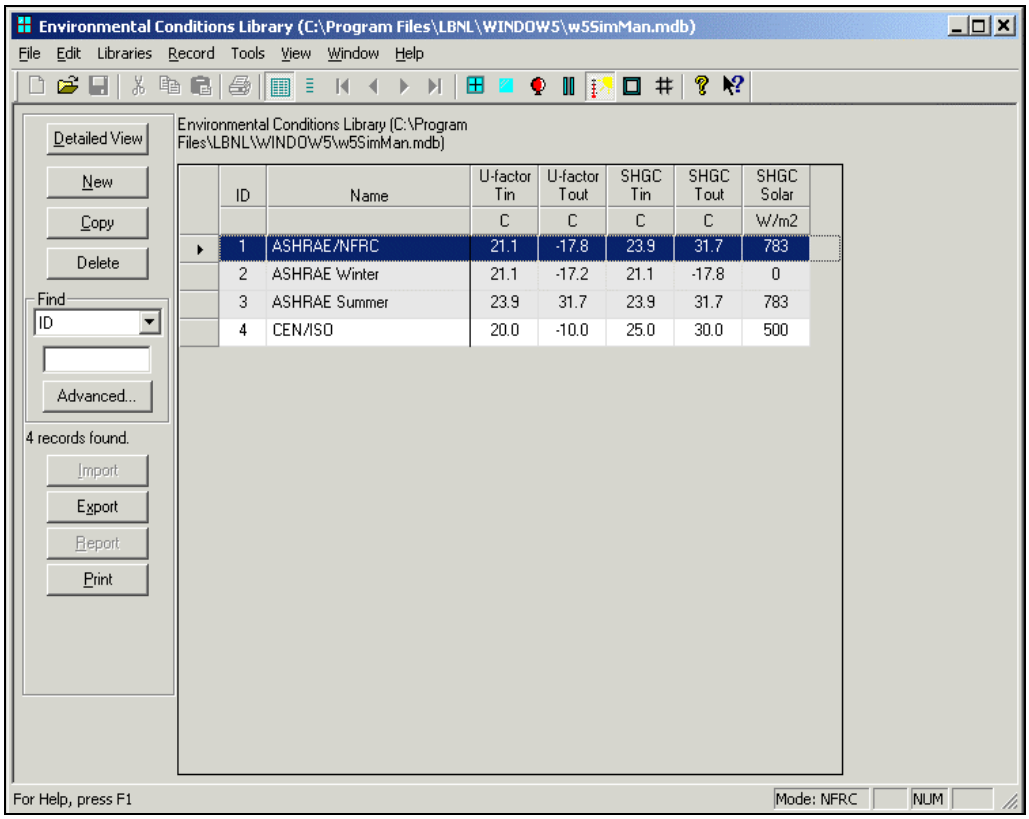


Figure 4-41. Environmental Conditions Library, Detail View, Solar Heat Gain Coefficient Outside tab.

The buttons on the left hand side of the List View have the following functions:

Detailed View	goes to the detailed view of the record, where the input values can be edited.
New	Used to make a new record, based on a default record.
Copy	Used to copy an existing record (including name and all associated input values) into a new record.
Delete	Used to delete the highlighted record(s).
Find	Used to find a record based on the field selected from the pulldown list, and a value typed into the input box.
Advanced	Used to access a more advanced method of searching the list
Import	Currently disabled.
Export	Used to create a comma-separated text file of library records, which can be imported into a spreadsheet or database program.
Report	Currently disabled.
Print	Used to print a report which contains a list of all the records in the library.