



National Fenestration Rating Council Incorporated

NFRC 303-2010

Constructing a Laminate in Optics5

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PREPARED BY:

National Fenestration Rating Council
6305 Ivy Lane, Suite 140
Greenbelt, MD 20770
Voice: (301) 589-1776
Fax: (301) 589-3884
Email: info@nfr.org
Website: www.nfr.org



FOREWORD

The National Fenestration Rating Council, Incorporated ("NFRC") has developed and operates a uniform rating system for energy and energy-related performance of fenestration products. The Rating System determines the U-factor, Solar Heat Gain Coefficient (SHGC) and Visible Transmittance (VT) of a product, which are mandatory ratings for labeling NFRC certified products and are mandatory ratings for inclusion on label certificates, and are supplemented by procedures for voluntary ratings of products for Air Leakage (AL), and Condensation Resistance. Together, these rating procedures, as set forth in documents published by NFRC, are known as the NFRC Rating System.

The Rating System employs computer simulation and physical testing by NFRC-accredited laboratories to establish energy and related performance ratings for fenestration product types. The Rating System is reinforced by a certification program under which NFRC-licensed responsible parties claiming NFRC product certification shall label and certify fenestration products to indicate those energy and related performance ratings, provided the ratings are authorized for certification by an NFRC-licensed certification and Inspection Agency (IA).

The requirements of the rating, certification, and labeling program (the "Certification Program") are set forth in the most recent versions of the following as amended, updated or interpreted from time to time:

- NFRC 700 Product Certification Program (the "PCP")
- NFRC 705 Component Modeling Approach ("CMA") Product Certification Program (the "CMA-PCP").

Through the Certification Programs and the most recent versions of its companion programs as amended, updated or interpreted from time to time:

- The laboratory accreditation program (the "Accreditation Program"), set forth in the NFRC 701 Laboratory Accreditation Program (the "LAP")
- The IA licensing program (the "IA Program"), set forth in NFRC 702 Certification Agency Program (the "CAP")
- The CMA Approved Calculation Entity ("ACE") licensing program (the "ACE Program") as set forth in the NFRC 708 Calculation Entity Approval Program (the "CEAP"),

NFRC intends to ensure the integrity and uniformity of NFRC ratings, certification, and

labeling by ensuring that responsible parties, testing and simulation laboratories, and IAs adhere to strict NFRC requirements.

In order to participate in the Certification Programs, a manufacturer / responsible party shall rate a product whose energy and energy-related performance characteristics are to be certified in accordance with mandatory NFRC rating procedures. At present, a manufacturer/responsible party may elect to rate products for U-factor, SHGC, VT, Air Leakage, Condensation Resistance, or any other procedure adopted by NFRC, and to include those ratings on the NFRC temporary label affixed to its products, or on the NFRC Label Certificate. U-factor, SHGC and VT, AL, and Condensation Resistance rating reports shall be obtained from a laboratory, which has been accredited by NFRC in accordance with the requirements of the NFRC 701.

The rating shall then be reviewed by an IA which has been licensed by NFRC in accordance with the requirements of the NFRC 702. NFRC-licensed IAs also review label format and content, conduct in-plant inspections for quality assurance in accordance with the requirements of the NFRC 702, and issue a product Certification Authorization Report (CAR), or approve for issuance an NFRC Label Certificate for site-built or CMA products and attachment products. The IA is also responsible for the investigation of potential violations (prohibited activities) as set forth in the NFRC 707 Compliance and Monitoring Program.

Ratings for products that are labeled with the NFRC Temporary and Permanent Label, or products that are listed on an NFRC Label Certificate, in accordance with NFRC requirements, are considered to be NFRC-certified. NFRC maintains a Certified Products Directory (CPD), listing product lines and individual products selected by the manufacturer/responsible party for which certification authorization has been granted.

NFRC manages the Rating System and regulates the Product Certification Program (PCP), Laboratory Accreditation Program (LAP) and Certification Agency Program (CAP) in accordance with the NFRC 700 (PCP), the NFRC 701 (LAP), the NFRC 702 (CAP), the NFRC 705 (CMA-PCP), and the NFRC 708 (CEAP) procedures, and conducts compliance activities under all these programs as well as the NFRC 707 Compliance and Monitoring Program (CAMP). NFRC continues to develop the Rating System and each of the programs.

NFRC owns all rights in and to each of the NFRC 700, NFRC 701, NFRC 702, NFRC 705, NFRC 707, NFRC 708 and each procedure, which is a component of the Rating System, as well as each of its registration marks, trade names, and other intellectual property.

The structure of the NFRC program and relationships among participants are shown in Figure 1, Figure 2, and Figure 3. For additional information on the roles of the IAs and laboratories and operation of the IA Program and Accreditation Program, see the NFRC 700 (PCP), NFRC 701 (LAP), and NFRC 702 (CAP) respectively.

Figure 1

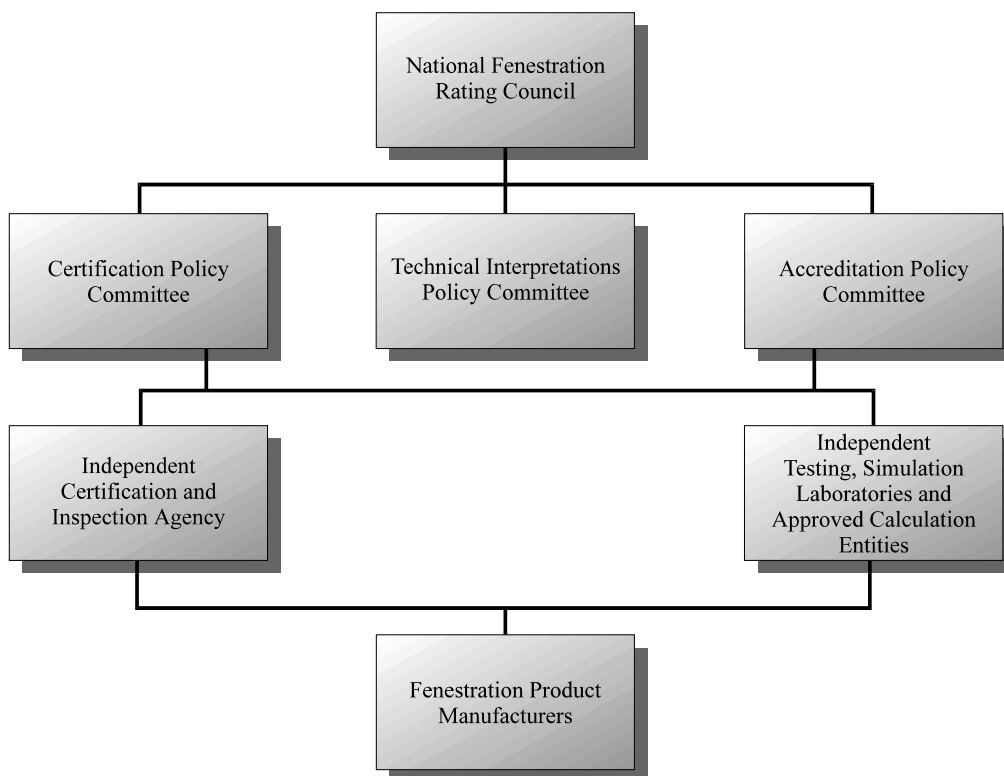


Figure 2

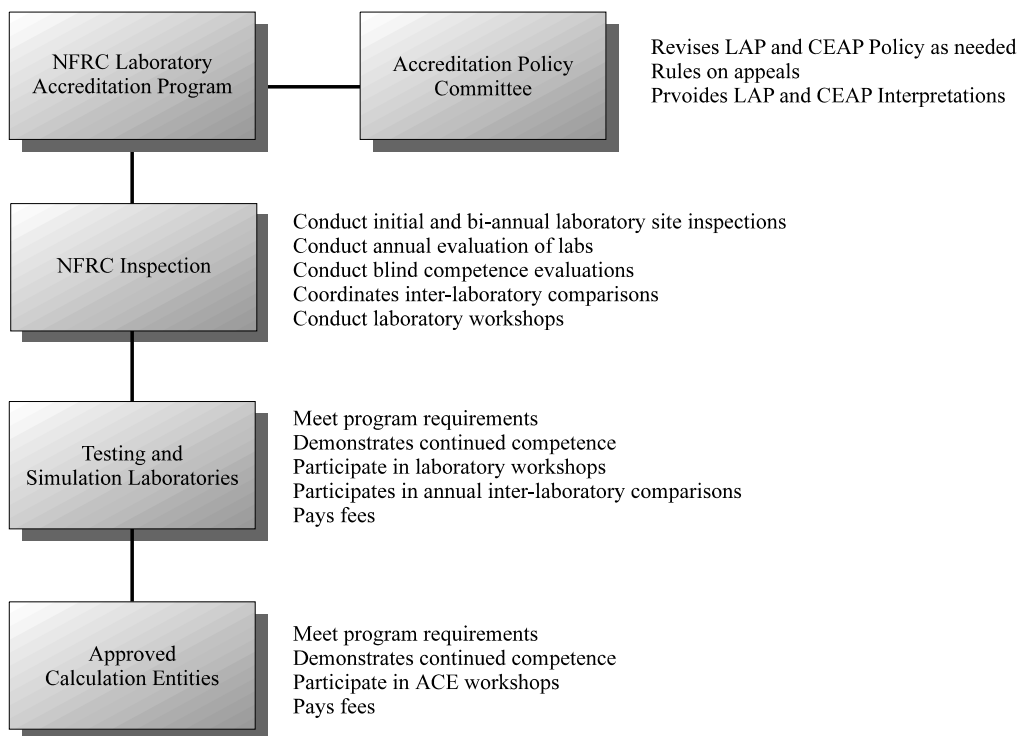
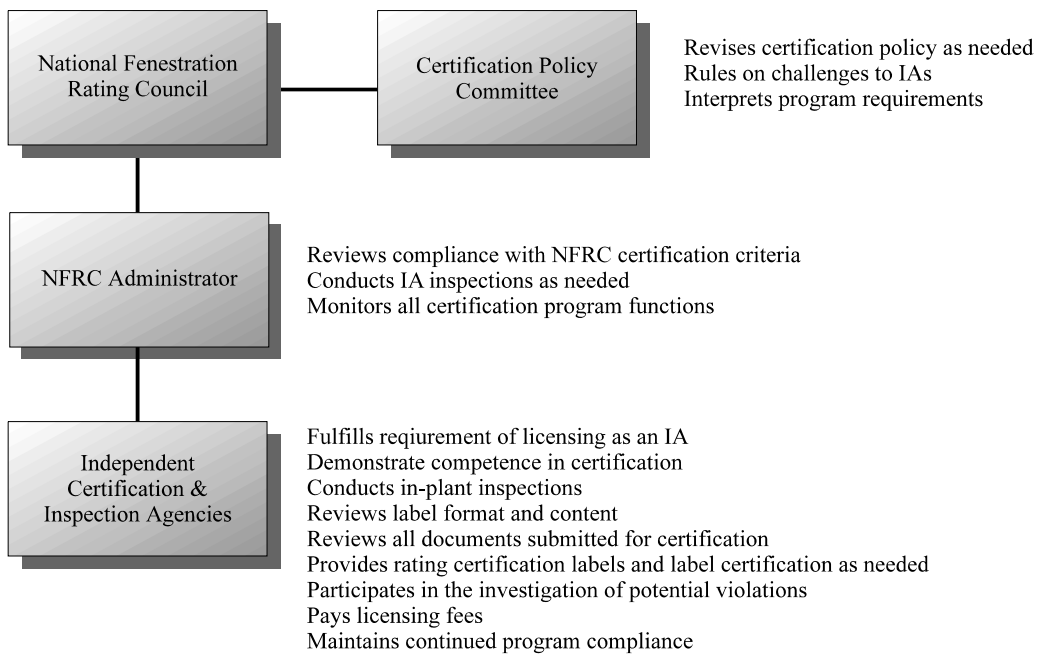


Figure 3



Questions on the use of this procedure should be addressed to:

National Fenestration Rating Council
6305 Ivy Lane, Suite 140
Greenbelt, MD 20770
Voice: (301) 589-1776
Fax: (301) 589-3884
Email: info@nfr.org
Website: www.nfr.org



DISCLAIMER

NFRC certification is the authorized act of a licensee in labeling a fenestration product with an NFRC Permanent Label and NFRC Temporary Label, which bears one or more energy performance ratings reported by NFRC-accredited simulation and testing laboratories and authorized for certification by an NFRC-licensed IA. Each of these participants acts independently to report, authorize certification, and certify a rating.

NFRC certification does not constitute a warranty of NFRC regarding any characteristic of a fenestration product. Certification is not an endorsement of or recommendation for any product or product line or any attribute of a product or product line. NFRC is not a merchant in the business of selling fenestration products and therefore cannot warrant products as to their merchantability or fitness for a particular use.

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1. OVERVIEW

Optics5 can be used for the limited purpose of constructing laminates for NFRC certified simulations using the following criteria:

- Laminates cannot have embedded coatings, where embedded coatings are defined as a coating on a substrate that touches an interlayer
- Only NFRC glass layers with the NFRC approval indicator “#” can be used in these constructed laminates
- The glass layers can be tinted or coated as long as the coatings do not face the interlayer
- The interlayers in Optics5 do not have a “#” on them and therefore, only interlayers from the LBNL/NFRC “Approved Interlayer” list can be used (this list may be updated in the future), which means the data for those interlayers was submitted to the IGDB using the criteria specified in Section 1.2 of this document.

For NFRC verification of the laminate construction submitted by simulators:

- Laminates constructed by simulators in Optics5 will not have a # next to them. (Future versions of the WINDOW software could determine if the laminate was constructed from NFRC approved # layers, and report/display this information).
- The simulator shall provide base properties for the complete laminate assembly, including solar transmittance (solar, T), visible transmittance (photopic, T), solar reflectance front (solar, Rf), solar reflectance back (solar, Rb), visible reflectance front (photopic, Rf), visible reflectance back (photopic, Rb), Emissivity front (EmitF), Emissivity back (EmitB). These values are reported on the Optics screen when the laminate is calculated, and also in the WINDOW5 Detailed Report from the Glazing System Library. This requirement is satisfied by submitting a WINDOW “mdb” database file which includes this laminate.
- An IA (or anyone else wanting to check the results) can recreate the laminate from the specified layers and verify the calculated values
- NFRC simulators shall assign numbers to the laminates starting with 30,000. The numbers do not have to be unique between simulation laboratories or even between projects in the same laboratory. These laminates are not stored in a central NFRC database.
- The naming convention for the laminate should describe the layers used to construct the laminate, using the IGDB Layer ID for glass layers and the interlayer name (from the Optics program) for the interlayer. If a glass layer is flipped, add the “F” designator to the end of the layer number. The total number of characters (not including extension, but including “/” separators in the name) cannot exceed 45.

<glass layer ID><F if layer is flipped>/<interlayer name from Optics5>/<glass layer ID><F if layer is flipped>

For example: 102/030keepsafe/2026F

2. TERMINOLOGY

See NFRC 600 (Glossary and Terminology) document for definitions.

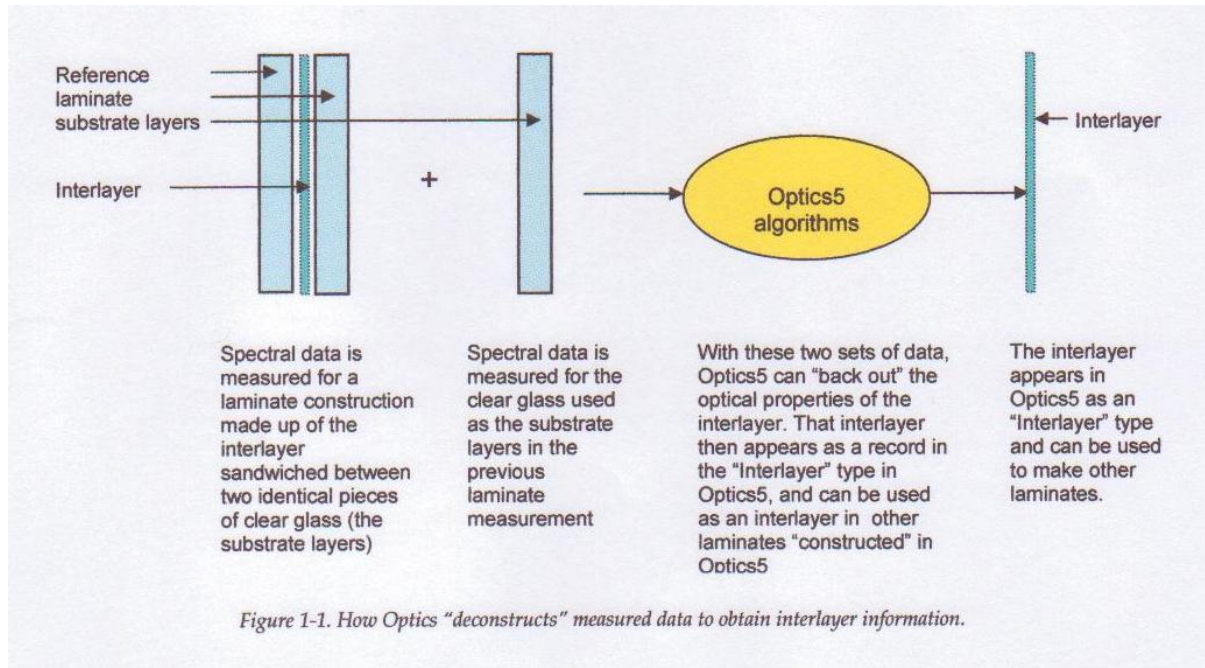
3. LAMINATE INTERLAYER DATA

Optics can accurately calculate the optical properties of laminates as long as the component layers with the following characteristics (and only interlayers submitted with these characteristics will be included in the “Approved Interlayer List” for NFRC certification:

- Interlayers are measured with transparent glass with a solar transmittance $T_{sol} > 0.820$ and $T_{vis} > 0.890$. This ensures that a “constructed” laminate in Optics5 will always have a similar or lower transmittance than the reference laminate which determines the interlayer properties
- No glass layers have coatings next to interlayers (embedded coatings).
- Substrate layers (the base glass to which the interlayers are applied) are measured separately from the interlayers. This is the responsibility of the manufacturer submitting data to the IGDB, as discussed below.

As discussed in the LBNL document which contains guidelines for submitting data to the IGDB (International Glazing Database: Data File Format, Version 1.4, April 2003), “an interlayer is an adhesive layer used to join components in a laminate. The optical properties of laminate layers cannot be measured directly. Instead they are calculated from the spectral properties of a ‘reference laminate’ which consists of the interlayer laminated between two glass layers of known optical properties. To submit data for an interlayer, both the spectral optical properties of the reference laminate, and the glass layers used in the reference laminate should be submitted.”

This means that in order for an interlayer to be added to the Optics5 “Interlayer” type, and therefore used in making laminate constructions in Optics5, the spectral data for a “reference” laminate which contains that interlayer is submitted to the IGDB as follows:



Optics5 can do an accurate calculation for the interlayer properties from the reference laminate as long as the substrate glass layers have a high solar and visible transmittance, hence the requirement of $T_{sol} > 0.820$ and $T_{vis} > 0.890$. This ensures that laminates that are later created in Optics5 with this interlayer will almost always have a lower solar and visible transmittance than the reference laminate.

4. PROCEDURE- CONSTRUCTING A LAMINATE IN OPTICS5

4.1 Building a New Laminate

When Optics5 starts, you can start building a laminate immediately by switching to the 'Laminate' tab and adding layers (see "1.3.3. Add Layers to a Laminate").

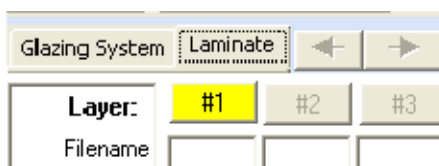


Figure 1-2. Click on the Laminate tab to start constructing a laminate.

If you have created a laminate already, but want to start over with an empty laminate:

- Make sure the 'Laminate' tab is selected
- Choose menu option File|New Laminate
- You will be prompted to save the current laminate if one already exists

Note: if you created new layers and did not save the layers or did not save the laminate (which would save any new layers), the new layers will be lost when you start a new laminate.

4.2 Wave Length Sets

Use the NFRC default wavelength set, which is called "Optics5". This setting is shown on startup of the program, and also can be viewed (and changed if necessary) from the menu option Tools|Select Wavelength Set.

4.3 Add Layers to a Laminate

You can add monolithic, coated, and interlayer type layers to a laminate. There are a number of 'rules' for building laminates:

- A. The first and last layer in a laminate must be a non-interlayer type (e.g. monolithic or coated)
- B. You can place as many interlayers as you like adjacent to each other, but you must separate rigid non-interlayers with at least one interlayer.
- C. For NFRC certified simulations, you can NOT place a coating next to an interlayer. If you break rule 1 or 2, the operation will be cancelled.

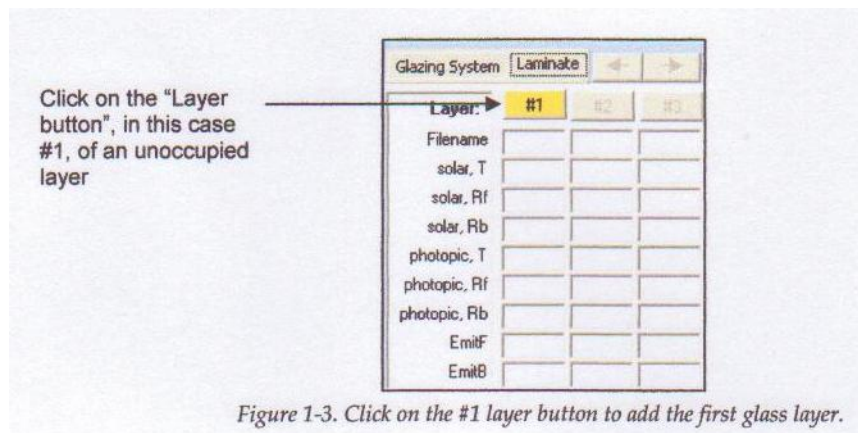
Use the 'Add Interlayer' tab above the database to add interlayers. To add other layers, use the 'Add Glazing' tab. Only those database records with enough data to be loaded into a laminate will be shown in these views – if you want to see all records in the database, including those which cannot be used in laminates, use the 'View All' tab. If you try to load an invalid layer into a laminate from the 'View All' view of the database, an error message will be displayed.

4.4 Add Glazings to a Laminate

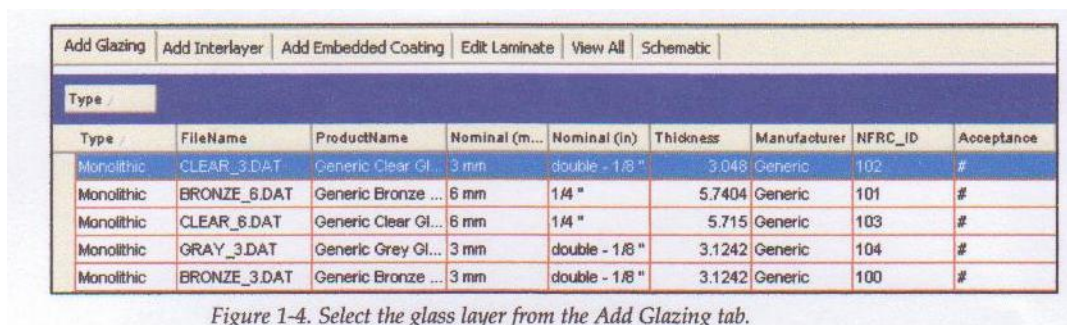
You can add monolithic, coated, and interlayer type layers to a laminate as long as you follow the laminate-building 'rules' (see "1.3.3. Add Layers to a Laminate" above).

To add layers from the current database to a laminate:

- Select the first available (unoccupied) layer in the laminate by clicking on its layer button – if you select an occupied layer, it will be replaced (see “1.3.8. Replace a Layer in a Laminate”)



- Select the “Add Glazing” tab in the database



- Double-click on the layer in the database
OR
- Using the mouse, drag the layer from the database over the layer button where you want to add the layer and release the mouse button
OR
- Select the layer in the database, then choose the menu option **Database|Add/Replace Layer**
OR
- Select the layer in the database, then right-click to display the pop-up menu then choose **Add/Replace Layer**

If you are replacing a layer, a dialog box will appear to confirm that you want to replace the existing layer.

Note: Select a layer in the database by clicking on it with the mouse, or by browsing to it by pressing the up and down arrow.

4.5 Add Interlayers

To add an interlayer to a laminate:

- Select the first available (unoccupied) layer by clicking on a layer button
- Select the “Add Interlayer” tab

Select the Layer Button for the Interlayer

Click on the Add Interlayer tab.

Select the desired interlayer for the laminate construction, double click the mouse, and that interlayer will be added as the next layer in the laminate

Layer:	#1	#2	#3	Lamin.
Filename	CLEAR			CalcLa
solar, T	0.834			N/A
solar, Rf	0.075			N/A
solar, Rb	0.075			N/A
photopic, T	0.899			N/A
photopic, Rf	0.083			N/A
photopic, Rb	0.083			N/A
EmitF	0.840			N/A
EmitB	0.840			N/A

Product name	Manufacturer	Nominal (mil)	Code	Appearance	Material	Reference
Butacite® NC010	DuPont	15		Clear	PVB	15PVB6.DUP
Butacite® NC010	DuPont	30		Clear	PVB	30PVB6.DUP
Butacite® NC010	DuPont	60		Clear	PVB	60PVB6.DUP
Butacite® 0637...	DuPont	30	0637600	Blue	PVB	AZURBLUE.DUP
Butacite® 2377...	DuPont	30	2377300	Blue-Green	PVB	BLUGREEN.DUP
Butacite® 0360...	DuPont	30	0360900	Dark Brown	PVB	BRN_DARK.DUP
Butacite® 0365...	DuPont	30	0365500	Light Brown	PVB	BRN_LITE.DUP
Butacite® 0362...	DuPont	30	0362800	Medium Brown	PVB	BRN_MEDM.DUP

The selected Interlayer has been added as then 2nd layer in the laminate construction

Layer:	#1	#2	#3	Lamin.
Filename	CLEAR	BLUGR		CalcLa
solar, T	0.834	0.859		N/A
solar, Rf	0.075	0.000		N/A
solar, Rb	0.075	0.000		N/A
photopic, T	0.899	0.834		N/A
photopic, Rf	0.083	0.000		N/A
photopic, Rb	0.083	0.000		N/A
EmitF	0.840	0.000		N/A
EmitB	0.840	0.000		N/A

Product name	Manufacturer	Nominal (mil)	Code	Appearance	Material	Reference
Butacite® NC010	DuPont	15		Clear	PVB	15PVB6.DUP
Butacite® NC010	DuPont	30		Clear	PVB	30PVB6.DUP
Butacite® NC010	DuPont	60		Clear	PVB	60PVB6.DUP
Butacite® 0637...	DuPont	30	0637600	Blue	PVB	AZURBLUE.DUP
Butacite® 2377...	DuPont	30	2377300	Blue-Green	PVB	BLUGREEN.DUP
Butacite® 0360...	DuPont	30	0360900	Dark Brown	PVB	BRN_DARK.DUP
Butacite® 0365...	DuPont	30	0365500	Light Brown	PVB	BRN_LITE.DUP
Butacite® 0362...	DuPont	30	0362800	Medium Brown	PVB	BRN_MEDM.DUP

- Select the interlayer you want to add, and load it into the laminate (see “1.3.3. Add Layers to a Laminate”)

Figure 1-5. Select the desired interlayer from the Add Interlayer tab for layer #2.

- Select the interlayer you want to add, and load it into the laminate (see “1.3.3. Add Layers to a Laminate”)

4.6 Flip Layers in a Laminate

To flip layers in a laminate:

- Select the layer to flip by clicking a layer button
- Choose the menu option **Edit/Flip Layer**

OR

- Right-click on the layer button to display the pop-up menu and select **Flip Layer**
- If flipping the layer would place a coating adjacent to an interlayer, and this will break the laminate-building rules (see “5.3: Add Layers to a Laminate”) and the laminate cannot be constructed for NFRC certification.

Note: Check the schematic view and the layer spectral averages if you are not sure which way a layer is oriented.

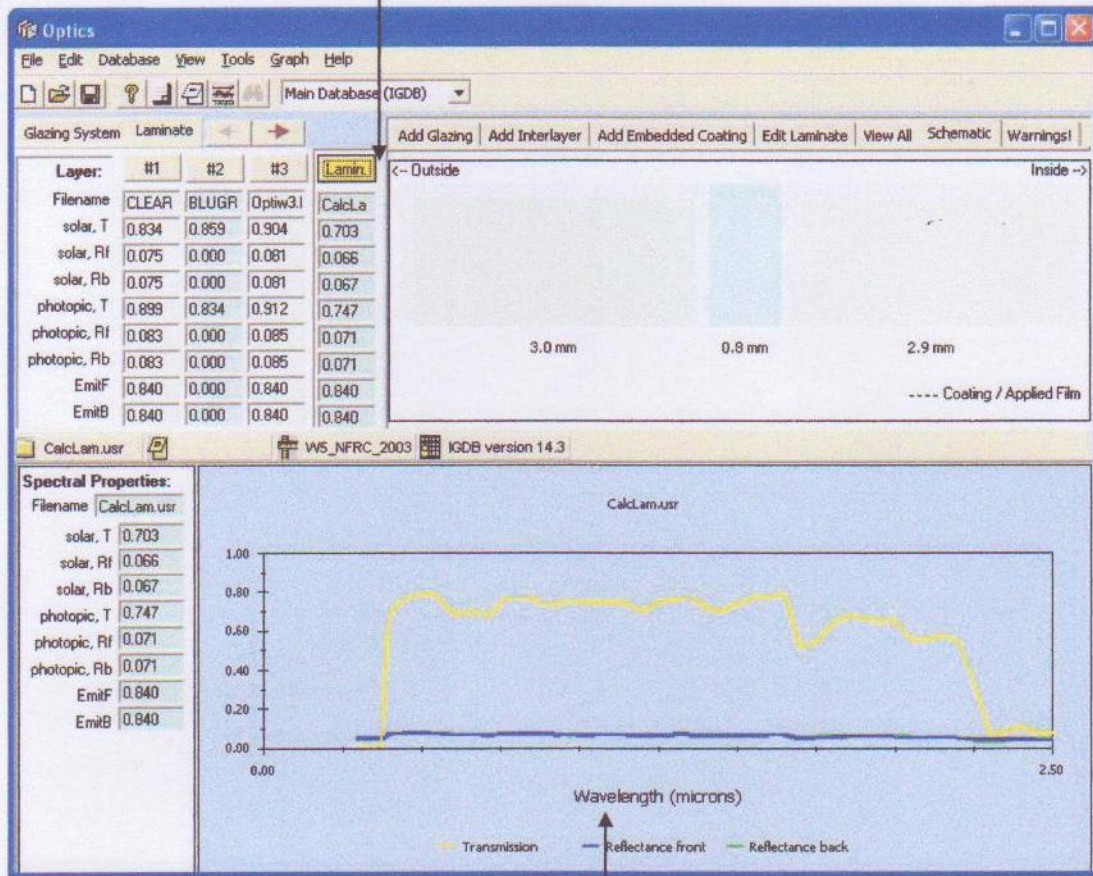
If any glass layers are flipped, make sure to add an “F” to the NFRC ID in the name of the final laminate.

4.7 View the Properties of a Laminate

Select the laminate by clicking on the ‘Lamin.’ layer button

- The laminate is now the current layer, so its spectral data and spectral averages are displayed in the lower part of the screen
- To view a schematic diagram of the laminate, select the ‘Schematic’ tab in the upper right part of the screen
- To view the spectral data in a table, choose menu option **View|Spectral Data Grid**
- To view calculation warnings for the laminate data, select the ‘Warnings’ tab in the upper right part of the screen
- To see more information about the laminate, choose menu option

Click on the Lamin. Button and Optics5 will calculate and display the calculated properties of the laminate construction in the column below that button.



When the Lamin. Button above is selected, the graph below displays the properties of the entire laminate construction.

4.8 Replace a Layer in a Laminate

Replace a layer in a laminate in the same way as you would replace a layer in a glazing system – you must respect the laminate-building rules (see “5.3: Add Layers to a Laminate”).

You cannot insert layers into a laminate – you must delete and add layers from the interior side of the laminate to modify the structure.

4.9 Delete a Layer in a Laminate

You can only delete the last (interior side) layer in a laminate. To delete the last layer:

- Select the last layer by clicking the layer button

- Choose the menu option **Edit|Delete Layer** or
- Right-click on the layer button to display the pop-up menu and select delete layer

4.10 Save a Laminate

To save a laminate to the user database:

- Select the laminate by clicking on the ‘Lamin’ layer button
- Click the ‘Save’ button on the toolbar: or
- Choose the menu option **File|Save** filename or
- Right-click the layer button to display the pop-up menu and select Save filename

Note: To save the laminate under a different name, choose the menu item **Save As...**

4.11 Edit a Laminate

To edit a laminate saved in the user database:

- Make sure the ‘Laminate’ tab is selected above the layer buttons
- Select the ‘Edit Laminate’ tab in the upper right part of the screen

OR

- Choose the menu option **File|Edit Laminate**
- Load the laminate you wish to edit like you would add a layer into any layer position – the current laminate will be cleared, and the saved laminate loaded.

Note: You cannot edit laminates in ‘Glazing’ mode, you must switch to ‘Laminate’ mode first. In order to use the edited laminate in a glazing system, save the laminate to the user database, switch to ‘Glazing’ mode and re-load the laminate layer into the glazing system from the user database.

Note: You cannot use a laminate as a component of another laminate.

4.12 Calculation Warnings for Laminates

The optical properties of most laminates without coatings can be calculated without generating warnings, except that it is likely that some components will not have spectral data across the whole range of the selected wavelength set (see “1.3.2. Wavelength Sets”), so the wavelength set will be truncated.

4.13 Viewing Calculation Warnings for Laminates

To view calculation warnings for a laminate:

- Select the laminate by clicking on the “Lamin” layer button
- Select the “Warnings” tab

The example below shows a warning message that says:

Results could not be calculated at all wavelengths in the selected wavelength set. Wavelengths set truncated to: 0.300 – 2.500 μm

This message does not indicate a problem because the solar optical properties in WINDOW are calculated between 0.300 – 2.500 μm .

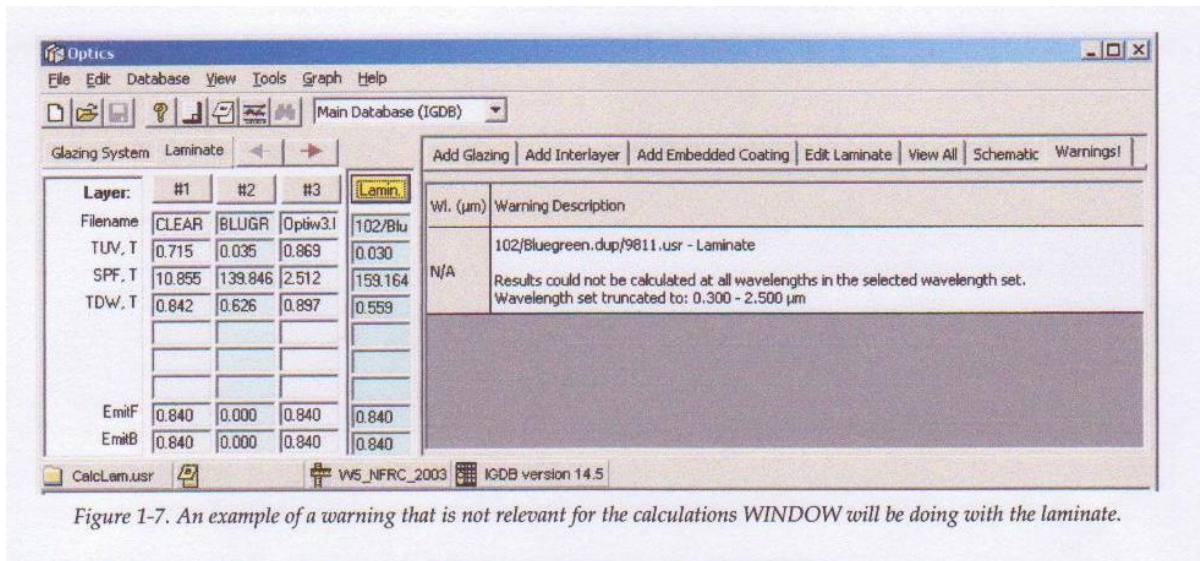


Figure 1-7. An example of a warning that is not relevant for the calculations WINDOW will be doing with the laminate.

4.14 Save the Laminate to a User Database to Import into WINDOW5

User databases have the same format as the IGDB, but they are used to store data that the user has imported, or generated with Optics5. It is not possible to add layers to the IGDB, so all new layers are saved to the user database.

The default user database is ‘UserGlazing . mdb’ in the ‘\LBNL Shared’ directory of your program installation. You can specify the location of the user database – this allows you to use as many user databases as you like (one at a time) with Optics5.

To create a new (empty) user database:

- Click on the Database menu, and select the choice “Create new user database”.

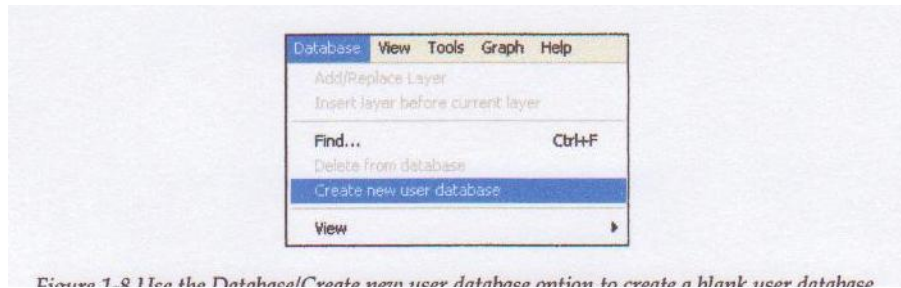


Figure 1-8 Use the Database/Creates new user database option to create a blank user database

- The program will ask you for a database name and location. Name the database as appropriate and put it in whatever directory is desired – the default directory for the default Optics User Database (called UserGlazing.mdb) is the “c: \ Program Files \ LBNL \ LBNL Shared” directory, but any user database can be put in any directory, as long as the path is specified (Tools menu)

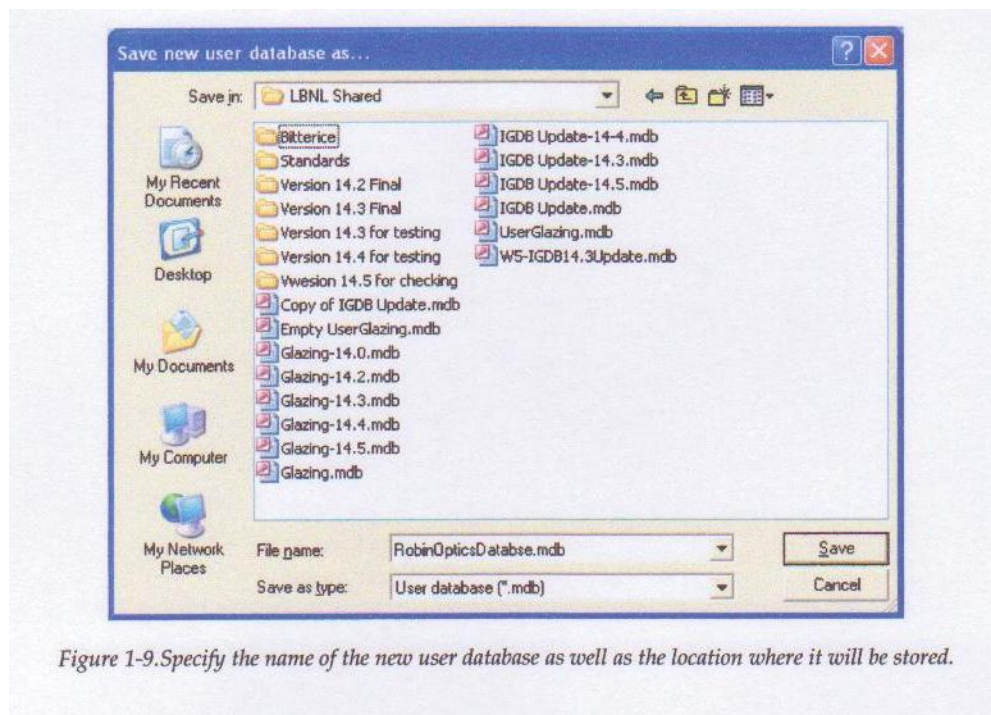


Figure 1-9. Specify the name of the new user database as well as the location where it will be stored.

- Set the default user database to the newly created database from Tool/Options

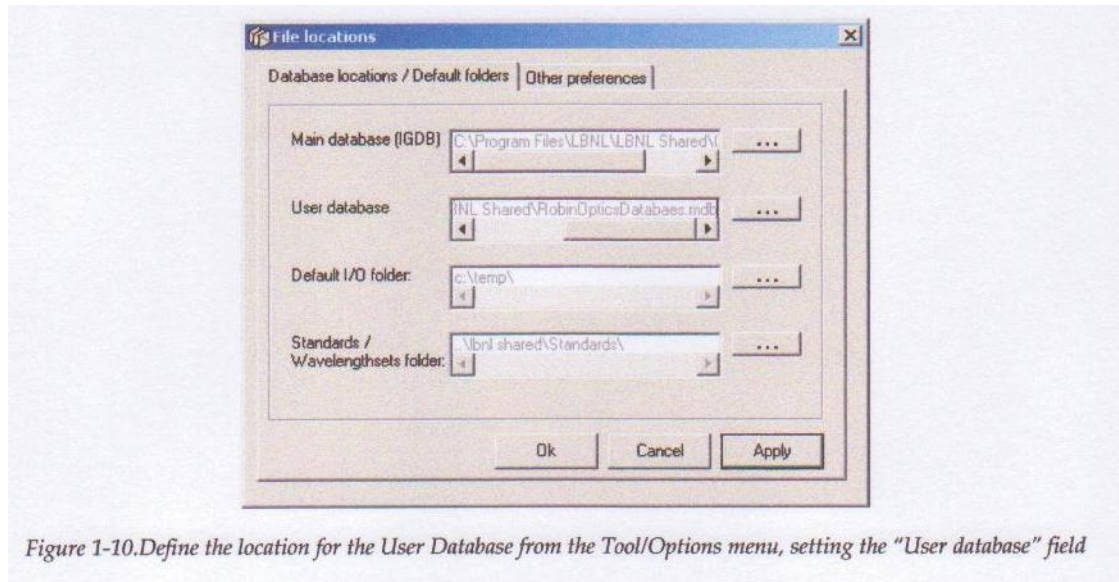


Figure 1-10. Define the location for the User Database from the Tool/Options menu, setting the "User database" field

You can save a layer to the user database if it has a different filename to any layer currently in the user database or in the IGDB. If you save a layer that has components (such as a coated layer that has a substrate, or a laminate which has component layers), the component layers will be saved to the user database at the same time (unless they already exist in the IGDB or user database). This allows you to load and edit those layers at a later time.

If you want to save an unmodified layer from the IGDB to the user database, you must change its filename first.

To save a layer to the user database:

- Select the layer or system to save by clicking on a layer button
- Click the "Save" button on the toolbar

OR

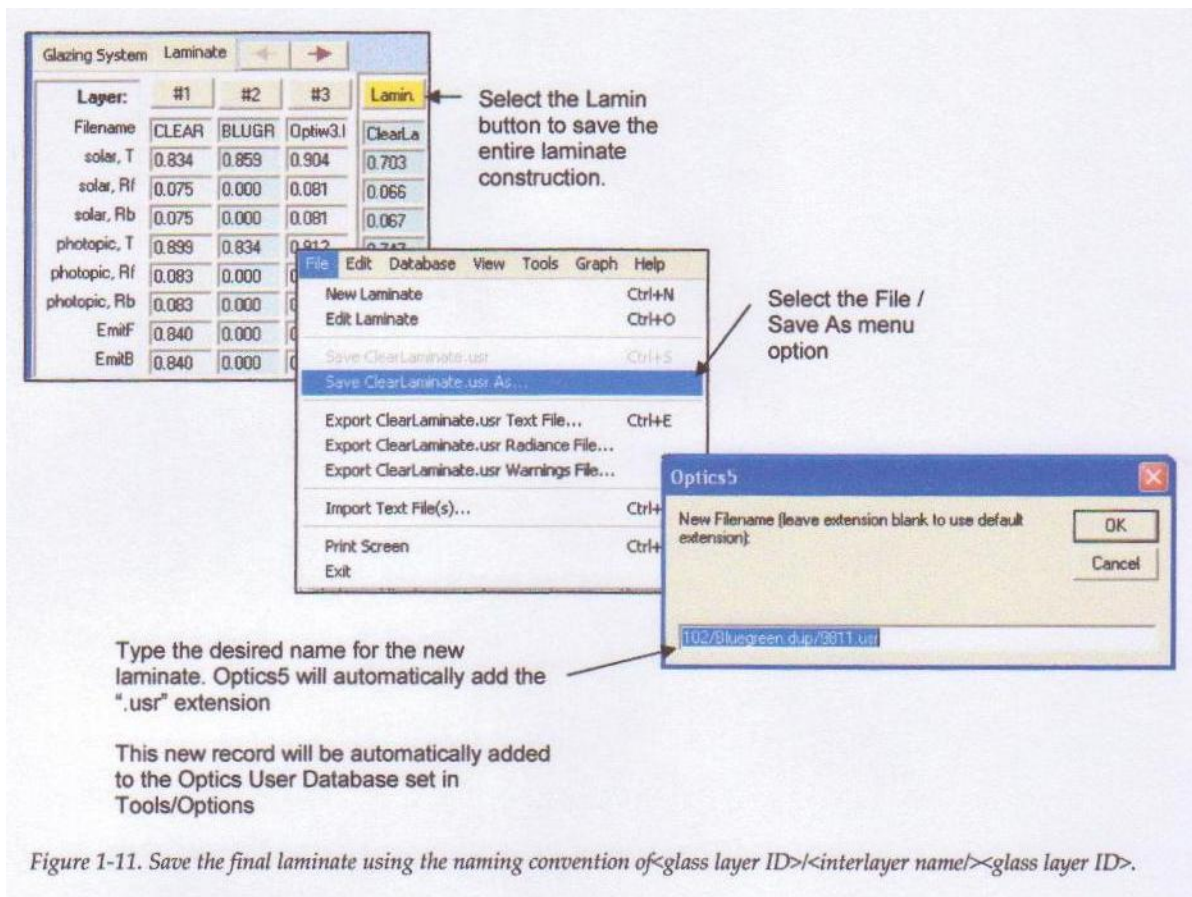
- Choose menu option **File/Save filename**

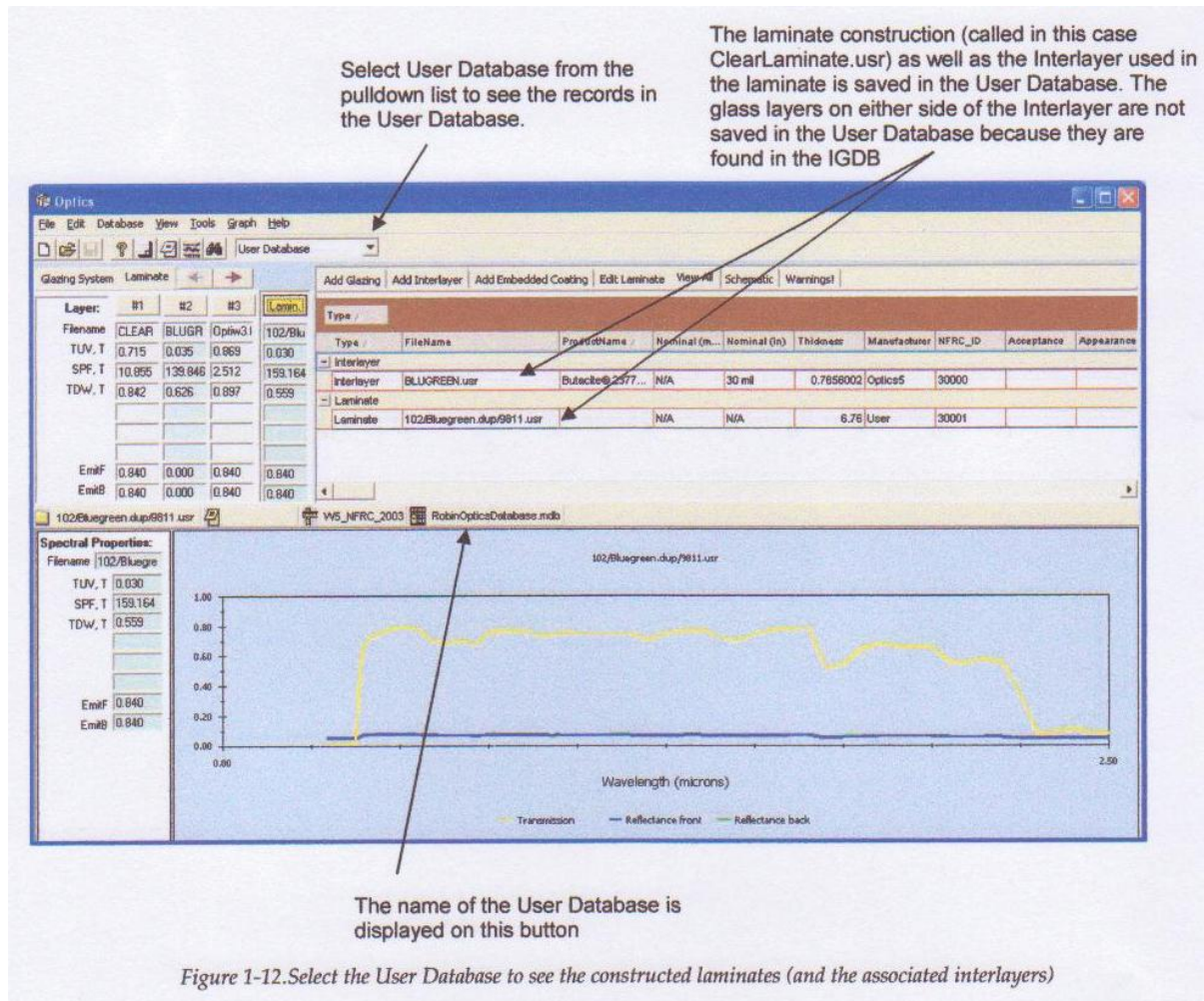
OR

- Right-click to display the pop-up menu and select the option **Save filename**
- If the layer or system you saved had components, or if the save operation fails, you will be asked "Do you want to view the details of the save operation?" If you answer yes, you can view information about components that were saved to the user database, and components that were not saved to the user database along with an explanation as to why some components were not saved.

Note: to change the filename and save in one operation, choose menu option **Save As...** instead.

Note: You cannot save data for a layer with the same filename as another layer in the IGDB or your current user database. If a conflict is detected, Optics will ask you to rename the layer before saving it, or cancel the import. The most common reason a component is not saved is that its filename already exists in the IGDB or user database. In this case Optics assumes that the component layer information is already available and does not need to be saved again.





4.15 Importing the Laminate into WINDOW5 from the Optics5 User Database

In WINDOW5, in File/Preferences, go to the Optical Data tab, and set the second option, Optics5 User Database, to your Optics5 user database (which by default is called UserGlazing.mdb, but it can have any name with the 'mdb' extension) -- you can browse to the file with the browse button (its default location is in Program Files\ LBNL \ LBNL Shared directory).

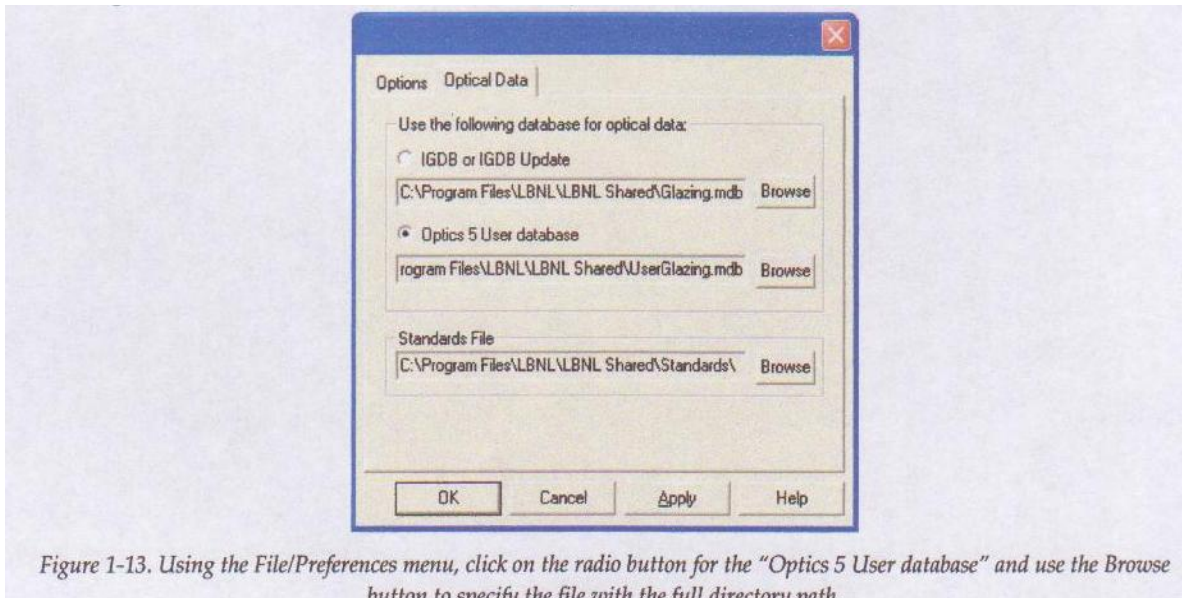


Figure 1-13. Using the File/Preferences menu, click on the radio button for the “Optics 5 User database” and use the Browse button to specify the file with the full directory path

In WINDOW5, go to the Glass Library List View, click on the Import button, select “IGDB or Optics User Database” as the format, and click OK.

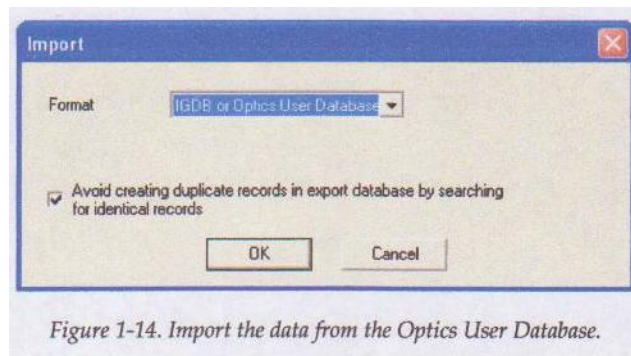


Figure 1-14. Import the data from the Optics User Database.

The program will open the user database set in the File/Preferences dialog box (the name will be displayed at the top of the dialog box) and you will see the glass layers that can be imported in to the existing library.

C:\Program Files\LBNL\LBNL_Shared\RobinOpticsDatabase.mdb

Select Cancel Select All Clear selection Find ID 1 records found.

NFRC_ID	FileName	ProductName	Manufacturer	Acceptance	Thickness	ef	eb	Appearance	Conductivity	Database_Version
30001	102/Bluegreen.dup/9811 usr		User		mm	0.84	0.84		0.70	User

Figure 1-15. You will see all the entries in the specified user database.

You can select the records you want to import (use **Shift Click** to select contiguous records, **Ctl Click** to select multiple non-contiguous records, or **Select All** to select all records). Then click the **Select** button, which will import the selected records into the **Glass Library**.

Glass Library (C:\Program Files\LBNL\WINDOW5\w5.mdb)

File Edit Libraries Record Tools View Help

Detailed View

Glass Library (C:\Program Files\LBNL\WINDOW5\w5.mdb)

ID	Name	ProductName	Manufacturer	Source	Mode	Color	Thickness	Tsol	Rsoll	Rso2	Tvis	Rvis1	Rvis2	Tir	emis1	emis2
							mm									
9930	SOLARE2.LOF	Solar E1	Pilkington North America	IGDB v11.4	#		2.235	0.475	0.073	0.122	0.505	0.069	0.098	0.000	0.840	0.160
9931	SOLARE3.LOF	Solar E1	Pilkington North America	IGDB v11.4	#		2.997	0.478	0.076	0.123	0.997	0.075	0.097	0.000	0.840	0.152
9932	SOLARE3.LOF	Solar E1	Pilkington North America	IGDB v11.4	#		3.175	0.477	0.075	0.123	0.986	0.075	0.100	0.000	0.840	0.152
9933	SOLARE4.LOF	Solar E1	Pilkington North America	IGDB v11.4	#		3.912	0.475	0.076	0.121	0.611	0.074	0.101	0.000	0.840	0.158
9934	SOLARE5.LOF	Solar E1	Pilkington North America	IGDB v11.4	#		4.699	0.471	0.077	0.119	0.612	0.077	0.107	0.000	0.840	0.163
9935	SOLARE6.LOF	Solar E1	Pilkington North America	IGDB v11.4	#		5.664	0.456	0.074	0.113	0.607	0.074	0.097	0.000	0.840	0.161
9936	Activ2.lof	Activ4 on Clear	Pilkington North America	IGDB v11.4	#		2.235	0.818	0.123	0.119	0.842	0.149	0.147	0.000	0.833	0.840
9937	Activ3.lof	Activ4 on Clear	Pilkington North America	IGDB v11.4	#		2.997	0.801	0.122	0.117	0.838	0.149	0.146	0.000	0.833	0.840
9938	Activ3.lof	Activ4 on Clear	Pilkington North America	IGDB v11.4	#		3.175	0.797	0.126	0.121	0.835	0.154	0.152	0.000	0.833	0.840
9939	Activ4.lof	Activ4 on Clear	Pilkington North America	IGDB v11.4	#		3.912	0.786	0.120	0.115	0.835	0.148	0.146	0.000	0.833	0.840
9940	Activ5.lof	Activ4 on Clear	Pilkington North America	IGDB v11.4	#		4.699	0.769	0.118	0.112	0.835	0.145	0.143	0.000	0.833	0.840
9941	Activ6.lof	Activ4 on Clear	Pilkington North America	IGDB v11.4	#		5.639	0.747	0.120	0.112	0.825	0.151	0.147	0.000	0.833	0.840
9989	ArcticBlue5m.LOF	Arctic Blue5	Pilkington North America	IGDB v13.9	#		5.918	0.328	0.049	0.049	0.526	0.057	0.057	0.000	0.840	0.840
9990	Sec9lam.lof	Solar E1 laminates	Pilkington North America	IGDB v12.1	#		8.484	0.413	0.063	0.121	0.583	0.074	0.099	0.000	0.840	0.152
30001	102/Bluegreen.dup/9811 usr		User	IGDB User v1.			6.760	0.703	0.066	0.067	0.747	0.071	0.071	0.000	0.840	0.840

1829 records found.

Import Export Report Print

For Help, press F1

Mode: NFRC | SI | NUM

The laminate has now been imported from the Optics5 user database to the WINDOW Glass Library. It can now be used in the Glazing System Library to create a glazing system.

Figure 1-16. The laminate has now been added to the WINDOW Glass Library.