Modeling Parameters for Low-E Storm Windows

Many states and weatherization programs use the Weatherization Assistant software program, which includes NEAT (National Energy Audit Tool), to determine the energy savings and cost effectiveness of different home weatherization measures.

Under direction from the Department of Energy, experts from Oakridge National Lab and Lawrence Berkeley National Lab worked to add the ability to model low-e storm windows in NEAT energy audits. This is included in version 8.5 and later of the Weatherization Assistant program.

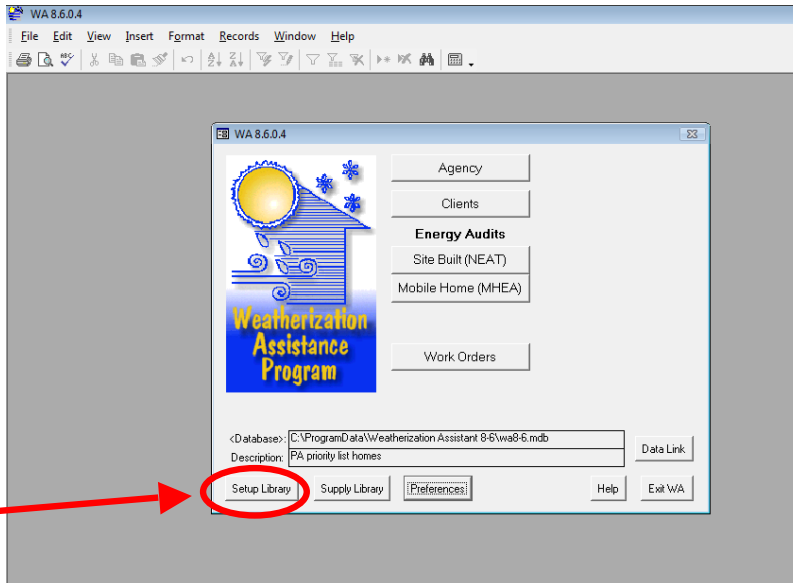
Detailed instructions on how to include low-e storm windows in a NEAT energy audit are provided below in **Part A**.

However, other states and weatherization programs do not use NEAT and may have their own custom software. Likewise, some may wish to use other building simulation tools (RESFEN, Energy Plus, etc) to model the energy savings from using low-e storm windows. This can be done by inputting typical generic energy performance parameters for the combined assembly of the existing windows with and without low-e storm windows installed. This is described in **Part B**.

PART A – How to include Low-E Storm Windows in a NEAT Energy Audit

1. **Make sure you have version 8.5 or later of the Weatherization Assistant program.**
   The latest version may be downloaded at http://www.waptac.org/sp.asp?mc=techaids_audits

2. **Open the Setup Library on the main page.**



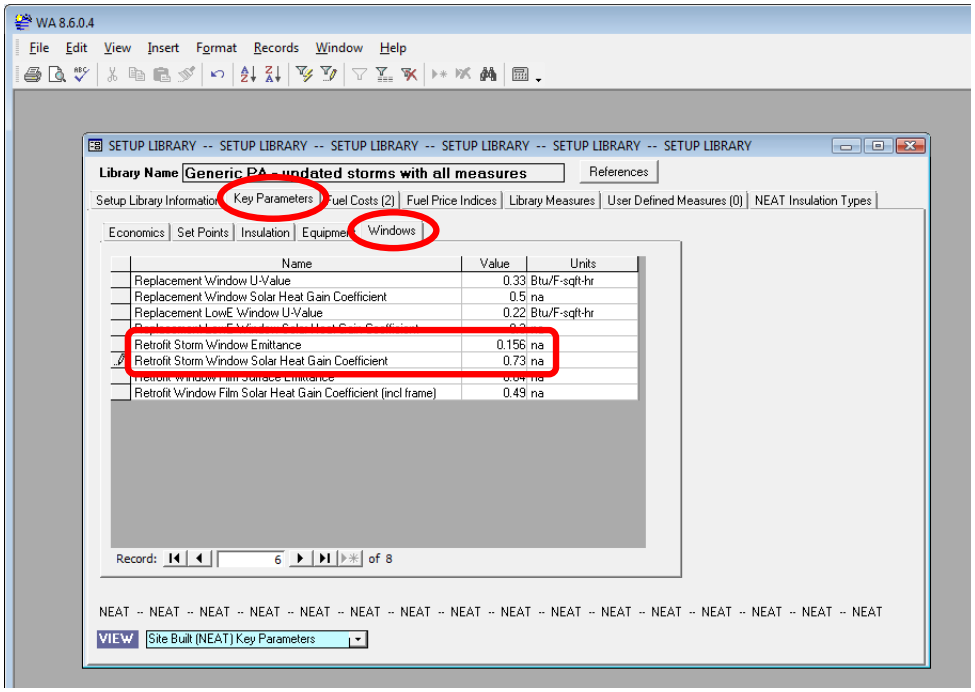
3. **Enter the properties for the Low-E Storm Windows.**

   Click on the **Key Parameters** tab at the top, and then the **Windows** tab.

   Enter the **Retrofit Storm Window Emittance** and **Solar Heat Gain Coefficient**.

   There are several low-e glass products that may be used, and specific values for each product may be entered from the table below. Note: all provide significant energy savings, and any small difference in emittance between low-e products should not be overemphasized.

Low-E Glass Product	Emittance	SHGC
Pilkington Energy Advantage	0.16	0.73
Pilkington Solar E	0.17	0.54
AGC Comfort E-PS	0.15	0.72
AGC Comfort E2	0.20	0.73



4. Enter the lifetime for the Low-E Storm Windows

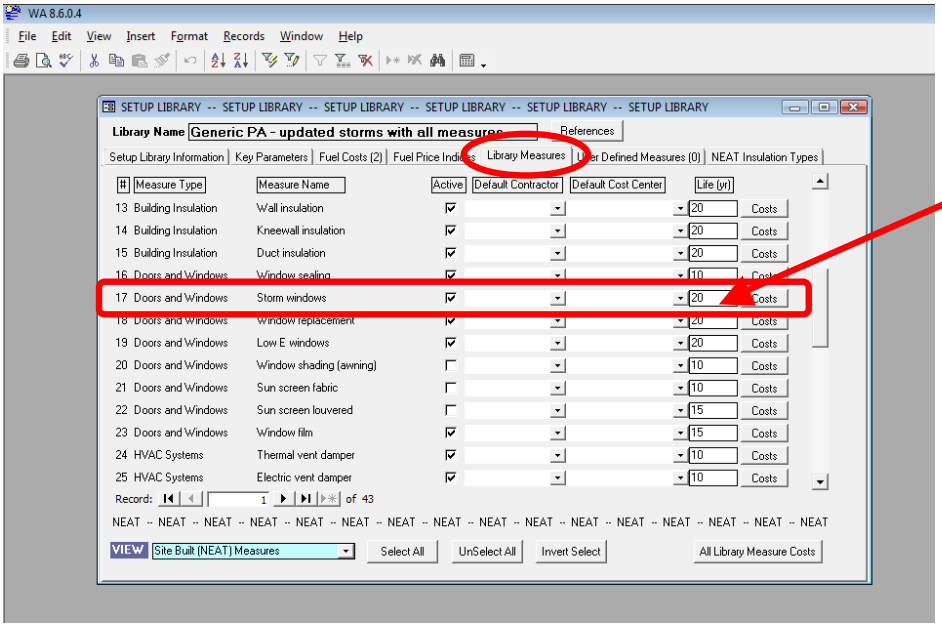
Click on the **Library Measures** tab.

Scroll down to **#17 Doors and Windows – Storm Windows**.

Make sure the **Active** box is checked.

Enter the measure **life** as 20 years.

Note: The expected lifetime of low-e storm windows is as long, if not longer, than modern replacement windows because there is no IG seal to fail, are simpler in design, and are made of durable materials. The low-e glass uses a durable "hard coat" ceramic coating that is actually harder than the glass itself. As such, the actual performance of low-e storm windows should be at least 20 years, if not longer.



5. Enter the costs for the Low-E Storm Windows

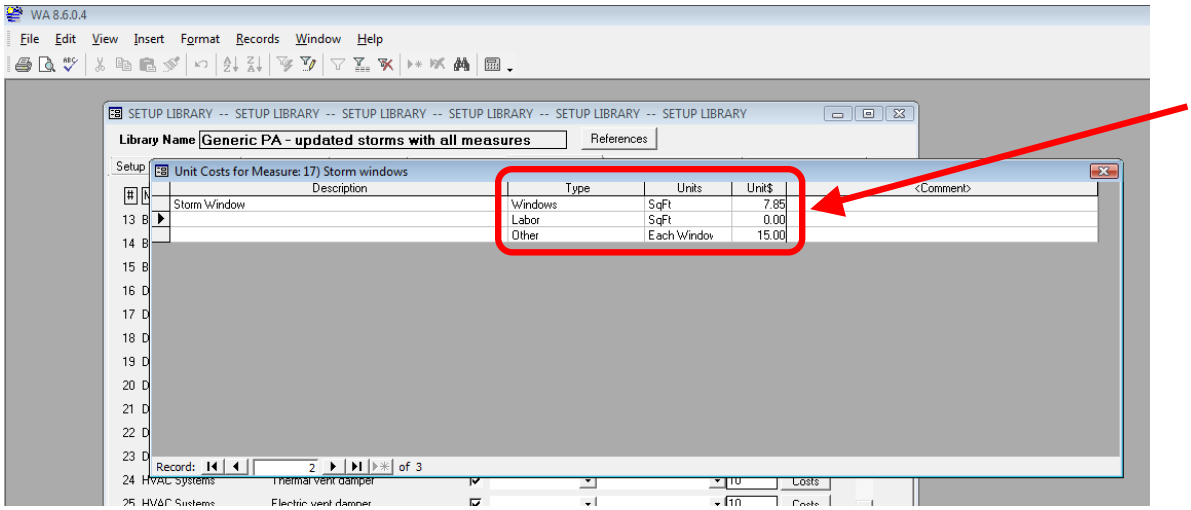
Click on the **Costs** button.

Enter the average cost for the low-e storm windows. This may be entered as either:

a) Enter the *average window cost per square foot* under "Windows"
and the estimated *installation labor cost per window* under "Other"

or

b) Enter the *total average cost per window*, including installation costs, under "Other"



6. Complete the NEAT energy audit as normal from the main screen.

"Storm Windows" will be reported on the selected measures report, but this should not be confused with normal storm windows.
Low-E Storm Windows must be used in accordance with the properties entered in step 3.

PART B
Modeling Parameters for Low-E Storm Windows in other Building Energy Performance Software

Each software tool will be different, but will typically require the U-factor, SHGC (Solar Heat Gain Coefficient), and AL (Air Leakage) to be input for the window properties.[†] These properties are for the entire window assembly, including both the glass and the window frame. The window area and distribution is also included as part of the building model.

To model the energy savings from using low-e storm windows, the software needs to be run twice:

1. once with the U, SHGC, and AL for the existing window alone
2. once with the U, SHGC, and AL for the combined assembly of the low-e storm window installed over the existing window

For new windows, the U, SGHC, and AL would be obtained from the NFRC label and/or manufacturers literature. However, this information is not available for existing windows, and NFRC does not yet have label ratings for low-e storm windows (although they are working on it). Therefore, generic or "typical" values must be used. Representative values are listed below. Actual values can vary significantly, but these representative values will give a good estimate of the relative beneficial impact of low-e storm windows.

Base Window	**Storm Window**	**U-factor** (Btu/hr ft2 F)	**SHGC**	**Air Leakage** (cfm/ft2)
Wood frame, Single glazing	--	0.84	0.63	1.0
	Old leaky, clear storm	0.50	0.56	0.7
	New clear storm	0.50	0.56	0.3
	New low-e storm	0.36	0.48	0.3
Wood frame, Double glazing (clear glass, no low-e)	--	0.50	0.56	1.0
	Old leaky, clear storm	0.33	0.50	0.7
	New clear storm	0.33	0.50	0.3
	New low-e storm	0.27	0.44	0.3
Metal frame, Single glazIng	--	1.16	0.76	1.0
	Old leaky, clear storm	0.65	0.64	0.7
	New clear storm	0.65	0.64	0.3
	New low-e storm	0.53	0.58	0.3
Metal frame, Double glazing (clear glass, no low-e)	--	0.71	0.67	1.0
	Old leaky, clear storm	0.55	0.58	0.7
	New clear storm	0.55	0.58	0.3
	New low-e storm	0.49	0.53	0.3

[†] Visible Transmittance (VT) can also be input, but will not affect the results unless automatic lighting controls are used, such as in a modern commercial office building. This is not a factor for weatherization homes or apartments.