

Release

Alpha 1.0

TAYLOR SYSTEMS ENGINEERING, INC.

Professional Engineering Services

TSe+ Glazing Library

PROFESSIONAL ENGINEERING SERVICES

TSe+

Taylor Systems Engineering, Inc.
9801 Fair Oaks Blvd. • Suite 100
Fair Oaks, CA 95628
Phone: 916.961.3400 • Fax: 916.961.3410

September 2003

Table of Contents

1. INTRODUCTION.....	2
1.1. OVERVIEW.....	1
1.2. THE USER MANUAL.....	1
1.2.1 SCOPE.....	1
1.3. INSTALLATION.....	2
1.3.1 DOWNLOAD.....	2
1.3.2 SYSTEM REQUIREMENTS.....	2
1.3.3 INSTALLATION.....	2
2. NAVIGATING THE TSE+GLAZING LIBRARY	3
2.1. E+ DATASETS	3
2.1.1 SETTING UP E+ DATASET	3
2.2. CALCULATION TOOL	4
2.3. CATEGORY FIELDS	5
2.4. DISPLAY UNITS	6
2.5. STORE AS.....	6
3. BUILDING THE TSE+GLAZING LIBRARY	7
3.1. WINDOW GLASS LAYER	7
3.1.1 GLASS LAYER NAMES	7
3.1.2 PROPERTIES	8
3.2. WINDOW GLASS LAYER ALT INPUT	10
3.2.1 GLASS LAYER NAMES	10
3.2.2 PROPERTIES	10
3.3. WINDOW GAS PROPERTIES.....	12
3.3.1 WINDOW GAS NAMES	12
3.3.2 PROPERTIES	12
3.4. GAS MIXTURE	14
3.4.1 WINDOW GAS MIXTURE NAMES.....	14
3.4.2 PROPERTIES	14
3.5. WINDOW SHADE	16
3.5.1 WINDOW SHADE NAMES	16
3.5.2 PROPERTIES	16
3.6. WINDOW BLIND	18
3.6.1 WINDOW BLIND NAMES	18
3.6.2 PROPERTIES	18
3.7. WINDOW CONSTRUCTION	20
3.7.1 CONSTRUCTION.....	20
3.7.2 GLAZING MATERIALS	20
3.7.3 PROPERTIES	20
4. EXPORTING WINDOW GLASS/GAS/SHADE/CONSTRUCTION DATA TO IDF.....	23
4.1. OVERVIEW.....	23
4.2. EXPORT.....	23

Preface

TSE has provided technical engineering services to facility owners and managers, worldwide, since 1974. We are specialists in complex mechanical heating, ventilation and air conditioning (HVAC) systems for corporate, industrial, laboratory and biotech facilities. We apply quality control and techniques gained from our experience in the following areas: Mechanical HVAC Systems Design and Analysis; Temperature and Building Control; Energy Conservation/Efficiency; Commissioning; Project Management; Operation/Maintenance Consulting; Facilities Operation Training; Fire and Life Safety

TSe+ is a suite of applications under development by TSE to enhance the user side data management for EnergyPlus inputs. The TSe+ suite consists of a number of smaller modules each addressing a specific group/sub-group of data required by EnergyPlus. The development stage of TSe+ is yet pre-release. TSe+Mat Alpha1.0 was the first module to be developed, and TSe+Glz Alpha 1.0 is the next. Each module at this time functions independently, though future efforts may unite them under a single unified interface. Similar in approach to its predecessor module (TSe+Mat), TSe+Glz addresses the window glazing material properties and construction.

1. Introduction

1.1. Overview

TSe+Glz is designed to support the user side management of the glazing, gas, shade and blind data associated with window construction. It allows for the creation of new materials and the use of the existing dataset library included in the EnergyPlus installation.

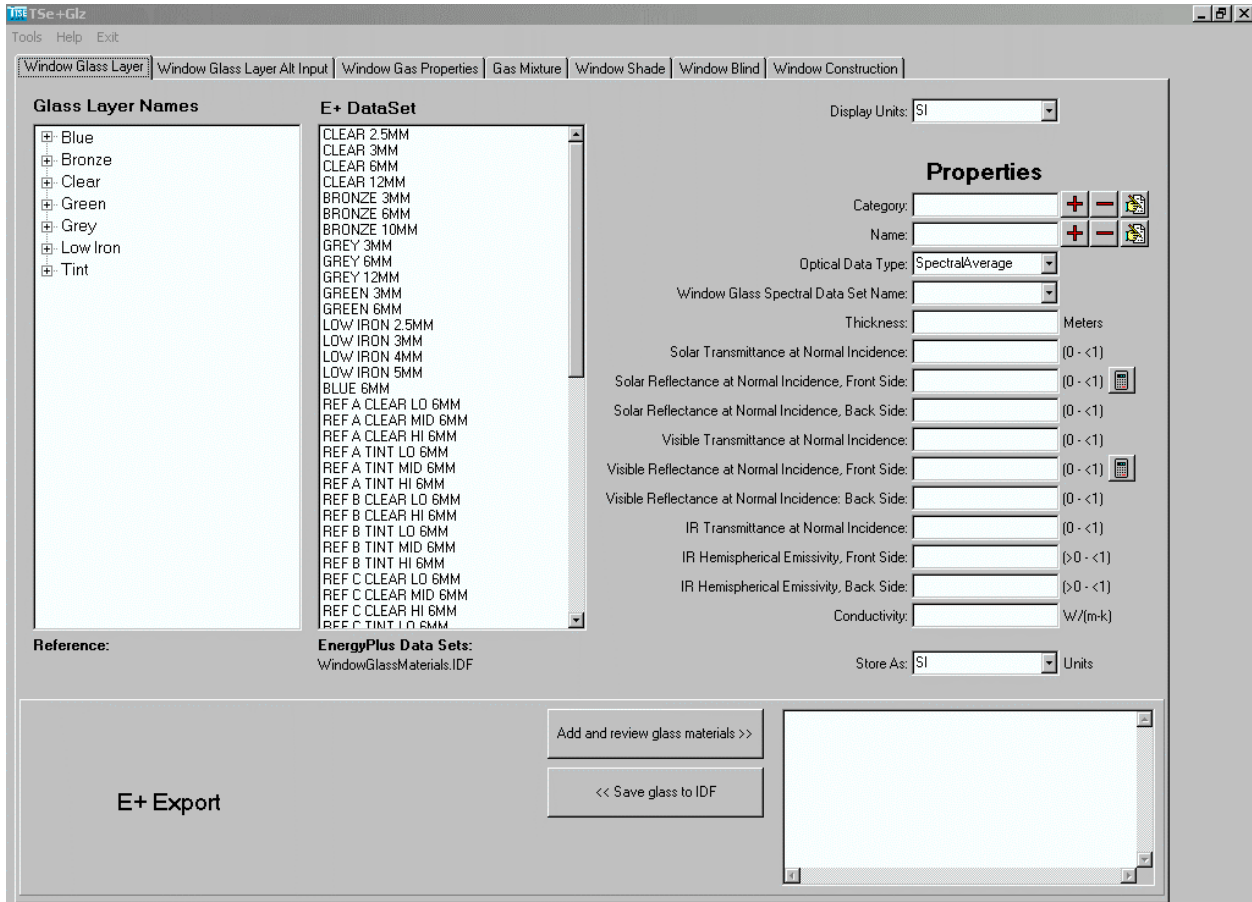


Figure 1. TSe+Glazing Library

1.2. The user manual

1.2.1 Scope

This user manual aims to provide the basic navigation instructions to the use of the TSe+Glz library. It assumes that the user is fairly comfortable and aware of the text input format for EnergyPlus. For help on input details refer to EnergyPlus documentation file *inputoutputreference.pdf*.

1.3. Installation

1.3.1 Download

The tool can be downloaded free of cost from the following website:

<http://www.tse-inc.net/tseplus>

1.3.2 System requirements

TSe+ suite of tools are all for the PC platform and require few system resources to operate.

- PC platform
- Windows OS (98, NT, 2000, XP)
- 5 mb of free hard disk space

Also, it would be preferable to have an installed version of EnergyPlus to make full use of the tools and the dataset libraries provided with E+.

1.3.3 Installation

Simply extract the downloaded TSe+Glz.zip (use freeware Winzip to extract) file into a folder on your hard disk. Then launch the tool by clicking on the TSe+Glz.exe file.

Note:

Please send all comments and feedback to tseplus@tse-inc.net

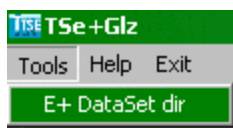
Disclaimer: TSe+ modules are provided free of cost and their use is totally voluntary. TSE will not be responsible for any loss or damages of any kind incurred due to the use of these tools.

2. Navigating the TSe+Glazing Library

2.1. E+ DataSets

The *E+ DataSets* panel contains a listing of dataset files included in the EnergyPlus program. The TSe+program reads the Glazing Materials, Shading, and Window Construction dataset files and allows the user to copy the information into the program database.

2.1.1 Setting up E+ Dataset



Use <Tools> then <E+ DataSet Dir> to set the directory where EnergyPlus is installed on your computer and point to the DataSet sub directory.

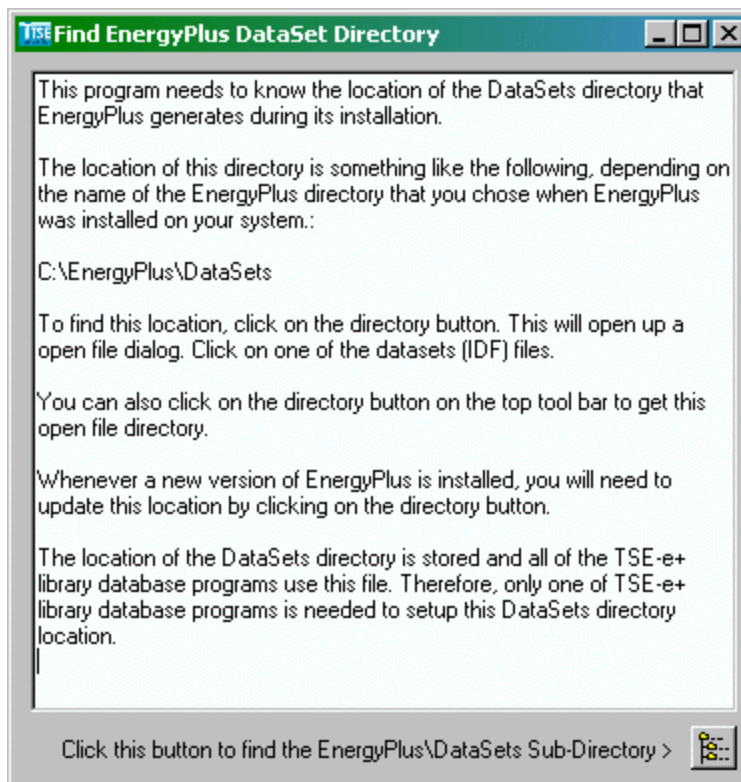


Figure 2. EnergyPlus Data Set Directory.

Note:

You can as an alternative, edit the file Dataset.txt in the TSe+Glz folder for the correct location path of the EnergyPlus Dataset directory, the default location is set as C:\EnergyPlus\Datasets\. Save the file and restart the application for the change to take effect.

Located directly below the tool bar is a seven-tab configuration window. This window provides the seven basic configuration properties available in the TSe+Glazing Library. To navigate through these windows, simply click on the labeled tab. They are:

1. Window Glass Layer
2. Window Glass Layer Alt Input
3. Window Gas Properties
4. Gas Mixture
5. Window Shade
6. Window Blind
7. Window ConstructionCalculation tool

Located on the right-side of the *Properties* panel, is a calculation command button to assist in the manual calculation of a specified field:



Calculation

If you click on the calculation command button, the following window appears (Figure 3).

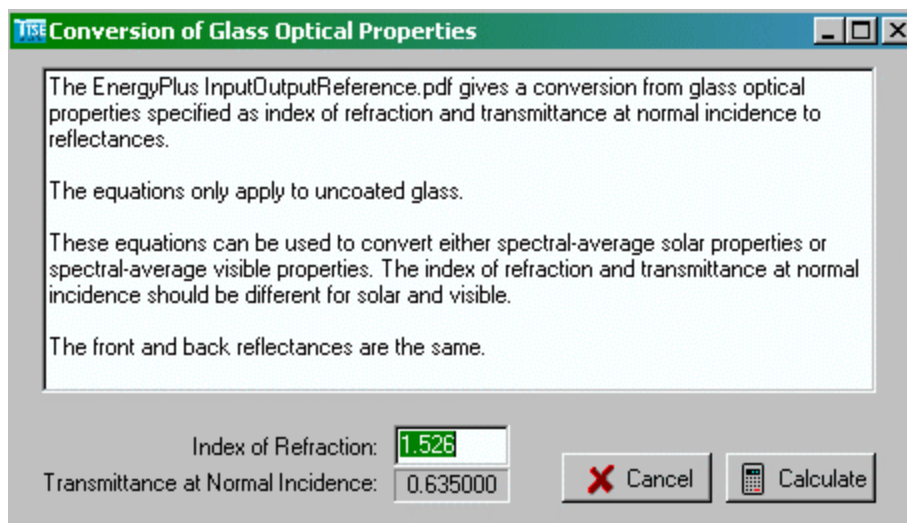


Figure 3. Conversion of Glass Optical Properties - Calculation Window

2.2. Category Fields

Within each tab window, a set of command buttons displays to control the **Category** and **Name** assignments within the *Properties* panel. They are:



Add



Delete




Edit.


Note:

The categories in TSe+ are created solely for the purpose of user saved materials. They have no implication on the EnergyPlus input data.


To add a category

1. In the *<tab window>*, click on the first item listed in the tree panel on the left -side of the window. This will enable the **Category** field in the *Properties* panel.
2. In the **Category** field, type a short label for the type of *<material>* you are creating.
3. Next to the **Category** field, click the  **Add a Category** command button to add the category to the listing in the tree panel.

To edit a category

1. In the *<tab window>*, click on the category in the tree panel that you wish to modify.
2. In the **Category** field, make the desired modification.
3. Next to the **Category** field, click the  **Edit a Category Name** command button to display the modification in the in the tree panel.

To delete a category

1. In the *<tab window>*, click on the category in the tree panel that you wish to delete.
2. Next to the **Category** field, click the  **Delete a Category** command button to delete the category from the tree panel.

Note:

The following Error Message displays if you have one or more glass layer materials assigned to the category you are deleting.

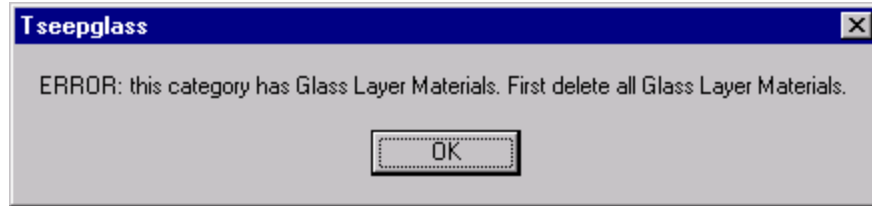


Figure 4. Error Message for Deleting a Category w/Materials Assigned

2.3. Display Units

The **Display Units** field allows you to view specific data fields within the *Properties* panel in either English or SI Units.

2.4. Store As

The **Store As** field allows you to store information in the TSe+ database in English or SI Units.

3. Building the TSe+Glazing Library

3.1. Window Glass Layer

The **Window Glass Layer** tab allows you to define a window glazing property and assign it to the TSe+Glazing Materials/Construction/Shading Library. You are able to define the window glazing parameters by selecting a pre-defined EnergyPlus dataset from the *E+ DataSet* panel or manually entering the information into the fields in the *Properties* panel.

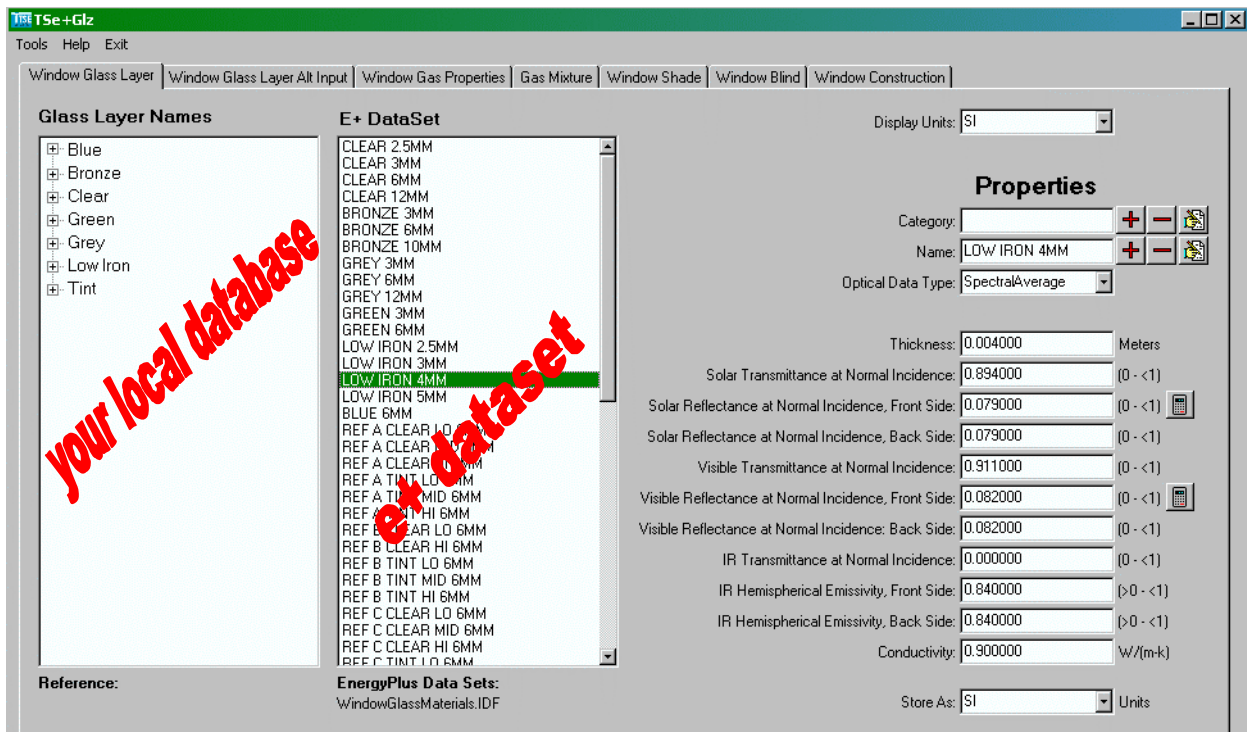


Figure 5. Window Glass Layer Tab

3.1.1 Glass Layer Names

On the left-side of the *Glass Layer Names* window, a tree displays a listing of each glass layer category you have created such as Bronze, Clear, etc.

Note:

To add, delete, or edit the contents of the *Glass Layer Names* panel, you must select a glass layer name from the glass layers tree to enable the *Properties* panel functionality.

3.1.2 Properties

For an indepth description of the Properties fields, reference the EnergyPlus InputOutputReference.pdf/Group – Surface Construction Elements/Material:WindowGlass directory.

Optical Data Type

The **Optical Data Type** selection determines which fields are displayed in the *Properties* panel.

- **SpectralAverage** – Data is defined with Solar, Visible, and IR Transmittance and Reflectance.
- **Spectral** – Data is defined with IR Transmittance and Hemispherical Emmissivity.

Note:

There are rules to follow when building your window glass layers:


1. **A maximum of four (4) glass layers and one (1) shading layer is permitted. If there is a shading layer, it must be the first or last layer.**
2. **A gas layer must always separate adjacent glass layers in a multi-pane glazing.**
3. **Putting two (2) gas layers adjacent to each other is not permitted because the resistance of a gas layer is dependent upon the thickness of the gap.**

To add a window glass layer material


1. In the *Glass Layer Names* panel, click on the **<category>** for which you are defining a window glass layer.
2. In the *E+ DataSets* panel, select the preferred dataset or manually enter data into the fields in the *Properties* panel.
3. In the *Properties* panel, do the following:
 - In the **Name** field, enter a unique short definitive label for the material.
 - In the **Optical Data Type** field, select the data type for the window glass material you are defining from the drop-down window.

Note:

The fields that are displayed are dependent upon your Optical Data Type selection: SpectralAverage or Spectral. (See the *Properties/Optical Data Type* section above).

4. Next to the **Name** field, click the  **Add a Window Glass Material to the database** command button to display the glass material name in the *Glass Layer Names* panel.

To edit a window glass layer material

1. In the *Glass Layer Names* panel, click on the **<glass layer material>** you wish to modify.
2. In the *Properties* panel, make the desired modifications.
3. Next to the **Name** field, click the  **Edit a Window Glass Layer Material in the database** command button when you are finished.

To delete a window glass layer material

1. In the *Glass Layer Names* panel, click on the **<glass layer material>** you wish to delete.
2. Next to the **Name** field, click the  **Delete a Window Glass Layer Material from the database** command button when you are finished.

3.2. Window Glass Layer Alt Input

The **Window Glass Layer Alt Input** tab is basically the same as the **Window Glass Layer** tab. It simply gives you an alternative way of defining, or manually entering, a glazing material property into the TSe+database.

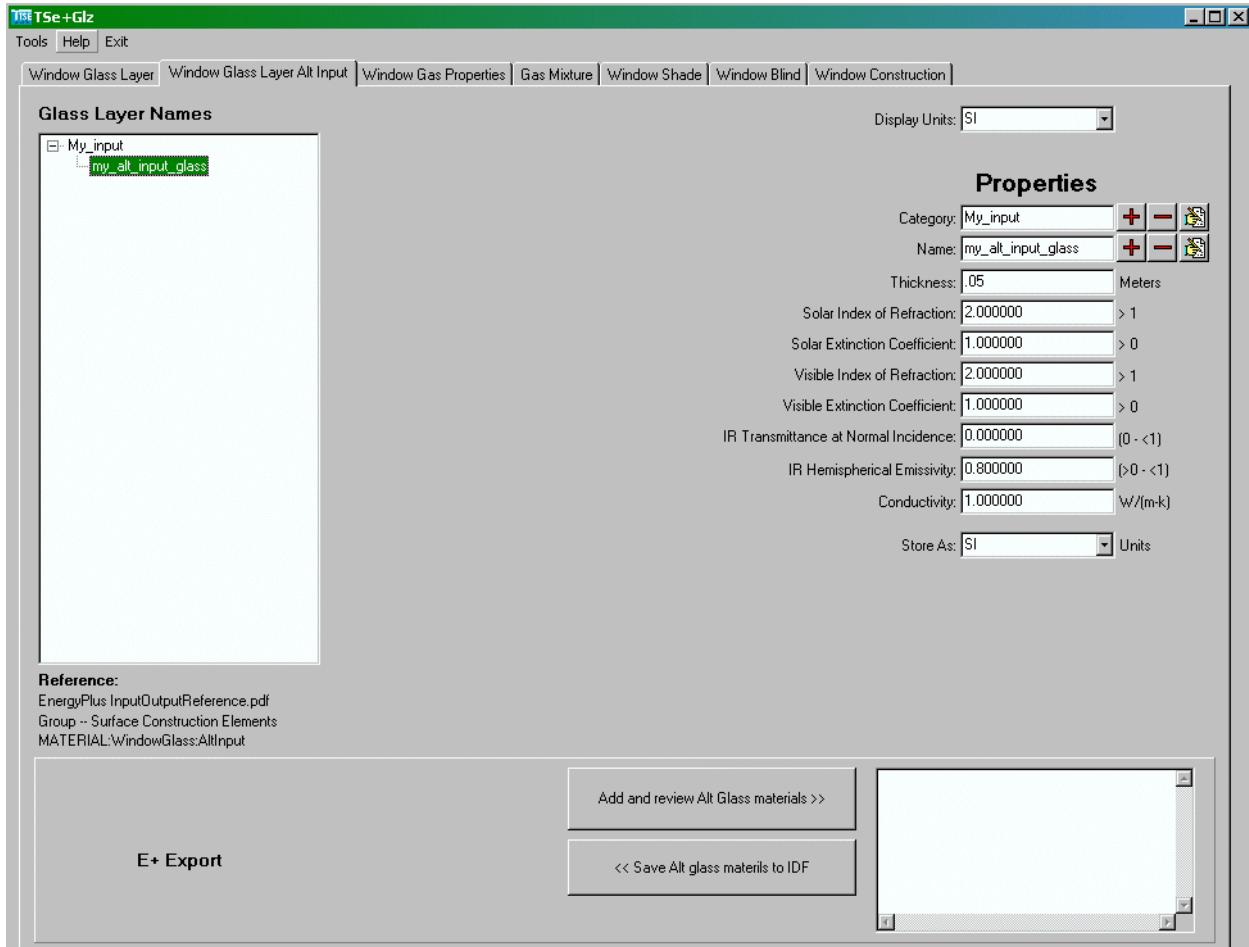


Figure 6. Window Glass Layer Alt Input Tab

3.2.1 Glass Layer Names

On the left-side of the *Glass Layer Names* window, a tree displays a listing of each glass layer category you have created such as Bronze, Clear, etc.

3.2.2 Properties


For an indepth description of the Properties fields, reference EnergyPlus InputOutputReference.pdf/Group – Surface Construction Elements/ Material:WindowGlass:AltInput.

To add a window glass layer material


1. In the *Glass Layer Names* panel, click on the **<category>** for which you are defining a window glass layer.
5. In the *Properties* panel, do the following:
 - In the **Name** field, enter a unique short definitive label for the window glass layer material.

Note:


Do not click the  **Add a Window Glass Layer Material to the database** command button until you have entered all of the data into the fields in the *Properties* panel.

- Manually enter data into the fields. **(See Properties section above.)**
2. Next to the **Name** field, click the  **Add a Window Glass Layer Material to the database** command button when you are finished.

To edit a window glass layer material

1. In the *Glass Layer Names* panel, click on the **<window glass layer material>** you wish to modify.
2. In the *Properties* panel, make the desired modifications.
3. Next to the **Name** field, click the  **Edit a Window Glass Layer Material in the database** command button when you are finished.

To delete a window glass layer material

1. In the *Glass Layer Names* panel, click on the **<window glass layer material>** you wish to delete.
2. Next to the **Name** field, click the  **Delete a Window Glass Layer Material from the database** command button when you are finished.

3.3. Window Gas Properties

The **Window Gas Properties** tab allows you to define window gas properties based on the thickness between window glazing layers.

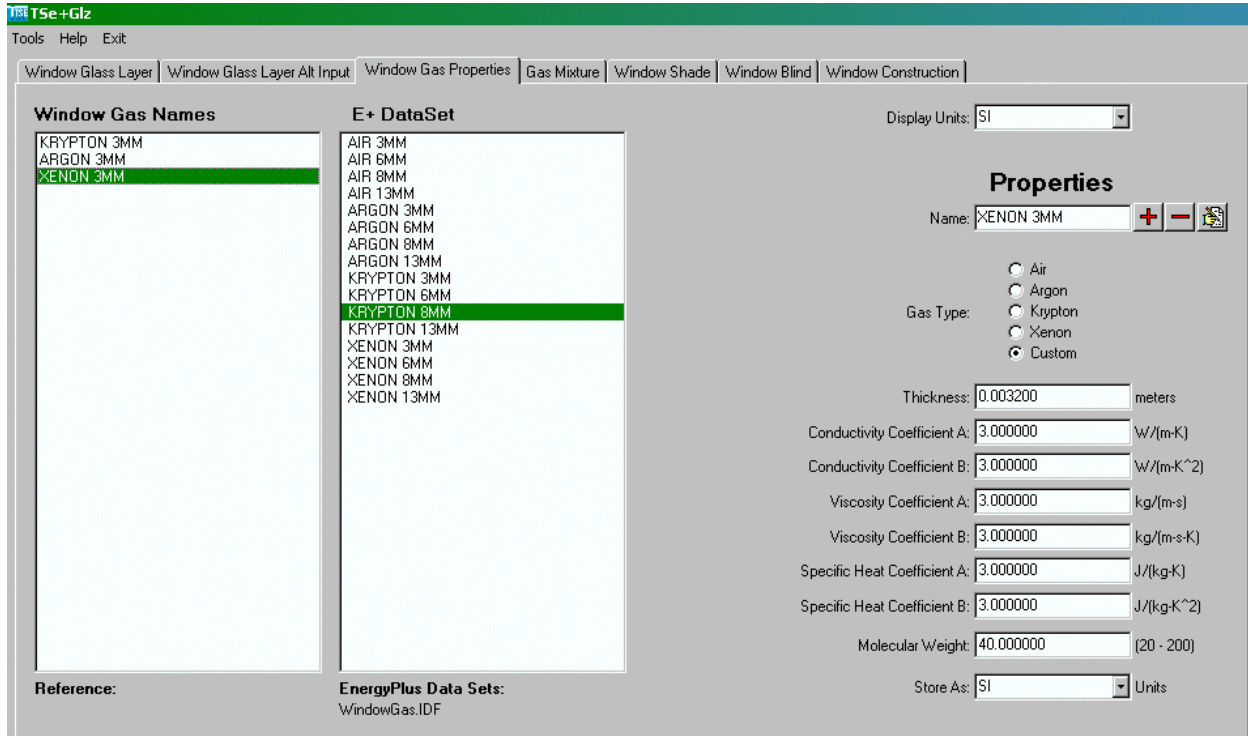


Figure 7. Window Gas Properties Tab

3.3.1 Window Gas Names

On the left-side of the *Window Gas Names* window, a listing displays of each type of window gas name you have created.

3.3.2 Properties


For an indepth description of the Properties fields, reference *EnergyPlus InputOutputReference.pdf/Group – Surface Construction Elements/ Material:WindowGas*.

Gas Type


The **Gas Type** selection determines which fields are displayed in the *Properties* panel:

- **Air, Argon, Krypton, and Xenon** – Data is defined by Thickness.
- **Custom** – Data is defined by Conductivity, Viscosity, Specific Heat, and Molecular Weight.

To add a window gas material

1. In the *Window Gas Names* panel, click anywhere to enable the **Name** field in the *Properties* panel.
2. In the *E+ DataSets* panel, select the preferred window gas dataset or manually enter data into the fields in the *Properties* panel.
3. Next to the **Name** field, click the  **Add a Window Gas Material to the database** command button when you are finished.

To edit a window gas material

1. In the *Window Gas Names* panel, click on the **<window gas material>** you wish to modify.
2. In the *E+ DataSets* panel, select the preferred dataset or manually enter data into the fields in the *Properties* panel.
3. Next to the **Name** field, click the  **Edit a Window Gas Material in the database** command button when you are finished.

To delete a window gas material

1. In the *Window Gas Names* panel, click on the **<window gas material>** you wish to delete.
2. Next to the **Name** field, click the  **Delete a Window Gas Material from the database** command button when you are finished.

3.4. Gas Mixture

The *Gas Mixture* tab allows you to create customized gas mixtures for use between window glazing layers. This is where you define which gases you wish to use and the percentage of each gas within a window gas mixture. **(See Properties section.)**

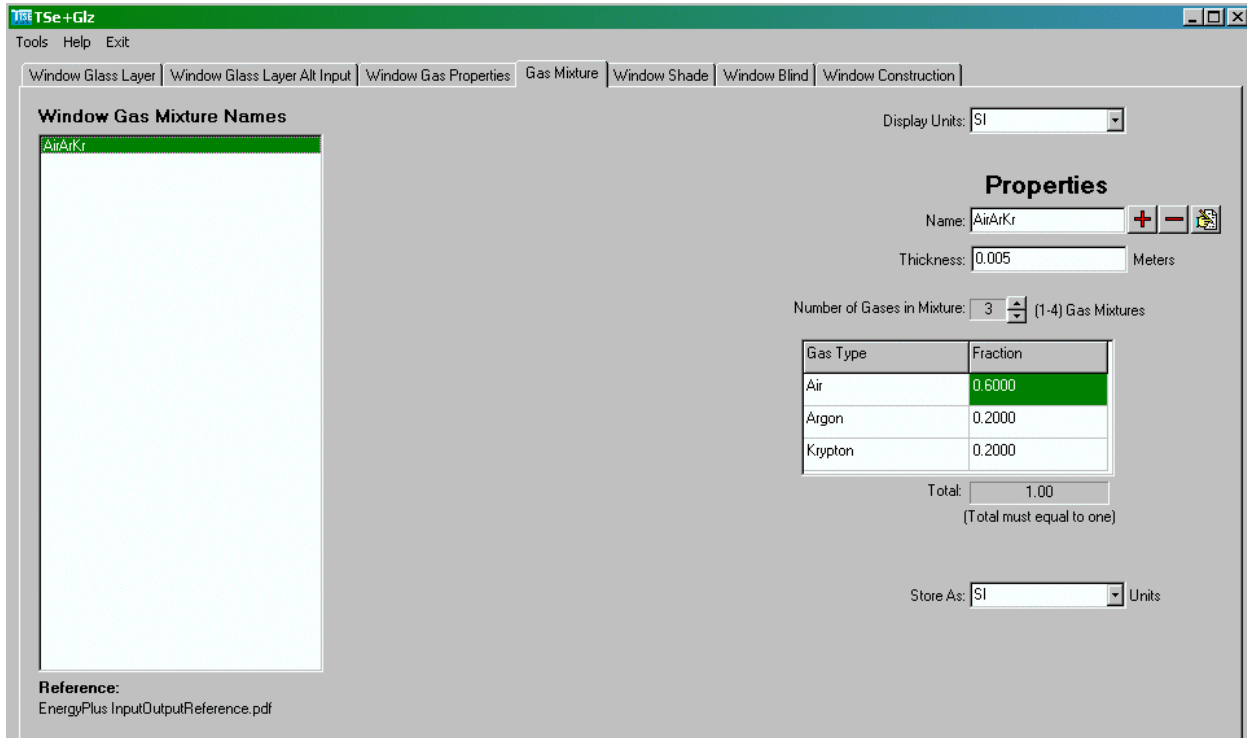


Figure 8. Gas Mixture Tab

3.4.1 Window Gas Mixture Names

On the left-side of the *Window Gas Mixture Names* panel, a listing displays of each type of window gas mixture you have created.

3.4.2 Properties

For an indepth description of the Properties fields, reference **EnergyPlus InputOutputReference.pdf/Group – Surface Construction Elements/ Material:Window GasMixture.**

Note

When defining your gas mixtures, you are only permitted to use a maximum of four (4) gases per mixture. When entering the percentage of each gas used, the total of the number of gases, rather you have used two (2) or three (3) gases, should equal one (1). (See Figure 1 Example of Gas Mixture and Percentage Allocation.)

Gas Type	Fraction
Air	0.7000
Argon	0.1000
Krypton	0.2000
Total: 1.00	
(Total must equal to one)	


Figure 9. Example of Gas Mixture and Percentage Allocation

To add a window gas mixture


1. In the *Window Gas Mixture Names* panel, click anywhere to enable the **Name** field in the *Properties* panel.
2. In the *Properties* panel, do the following:
 - In the **Name** field, enter a unique short definitive label for the gas mixture.

Note:


Do not click the  **Add a Window Gas Mixture to the database** command button until you have entered all of the data into the fields in the *Properties* panel.

- Manually enter data into the fields. (See *Properties* section above.)
3. Next to the **Name** field, click the  **Add a Window Gas Mixture to the database** command button when you are finished.

To edit a window gas mixture

1. In the *Window Gas Mixture Names* panel, click on the **<gas mixture>** you wish to modify.
2. In the *Properties* panel, make the desired modifications.
3. Next to the **Name** field, click the  **Edit a Window Gas Mixture in the database** command button when you are finished.

To delete a window gas mixture

1. In the *Window Gas Mixture Names* panel, click on the **<gas mixture>** you wish to delete.
2. Next to the **Name** field, click the  **Delete a Window Gas Mixture from the database** command button when you are finished.

3.5. Window Shade

The *Window Shade* tab allows you to define a shading surface based on what type of shading you are using, i.e. drapes, blinds, etc.

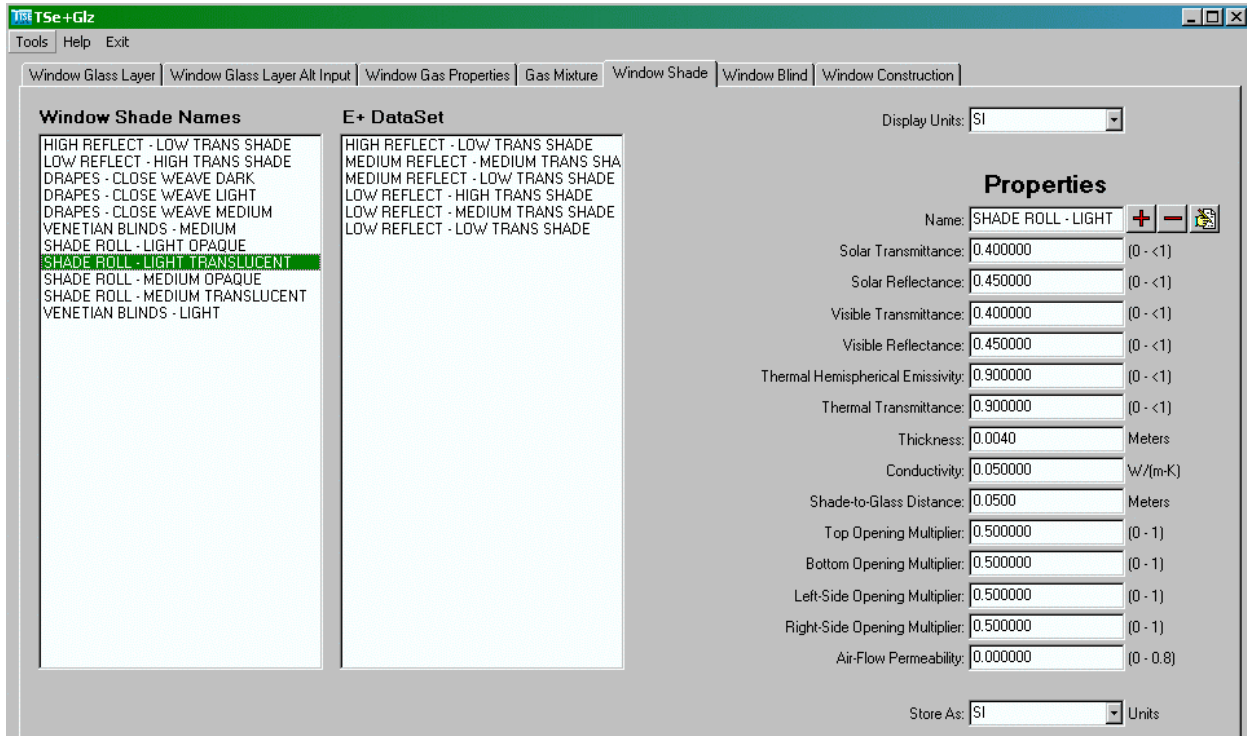


Figure 10. Window Shade Tab


3.5.1 Window Shade Names

On the left-side of the *Window Shade Names* panel, a listing displays each type of shading you have created.


3.5.2 Properties

For an indepth description of the Properties fields, reference EnergyPlus InputOutputReference.pdf/Group – Surface Construction Elements/ Material:WindowShade.

To add a window shade

1. In the *Window Shade Names* panel, click anywhere to enable the **Name** field in the **Properties** panel.
2. In the *E+ DataSets* panel, select the preferred window shade dataset or manually enter data into the fields in the *Properties* panel.
3. Next to the **Name** field, click the  **Add a Window Shade to the database** command button when you are finished.

To edit a window shade

1. In the *Window Shade Names* panel, click on the **<window shade>** you wish to modify.
2. In the *E+ DataSets* panel, select the preferred dataset or manually enter data into the fields in the *Properties* panel.
3. Next to the **Name** field, click the  **Edit a Window Shade in the database** command button when you are finished.

To delete a window shade

1. In the *Window Shade Names* panel, click on the **<window shade>** you wish to delete.
2. Next to the **Name** field, click the  **Delete a Window Shade from the database** command button when you are finished.

3.6. Window Blind

The *Window Blind* tab allows you to define a customized window blind deployment. This is where you define how much or how little light, heat, cold, etc. enters into a specified space. The properties are based on blinds with equally spaced slats.

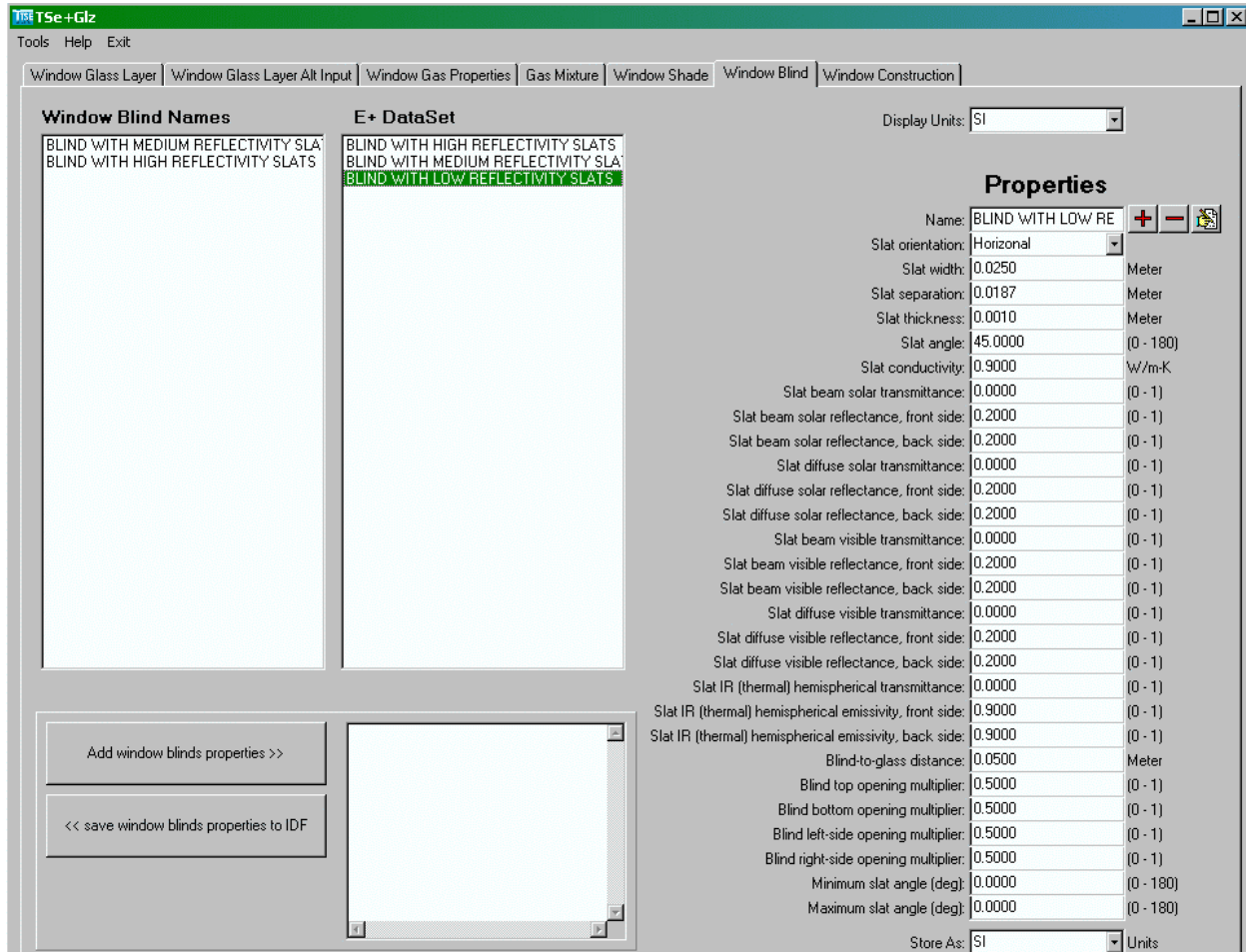


Figure 11. Window Blind Tab


3.6.1 Window Blind Names

On the left-side of the *Window Blind Names* panel, a listing displays each type of window blind deployment you have created.


3.6.2 Properties

For an indepth description of the Properties fields, reference EnergyPlus InputOutputReference.pdf/Group – Surface Construction Elements/ Material:WindowBlind.

To add a window blind

1. In the *Window Blind Names* panel, click anywhere to enable the **Name** field in the *Properties* panel.
2. In the *E+ DataSets* panel, select the preferred window blind dataset or manually enter data into the fields in the *Properties* panel.
3. Next to the **Name** field, click the  **Add a Window Blind to the database command** button when you are finished.

To edit a window blind

1. In the *Window Blind Names* panel, click on the **<window blind>** you wish to modify.
2. In the *E+ DataSets* panel, select the preferred dataset or manually enter data into the fields in the *Properties* panel.
3. Next to the **Name** field, click the  **Edit a Window Blind in the database** command button when you are finished.

To delete a window blind

1. In the *Window Blind Names* panel, click on the **<window blind>** you wish to delete.
2. Next to the **Name** field, click the  **Delete a Window Blind from the database** command button when you are finished.

3.7. Window Construction

The *Window Construction* tab allows you to create customized window construction assemblies.

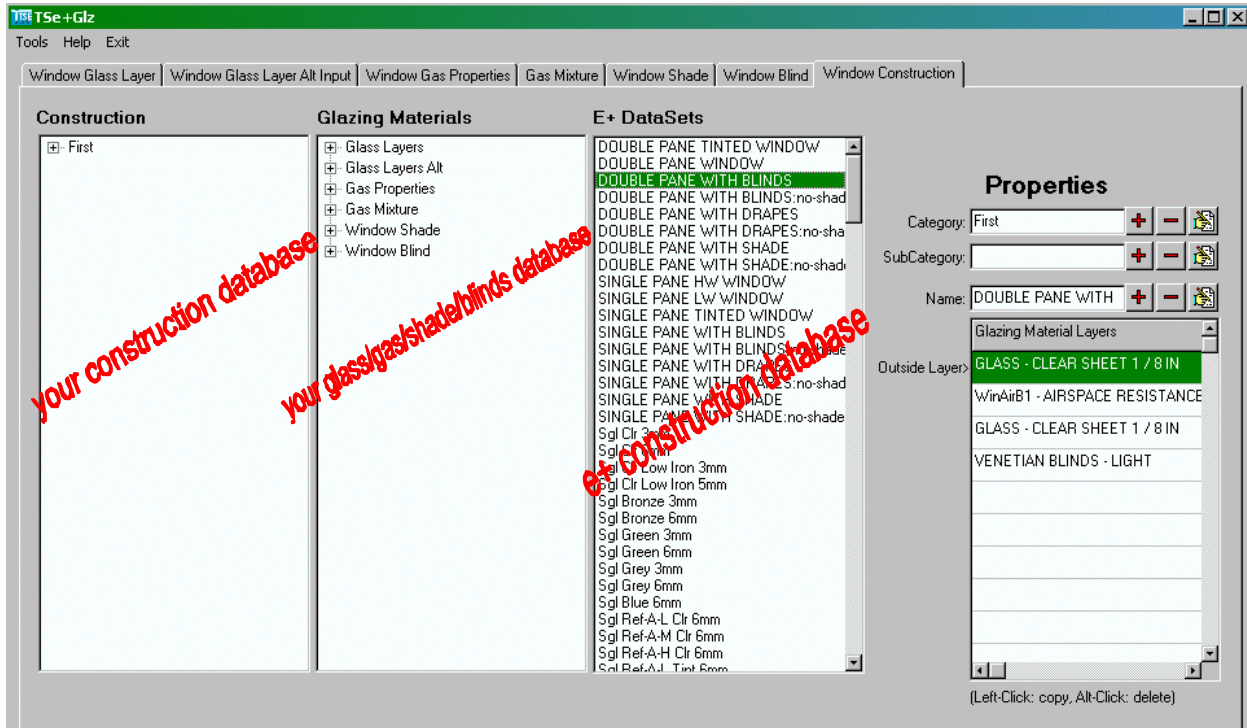


Figure 12. Window Construction Tab

3.7.1 Construction

On the left-side of the *Construction* panel, a construction type tree displays a listing of each type of window construction category and subcategory you have created.



3.7.2 Glazing Materials

In the center of the *Window Construction* panel, a glazing materials tree displays a listing of each type of glazing material you have created.

3.7.3 Properties

For an indepth description of the Properties fields, reference *EnergyPlus InputOutputReference.pdf/Group – Surface Construction Elements/ Construction*.

To add a window construction

1. In the *Properties* panel, do the following:
 - In the **Category** field, type a short label for the type of **<window construction>** you are creating.
 - Next to the **Category** field, click the  **Add a Category** command button to add the category to the listing in the tree panel.
 - In the **SubCategory** field, enter a short definitive label for the subcategory you are creating.
 - Next to the **SubCategory** field, click the  **Add a SubCategory** command button.
2. In the *Construction* panel, click on the **<subcategory>** to which you are assigning the window construction.
3. In the *E+ DataSets* panel, select the preferred window construction dataset or continue to Step 4.
4. In the *Glazing Material Layers* panel, select all of the materials required for the window construction you are defining. The maximum number of layers permitted is 10.

Note:

To select materials for a window construction, simply click on the preferred material in the *Glazing Materials* panel and click on the appropriate layer field inside of the *Glazing Material Layers* panel. Remember to select the materials from the outside layer to the inside layer. This procedure copies the selected material and places it in the appropriate layer field. (See *Figure 13 below.*)

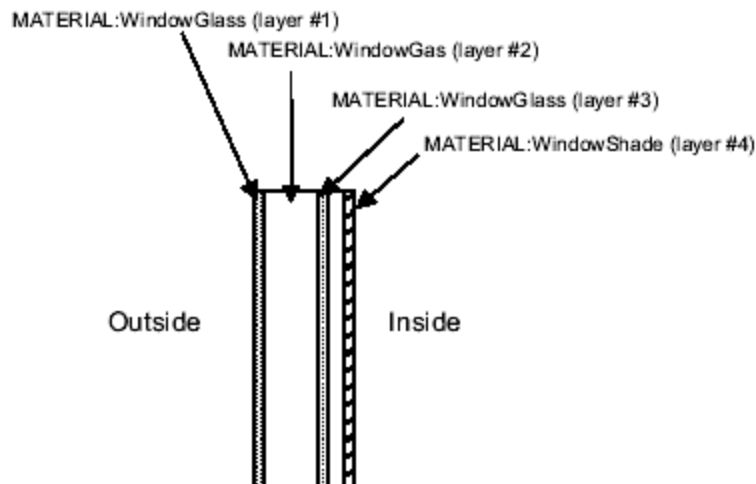





Figure 13. Window Construction - Outside to Inside Layer Example

5. In the *Properties* panel, in the **Name** field, enter a short definitive label for the window construction you are creating.
6. Next to the **Name** field, click the  **Add a Window Construction to the database** command button when you are finished.

To edit a window construction

1. In the *Construction* panel, click on the **<window construction>** you wish to modify.
2. In the *E+ DataSets* panel, select the preferred dataset or manually enter data into the fields in the *Properties* panel. **(See Step 5, To add a window construction section above)**
3. Next to the **Name** field, click the  **Edit a Window Construction in the database** command button when you are finished.

To delete a window construction

1. In the *Construction* panel, click on the **<window construction>** you wish to delete.
2. Next to the **Name** field, click the  **Delete a Window Construction from the database** command button when you are finished.

4. Exporting window glass/gas/shade/construction data to IDF

4.1. Overview

This section gives the details of the export sequence of materials data selected by user to the requisite IDF format for EnergyPlus input.

4.2. Export

At the bottom of the window is a frame, which provides the functionality to view and export the user selected materials information into the IDF format.

Select a material from the E+ or the user created/saved Materials database panes so as the properties are visible in the various fields, then click the *<Add and View Materials>* button to display the material properties in the text box alongside. Click and add as many materials as required to populate the text box. When finished, click the *<save materials to IDF>* button to save the materials to a file **glass.idf** found in the TSe+Glz folder. This file can then used as a base or to copy paste the materials input for EnergyPlus.

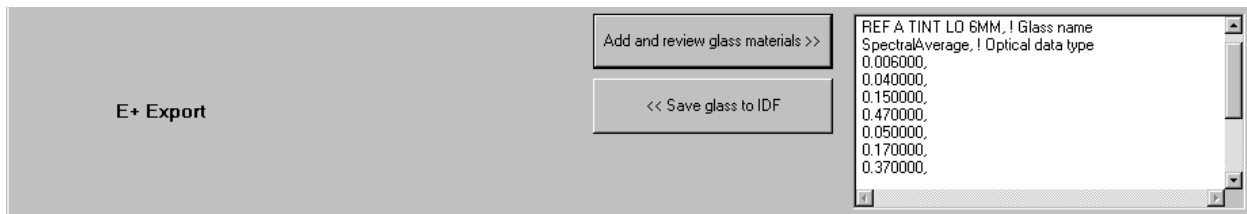


Figure 14. Exporting to E+ section

This procedure can be repeated for all the tabs. The properties selected will be appended to the glass material properties selected and exported in the previous tab to the **glass.idf** file. Be sure to first select and add the main glass/gas/shade properties before adding on the construction. Use the **glass.idf** file to cut and paste the relevant portions into the main input file.