FY17 Wisconsin Weatherization Assistant Guide

The Wisconsin Weatherization Assistance program mission is to reduce energy costs for eligible low-income households by improving the energy efficiency of their homes while ensuring their health and safety.

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Chapter 1 Database Management

1.0 Introduction to the Weatherization Assistant

The Weatherization Assistant modeling software has been developed for use by local and state agencies under the Department of Energy's (DOE) Weatherization Assistance Program. It is intended to assist state and local agencies in the selection of cost effective, energy efficient, weatherization measures that can be installed in homes of eligible participants of the Weatherization Assistance Program. The modeling software is comprised of two separate modeling components plus additional functionality to aid in the coordination of weatherization activities.

The National Energy Audit Tool (NEAT) is designed for single-family site-built homes; it can also be used for multi-family residences. The Manufactured Home Energy Audit (MHEA) is designed for manufactured (or mobile) homes.

1.1 Features of Version 8.9

The features of Version 8.9 in the Weatherization Assistant were incorporated into the program to allow NEAT and MHEA, to be used almost as stand-alone programs. Separate buttons on the Main Menu take a user directly to either NEAT or MHEA.

The Weatherization Assistant incorporates an extensive client status tracking system allowing agencies to track the progress of audits, and recommended measures.

1.2 Weatherization Assistance Help

This manual provides instructions on how to operate the Weatherization Assistant User Guide software per Wisconsin's Weatherization Assistance Program. The majority of this language is located in the help file of the program, which is available in the top menu under *Help* by selecting *Weatherization Assistant Help*, or by pressing F1. Please see table below for additional Weatherization Assistant help information

For help with…	Best source…	Secondary Source
MHEA or **NEAT** audit screens	**F1** (think "Friend One")	**Wx Assistant Manual**
Agency, Client, Work order, Setup, Supply, Data Link screens	**Wx Assistant Manual**	**F1** (think "Friend One")

1.3 Hardware Requirements

Computers, laptops, tablets, and desktop PCs, shall use a version of Microsoft

(MS) Windows® operating system. Productivity software loaded on the computers shall be a version of MS Office® compatible with Division software to allow for transmittals of files in the form of a .wdz

Weatherization Assistant uses your existing Windows printer setup to both display and print results and reports. Thus, even though you may not have a printer physically attached to your computer, you must have an acceptable printer driver loaded and selected as the default in order to display the results. Output produced by the program is stored in the audit database and displayed in rich-text format from within the program.

Version 8.9 of the Weatherization Assistant utilizes Microsoft Access to store the information from running the program. Information for all homes is stored in a single file: the ".mdb" database file. Within this file, information is stored in linked tables, with each table composed of as many "records" as is required to store the information. When data pertaining to a new customer is entered into a WA-8 form, a new record is added to the client table.

1.4 Installation Procedure

Installers must have administrative rights to proceed. The procedure used to install the Weatherization Assistant onto a computer uses the standard Windows process for the platform being used.

1) Close any applications currently open. If installing the program from a CD, place the CD in the CD ROM drive and note the drive letter assigned to the drive on your computer. If installing from a downloaded file, note the location of the file on the computer.

2) Installation is initiated by executing the file “waxxxx.exe,” either from the CD or from the download location, where the “xxxx” represents the version number, (for example “8905”). This may be done in any of the ways Windows installation provides. Once found, double click on the executable file to run it. Or, use Windows Explorer, or the browse window under the Start/Run option. The control panel of Windows versions also has an “Add and Remove Programs” entry from which the file can be executed. Refer to a Windows manual or consult your system administrator.

3) The installation procedure will generate the license agreement. Read the agreement and click the “I Agree” button if you agree with its contents. Otherwise, click on Cancel to abort the installation process. Any time “Cancel” is chosen, you will be asked to confirm this choice.

4) If proceeding, a “Welcome” screen will provide a second opportunity to go to the “Next” screen or “Cancel” the process.

5) The release version number contains four digits (e.g., "8905"). Any installation having a version number whose first three digits differ from a previously installed version is considered a new installation, i.e. a major version change. However, if the first three digits are the same as an existing version on the machine, the installation is considered an “update”. Depending on the new version number, select update or install from the window. An update will not affect the settings or data already entered. It will only affect the operation of the program. A new installation will provide a completely separate

program with a new empty data set and default settings. The new installation, however, will not affect any previous installation. In this instance, following this new installation, there will be two icons for this version of the program on the computer, each linking to the different installations. This form is only informational, but still gives an opportunity to continue with installation by choosing "OK", or exit the process by selecting "Cancel."

6) The next screen in the installation process allows selection of the location on your computer where the program files will be copied, the “Destination Directory.” If this major version has not been installed previously, the default location will be “c:\ProgramFiles\Weatherization Assistant xxx,” where “xxx” stands for the major version number being installed. If this major version was installed previously, the location displayed will be wherever the program was previously installed. This is why the prior form (discussed in step 5 above) instructed the user to “accept the default installation path name” in order to “update.”

7) If this default location is satisfactory, choose “Next.” Otherwise, click on the “Browse” button and select the preferred location from the drives (bottom) and folders (middle) sub-windows presented. The destination field at the top of this window will change according to the selection made. This destination field can also be modified by entering a selection directly. If the selected entry does not correspond to an existing location, confirmation to create the location will be required. If the selected entry corresponds to an existing installation, a choice to confirm the installation will appear.

Click “OK” to accept the location specification or “Cancel” to return to using the default or previously accepted location. When satisfied with the selection as displayed in the box containing the Browse button, click on the “Next” button to continue.

Note that this screen will display the “free disk space” available on the drive selected as well as the expected remaining free disk space after Installation.

1) The next screen summarizes the version being installed, the date of installation, and the choice of the destination directory. If the summary is correct, choose "Next" to continue the installation. Otherwise, choose "Back" to return to the previous screen to modify the selections or "Cancel" to exit the installation process without having installed the program. Anytime a choice to “Cancel” the installation is made, confirmation of the choice will be required.

2) If the selection of destination directory does not exist on the computer, notification of the situation will appear on the screen. Click the OK button to confirm receipt of this notification. The next window will display a bar which meters the progress of installing the necessary files. At the conclusion of this process, the “Installation Completed” notice will appear. Finish the installation with or without viewing the “User Notes.” If viewing the notes, they will appear in a Notepad window.

This installation process will automatically place the Weatherization Assistant icon on the desktop, containing the version number in its name. The installation process will copy a file into the Weatherization Assistant destination directory chosen above. This file contains the default

national data already entered into to the program. The name of the file will reflect the version of the Weatherization Assistant with which it is to be used, (e.g., "wa895.mdb"). Though not necessary, it is recommended that the system administrator make a copy of this file before using the program. A default agency database file is provided on an annual basis by DEHCR for Wisconsin Weatherization Agencies.

1.5 Network Installation

One advantage of using a standard database environment is that standard multi-user features are available. Microsoft Access strategy separates the "front-end" interface (the forms and reports) and the "back-end" database (just data tables). The Weatherization Assistant uses this design strategy to allow it to be operated on networks. The front-end, located in the "wa.mde" file, can be installed on each employee's computer while the back-end, located by default in the "waxxx.mdb" file (where xxx is the version number), can be installed in a shared folder on a network. The front-end can connect (or link) to any back-end file located anywhere on the employee's computer's file system including shared network drives. Below are some installation instructions that might be suitable for your situation:

CASE #1

Multiple users on different computers on a local area network need to share data:

1) Install the Weatherization Assistant using the installation executable file on each of the employee's computers.
2) Install the Weatherization Assistant using the installation executable file on the server computer OR copy the "waxxx.mdb" file from one of the employee's computers to a shared folder on the server. Make sure that shared folder has no read or write security restrictions.
3) Run the Weatherization Assistant on each employee's computer and use the *Data Link* feature on the *Main Menu* to link each employee's computer to the shared "mdb" file on the server.
4) (Optional) Erasing the "mdb" files on each of the employee's computers may avoid any confusion.

CASE #2

Multiple users, some with portable computers used in the field for data collection:

1) Follow all the steps for CASE #1 above.
2) Install the Weatherization Assistant using the installation executable on each portable computer. Do NOT link to the "mdb" file on the server. Each portable then has an independent "mdb" back-end file. Auditors with portable computers should use the Import/Export feature under the *Data Link Main Menu* item to move jobs manually to/from their computer.

Client records created on different computers linked to a shared back-end database file will not conflict. However, if several employee's computers linked to the same back-end database file attempt to access the same client record, conflicts could arise. Microsoft Access handles these conflicts with "record locking." The first person to open a record "wins", and the second person is locked out of editing (the computer just beeps whenever attempts to change a locked field are made) until the first person is finished editing the record. So, when sharing a back-end, there is a very important rule to follow: Always finish edits to unlock the record for other users. Never

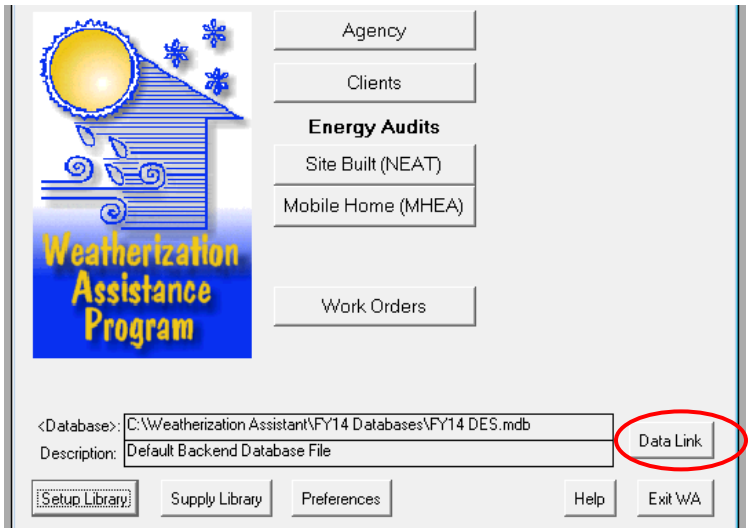
leave edits in process for extended periods since the record (and potentially some adjacent records) will remain locked for other users. To finish edits, just change tabs, or back out of the form being worked on. This writes the record to the back-end database and unlocks the record for other users.

If all users install the Weatherization Assistant software and do NOT link to a shared database, there will be independent back-end database files, each with their own set of client records and its own Agency record on each machine.

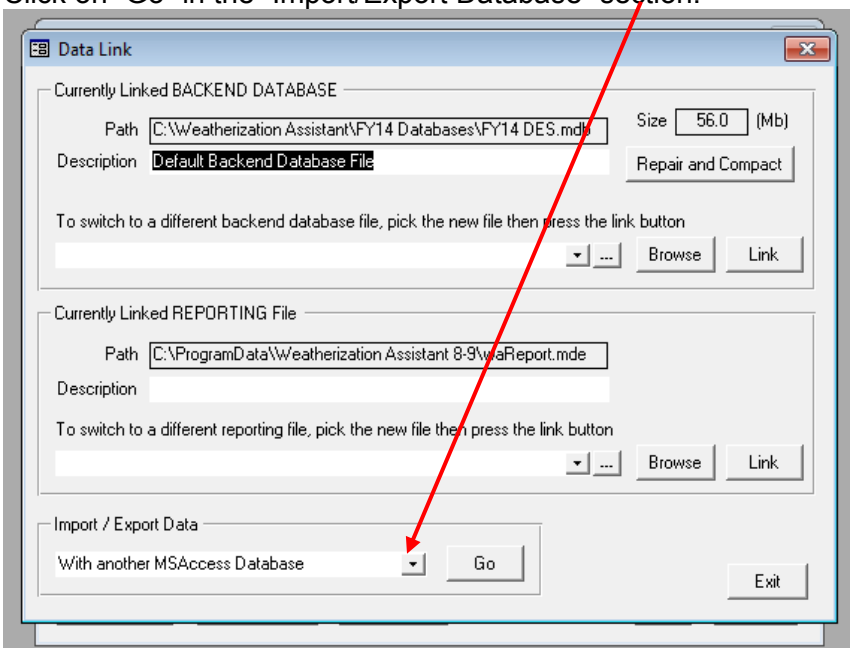
1.5 How to Import Weatherization Assistant 8.9 Client Records

The following directions should be used when importing NEAT or MHEA audits sent from another user of the Weatherization Assistant Software. When an import is completed, a database that includes all information related to the selected client record that is unzipped. This information includes the agency record and all audits assigned to the client as well as the supply and setup libraries used by the audits.

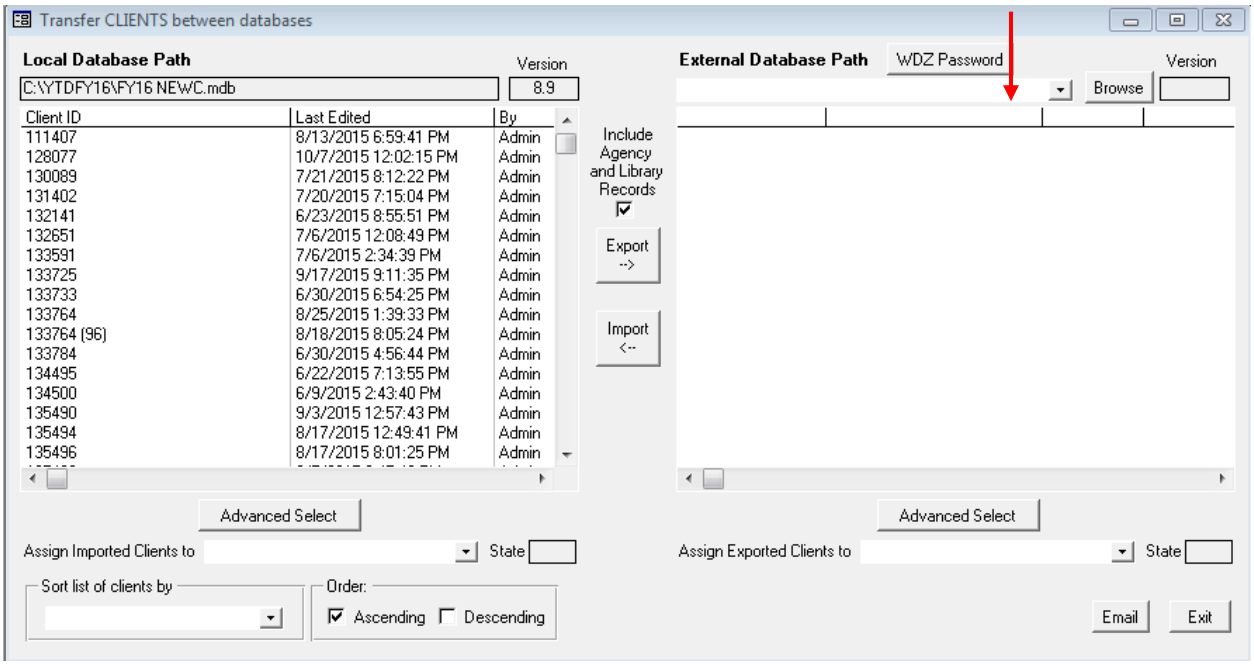
1) Select “Data Link” from the main Weatherization Assistant menu.



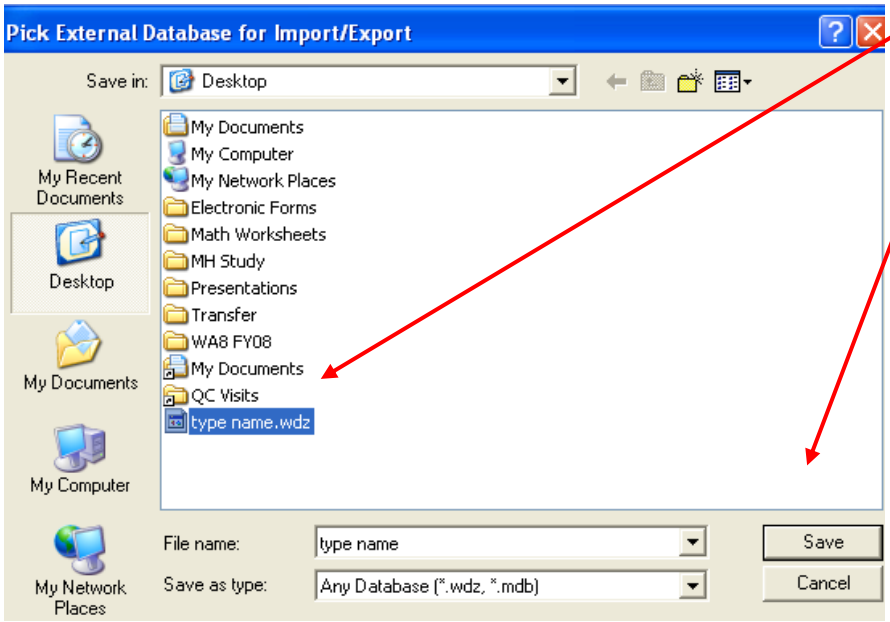
2) Click on “Go” in the “Import/Export Database” section.



3) A window labeled “Transfer CLIENTS between databases” will appear. The first thing to do is to locate the zipped database file to be imported. Click on the “Browse” button to locate the WDZ file that contains the client records to be imported into your database.



4) Select the folder location that contains the WDZ file to be imported. Highlight the file to be imported in the list, double click on it or click “Save.”

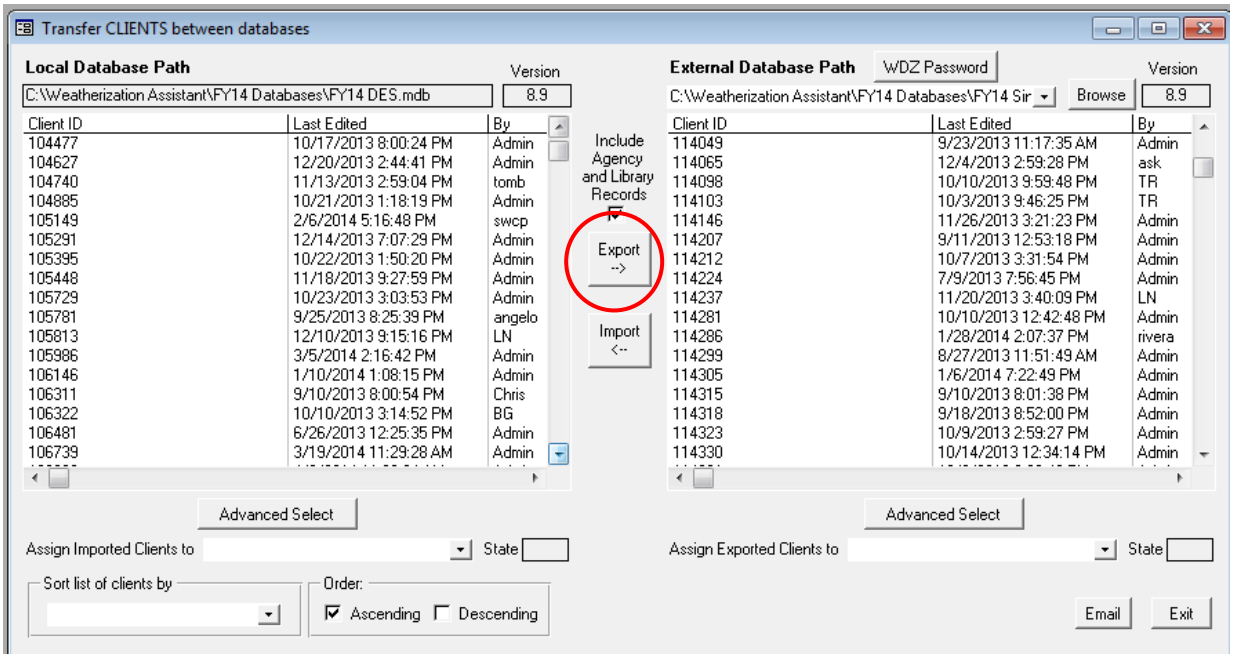


Double click on file name

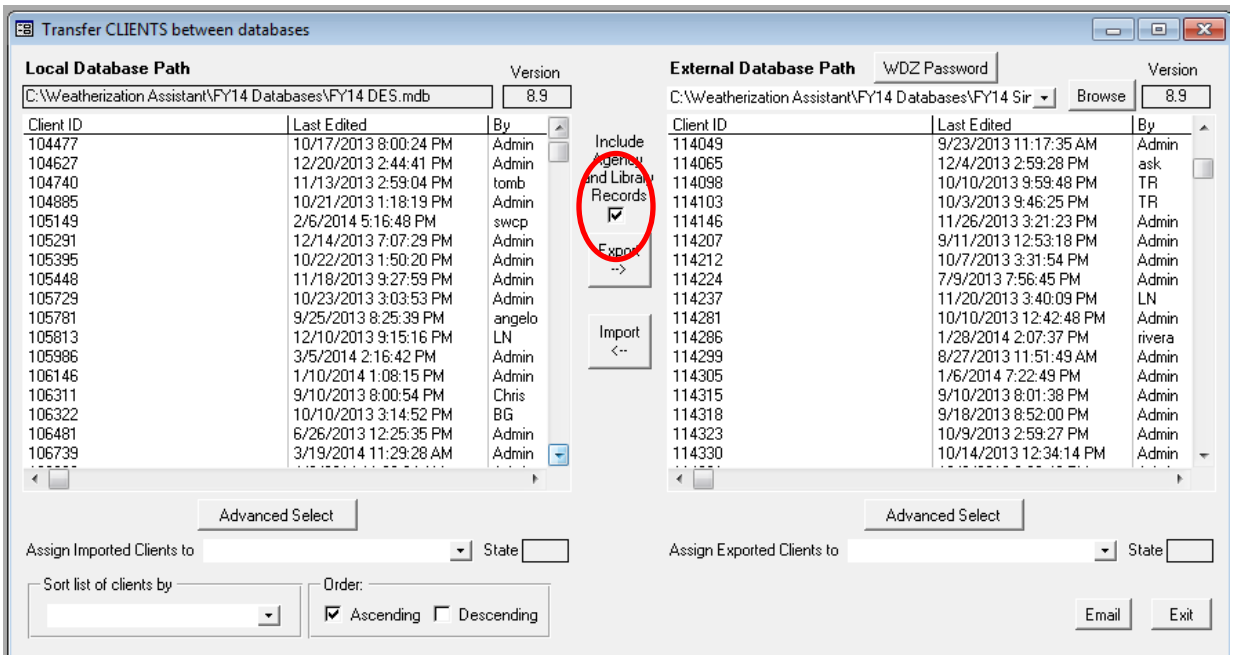
OR

Click Save

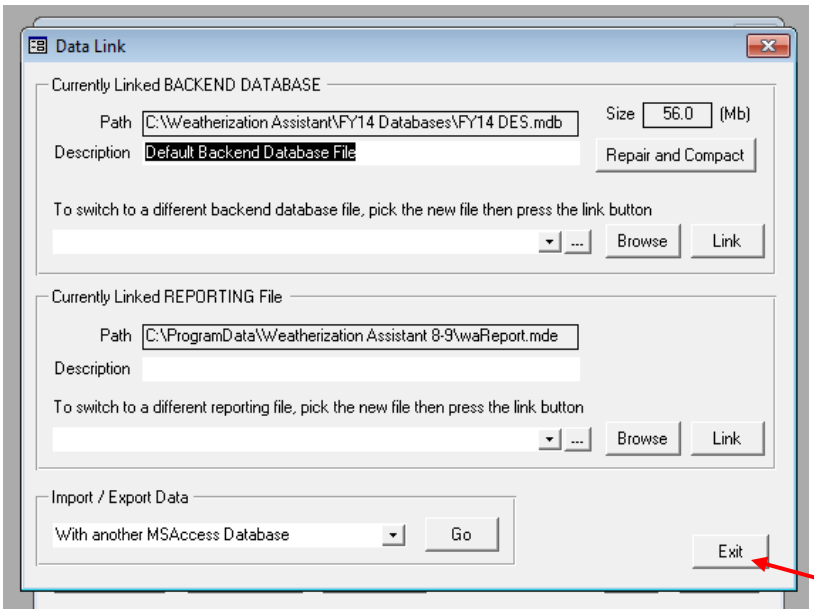
5) Next, highlight the jobs to be imported on the right-hand side of the screen, and click the “Import” button to copy the client records into the database where the WA 8.9 software is linked. (Note: to select multiple records, hold the CRTL key down and click each one—or just click on the first and last jobs in the list while holding down SHIFT to select all client records.) If the client record already exists, it will be “edited” to whatever data is in the imported file.



To keep existing agency or library information, make sure this box is NOT checked. Also, if importing previous year records do not check this box.
Click on Import to move client records into the database.



6) All of the jobs to be imported on the right-hand side under “External Database Path” should now appear on the left-hand side under “Local Database Path.” Close this window by clicking exit, and back out of the Data Link screen.

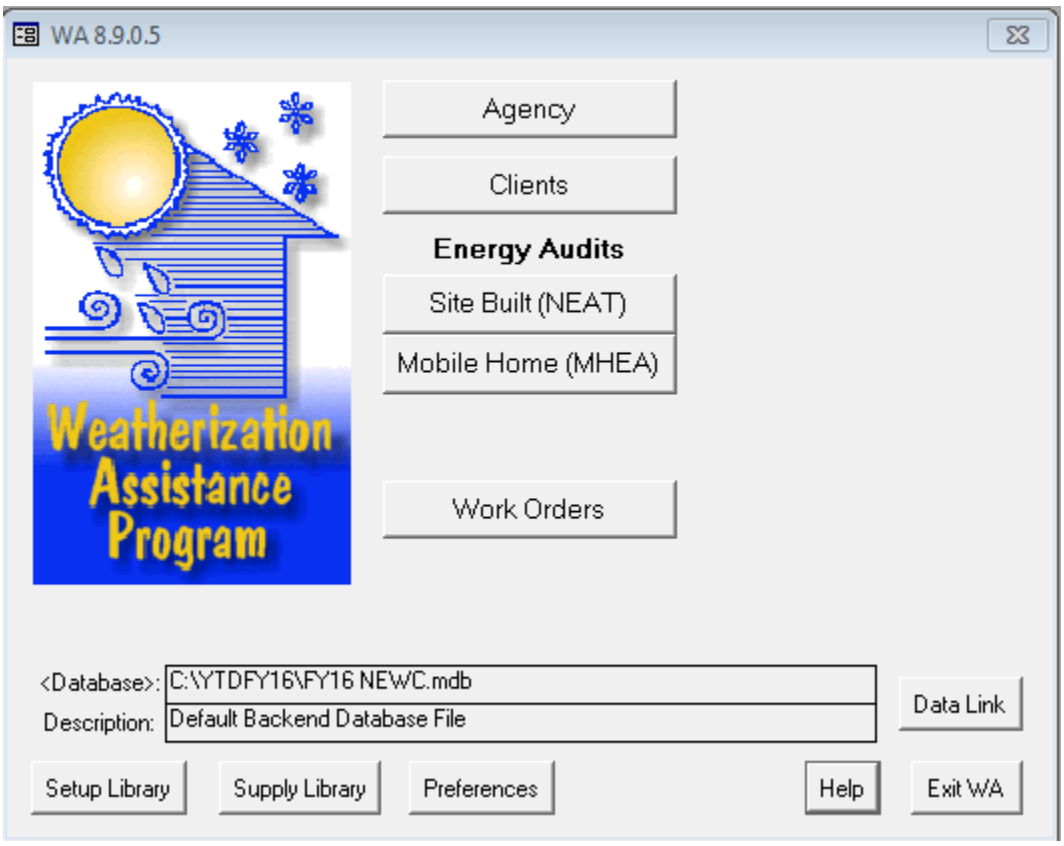


Click on Exit

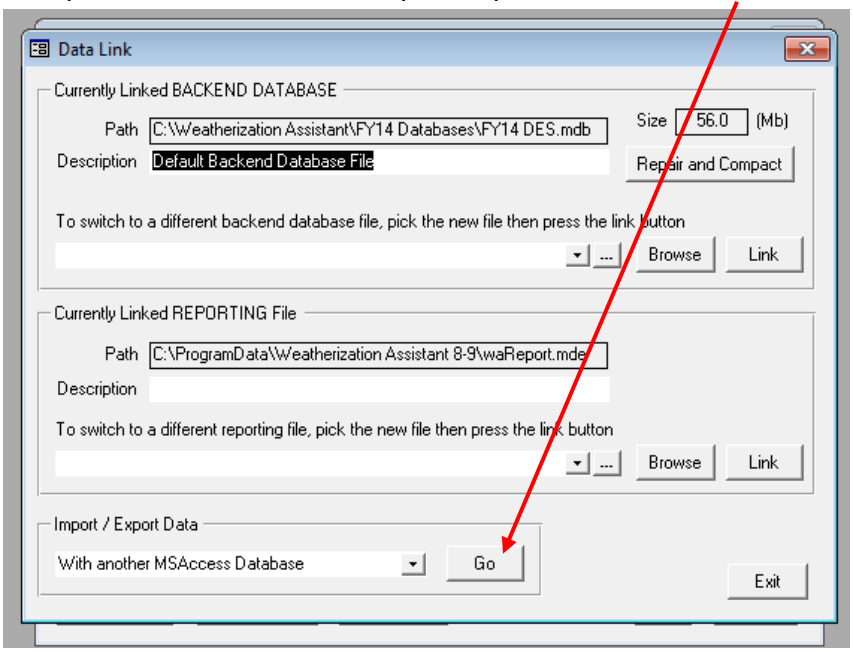
7) Any of the client records or audits that were imported from the main menu screen of the WA 8.9 software can now be opened. Please note that if the agency or library information was not imported in Step 5, these values must be selected in the imported records as needed.

The following directions should be used whenever sending NEAT or MHEA audits to another user of the Weatherization Assistant Software. When completing an export, a zipped database is created that includes all information related to the selected client record. This information includes the agency record and all audits assigned to the client as well as the supply and setup libraries used by the audits.

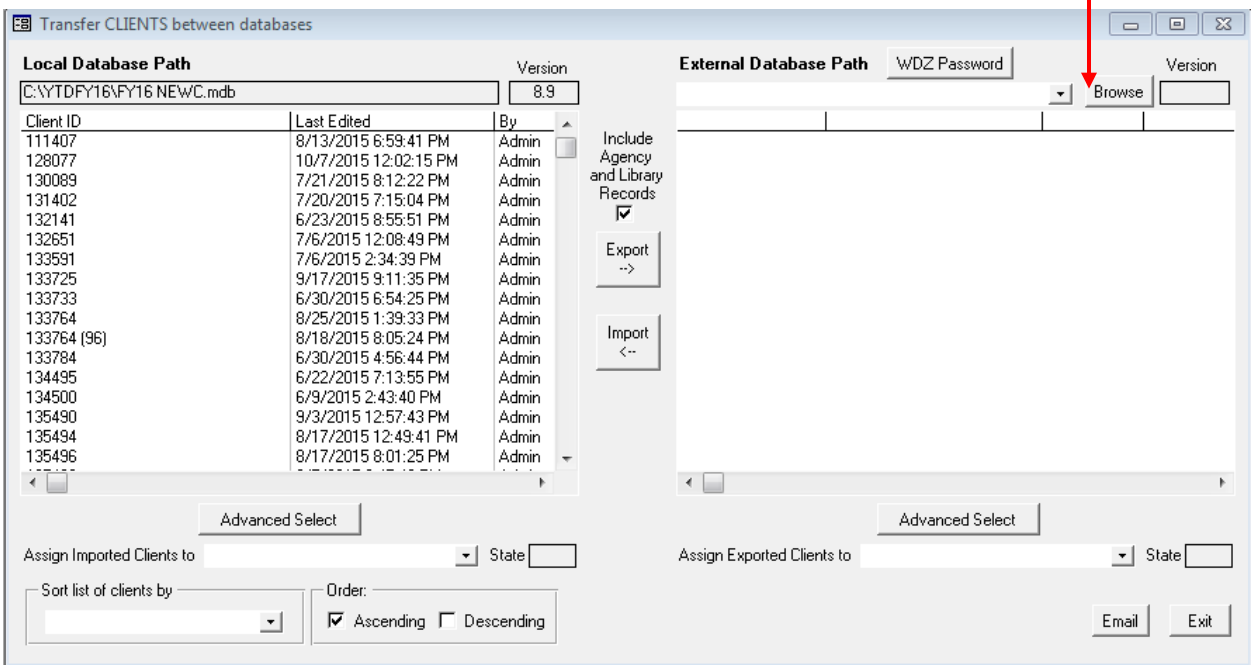
1) Select “Data Link” from the main Weatherization Assistant menu.



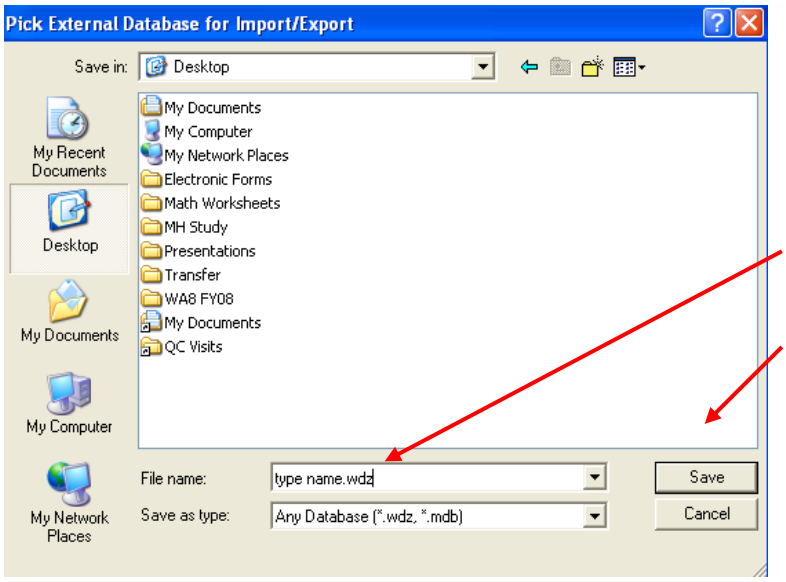
2) Click on “Go” in the “Import/Export Database” section



3) A window labeled “Transfer between databases” will appear, and the first thing to do is set up a database file to hold the exported client record(s). Click on the “Browse” button to open a new window to name the zipped database that will contain the record export.



4) Select a folder location to save the export file. One method is to save it to your desktop so it can easily be located. When naming the file, be sure to include the .wdz extension to ensure that it is saved as a WDZ and not a MDB file. Give the program a path and file name, and click "Save."

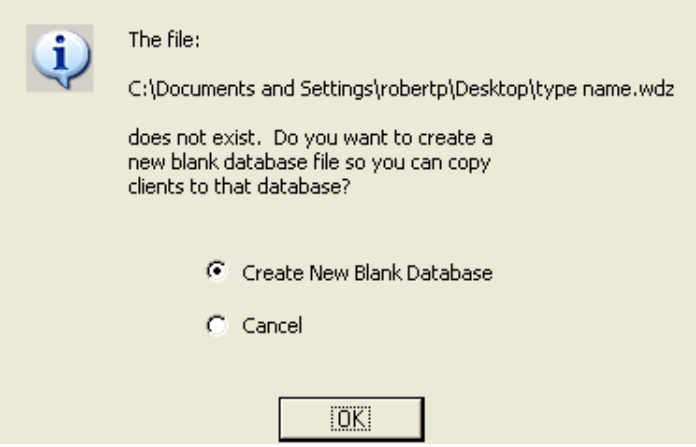


Click on *Desktop* icon to save there

Type in and save a name for the file that describes what is being exported

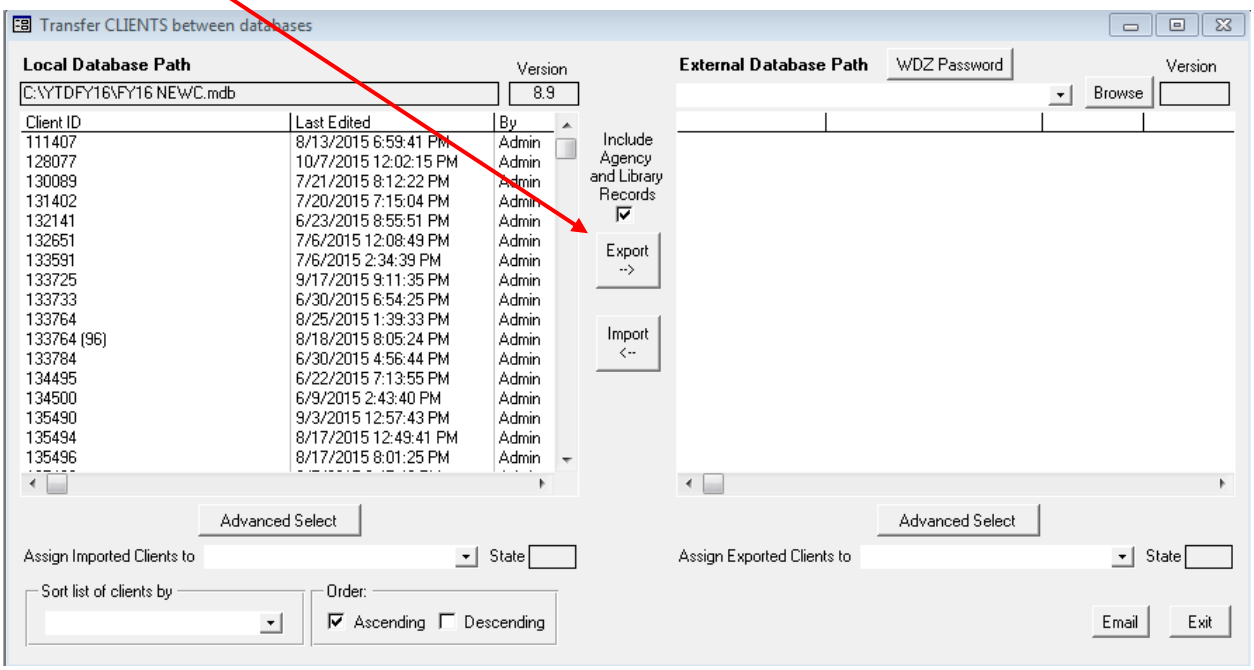
Click Save

5) The following window will appear before the export file can be created. Make sure to note the location of this file: you will need to find it on your computer later. Click "OK" to create the new blank database.

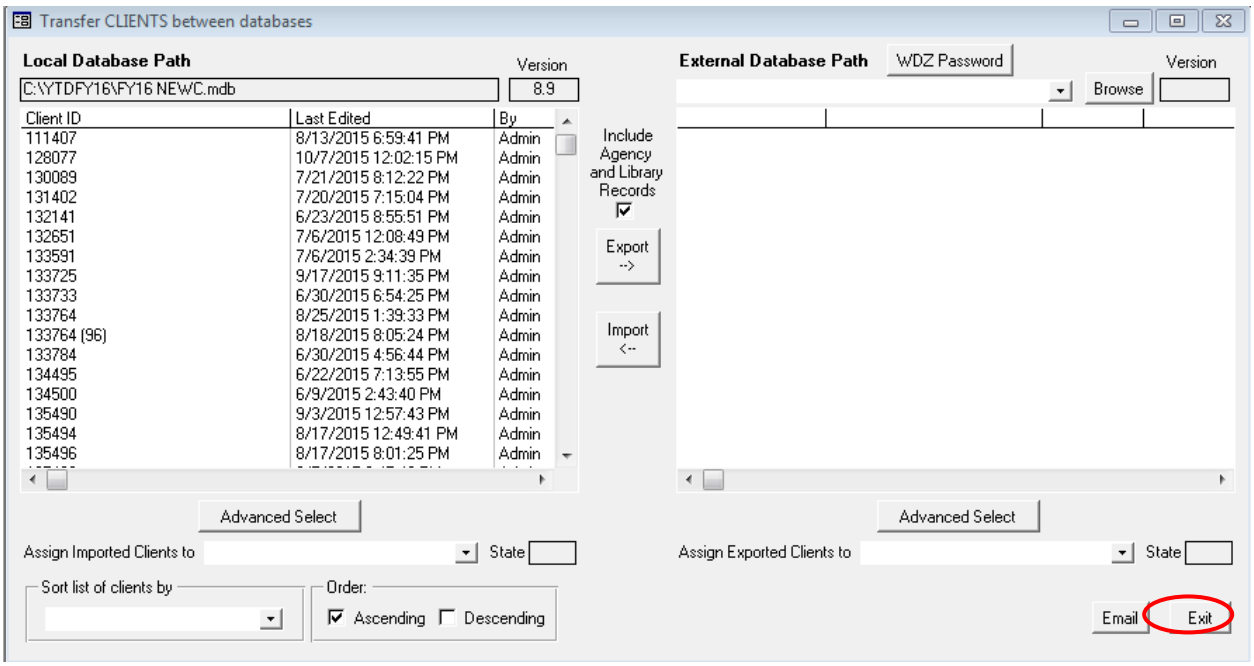


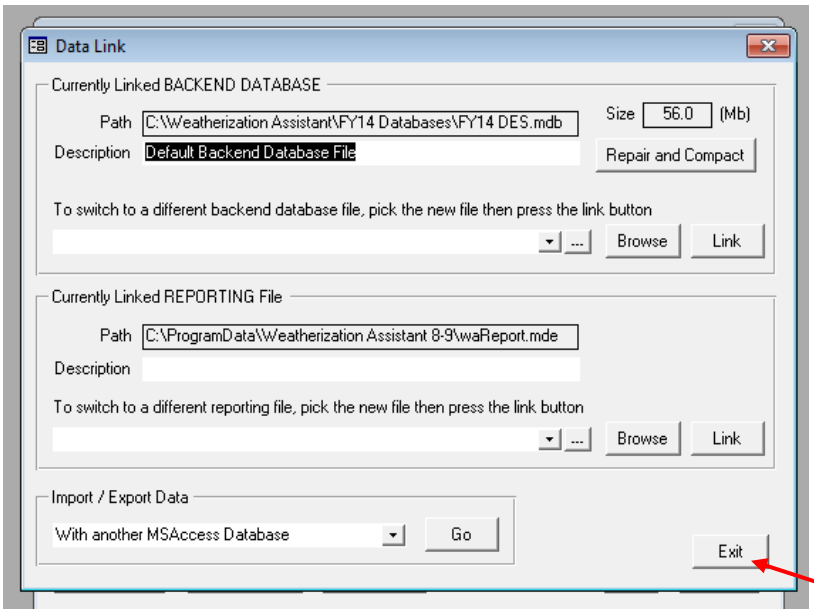
6) Next, highlight the jobs to be exported on the left-hand side of the screen, and click the "Export" button to send the jobs to the export file. (Note: to select multiple records, hold the CRTL key down and click each one—or just click on the first and last jobs in the list while holding down SHIFT to select all client records.) You do not need to include your agency libraries; however, it is best to include them.

Click on Export



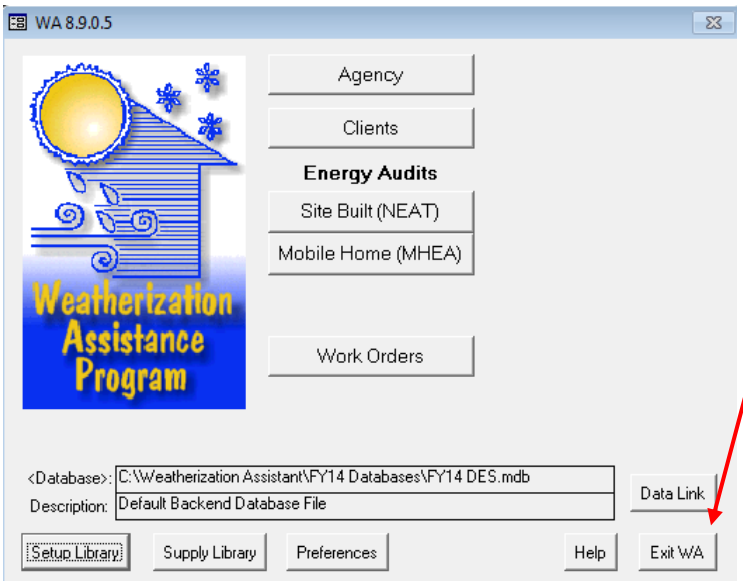
7) All of the jobs to be exported on the left-hand side under “Local Database Path” should now appear on the right-hand side under “External Database Path.” You can now exit this window, and back out of the Data Link screen. DO NOT USE THE Email BUTTON. Click on Exit



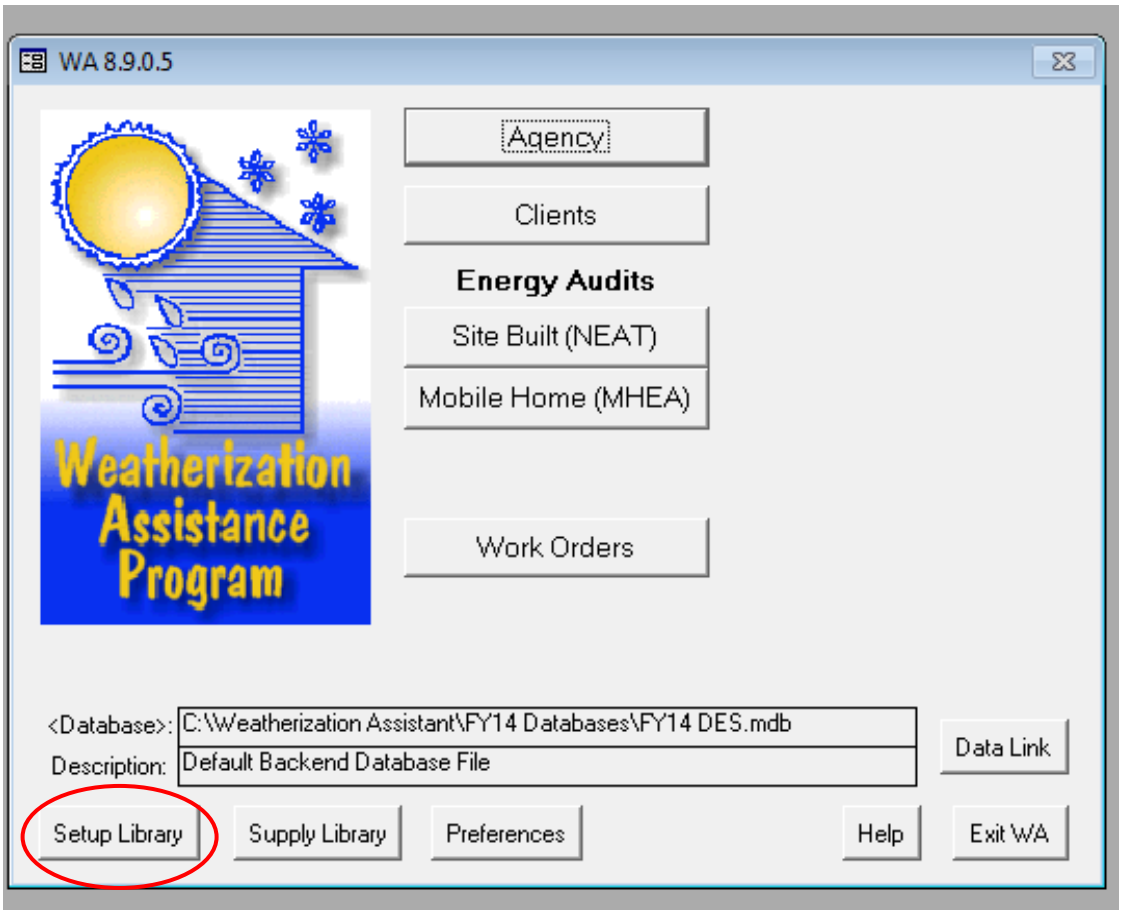


Click on Exit

8) Exit the WA 8.9 Software when you are finished with exporting client records.



9) Locate the export database file you created on your computer to verify that it was created. If not found you will need to start over from the beginning. The new "namefile.wdz" zipped database file can now be attached to an e-mail to send to another user or copied to a network location for other users to import.

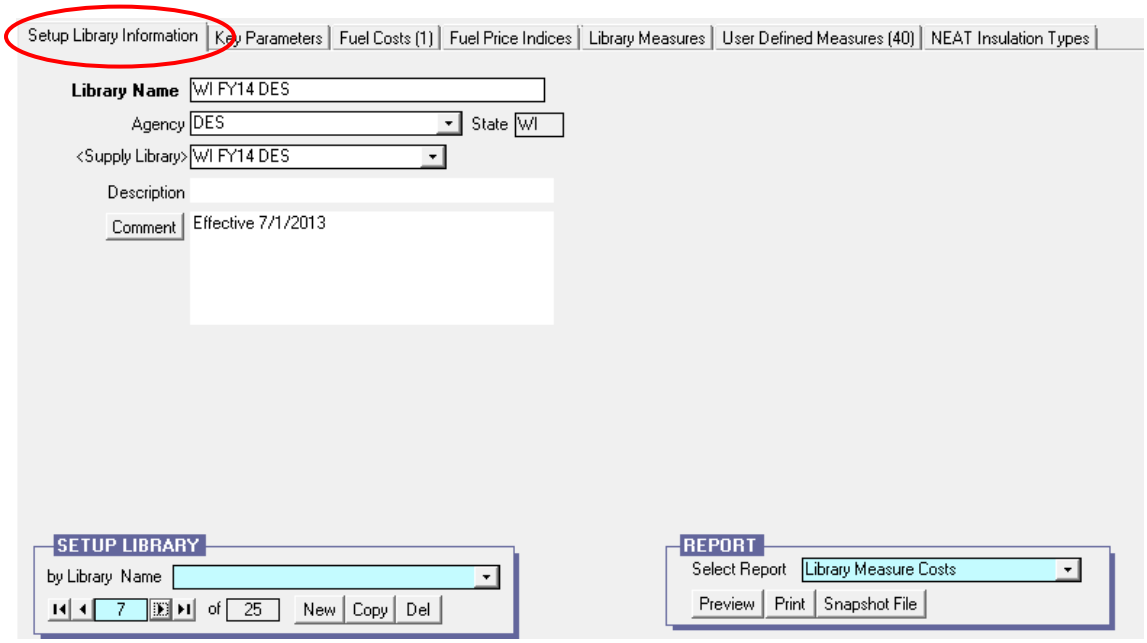


2.0 Overview

The *Setup Library* is a data structure where measure costs, fuel prices, and other required data is entered to customize the Weatherization Assistant for a particular area (such as the State of Wisconsin or an agency). Any number of different setup library records can be created and associated with the identified area.

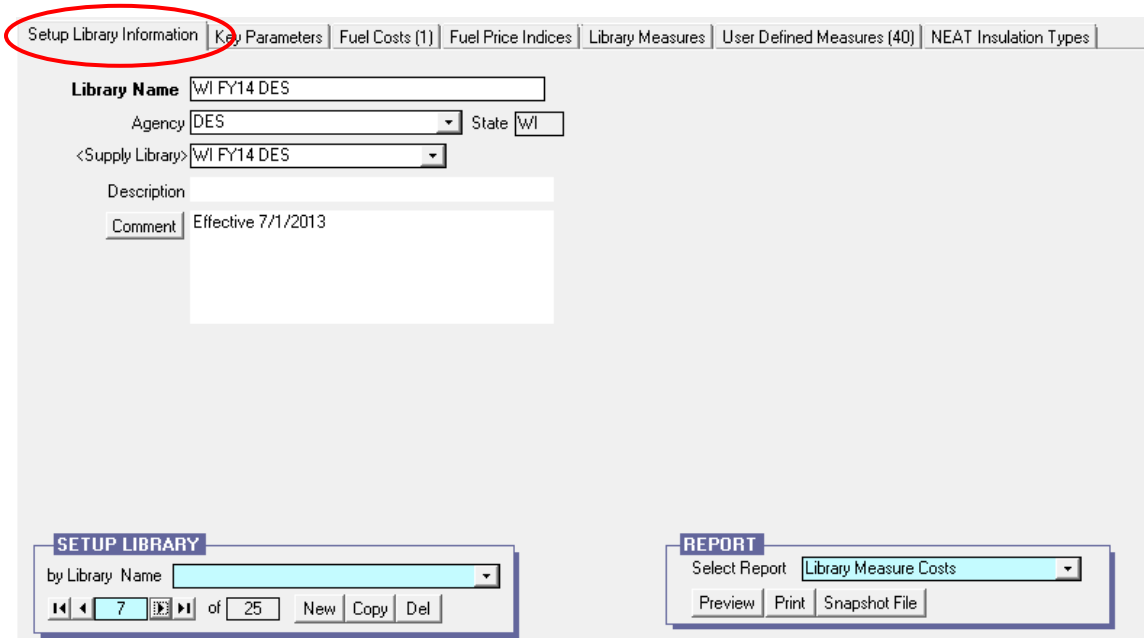
In Wisconsin, the set-up library stores information like material costs, fuel costs, and other adjustable parameters that relate to most of Wisconsin's audit jobs. The set-up library customizes the program to Wisconsin. The parameters in Wisconsin's set-up library are determined and set by the division. Agencies receive a unique agency set-up library at the beginning of each contract year with the current fiscal year parameters as well as agency specific costs. Changes in the setup library (cost details for example) WILL affect the generation of audit recommendations.

2.1 Setup Library Tabs



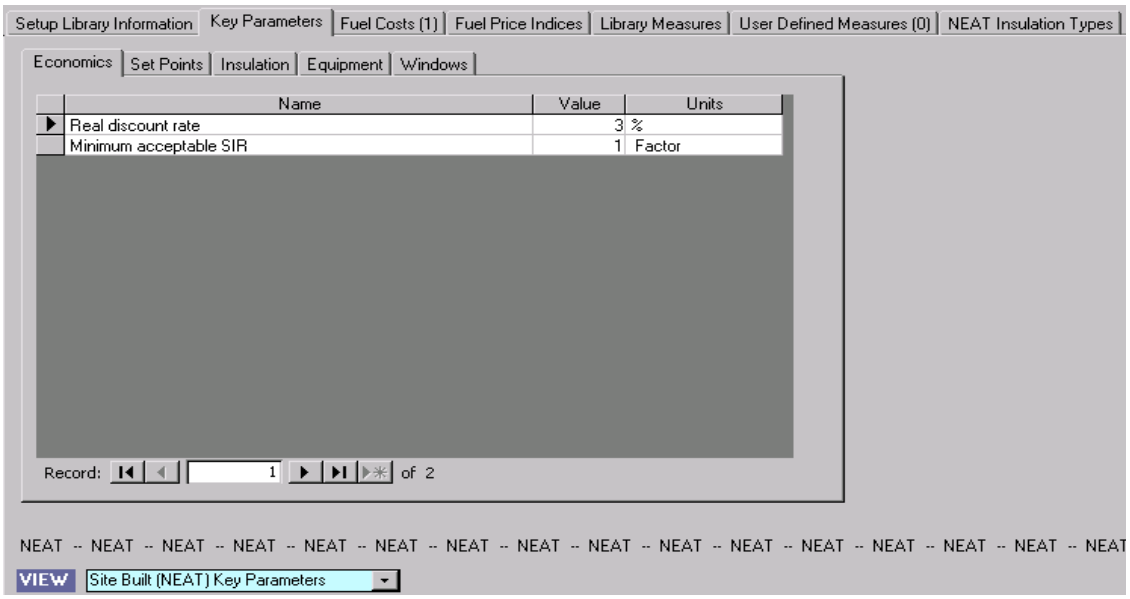
2.1.1 Setup Library Information

On this tab, general information about the setup library record is entered. The library name will show as the program year and the agency code. The *Agency* field will display the name of the agency. Choose the appropriate supply library selection from the *Supply Library* dropdown.



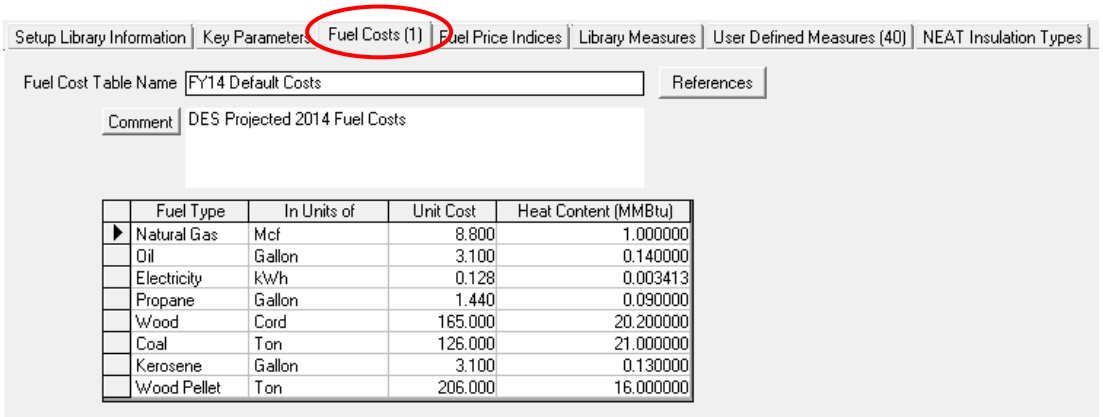
Note: Boxes outlined in black indicate a required field.

2.1.2 Key Parameters



Key parameters in Wisconsin are pre-defined by the division. Any changes to key parameters are approved and directed by division staff and should not be changed by agencies. Choose to view either NEAT or MHEA parameters by using the *View* dropdown box in the lower left corner of the *Key Parameters* form. A banner line just above the View dropdown box will indicate which set is currently being displayed (e.g., “NEAT - - NEAT - - NEAT...”). The sub-tabs under the *Key Parameters* tab divide the parameters into different categories.

2.1.3 Fuel Costs

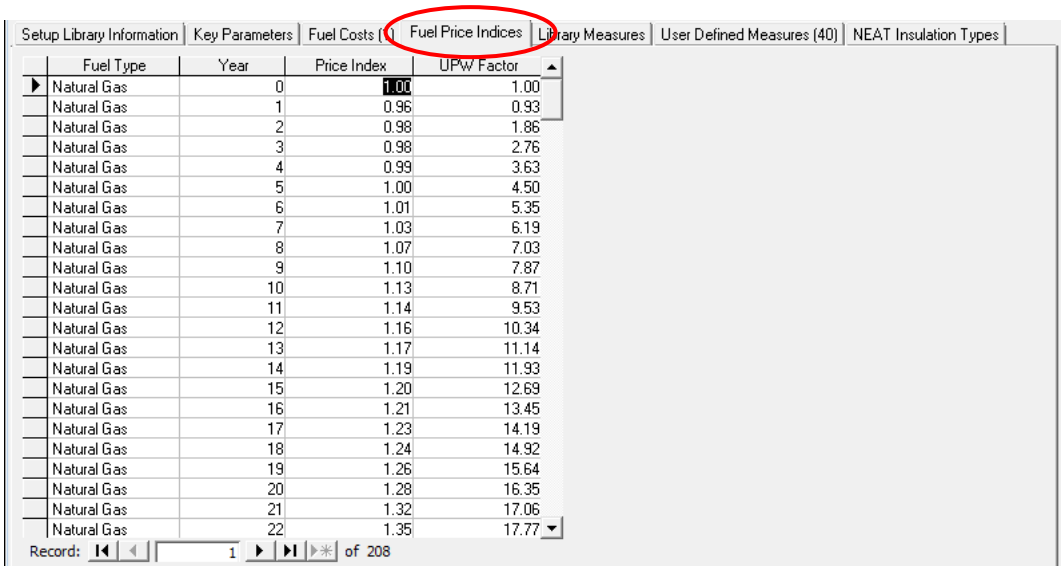


The Division enters the fuel costs for the state. Do not change any of the fuel costs.

2.1.4 Fuel Price Indices

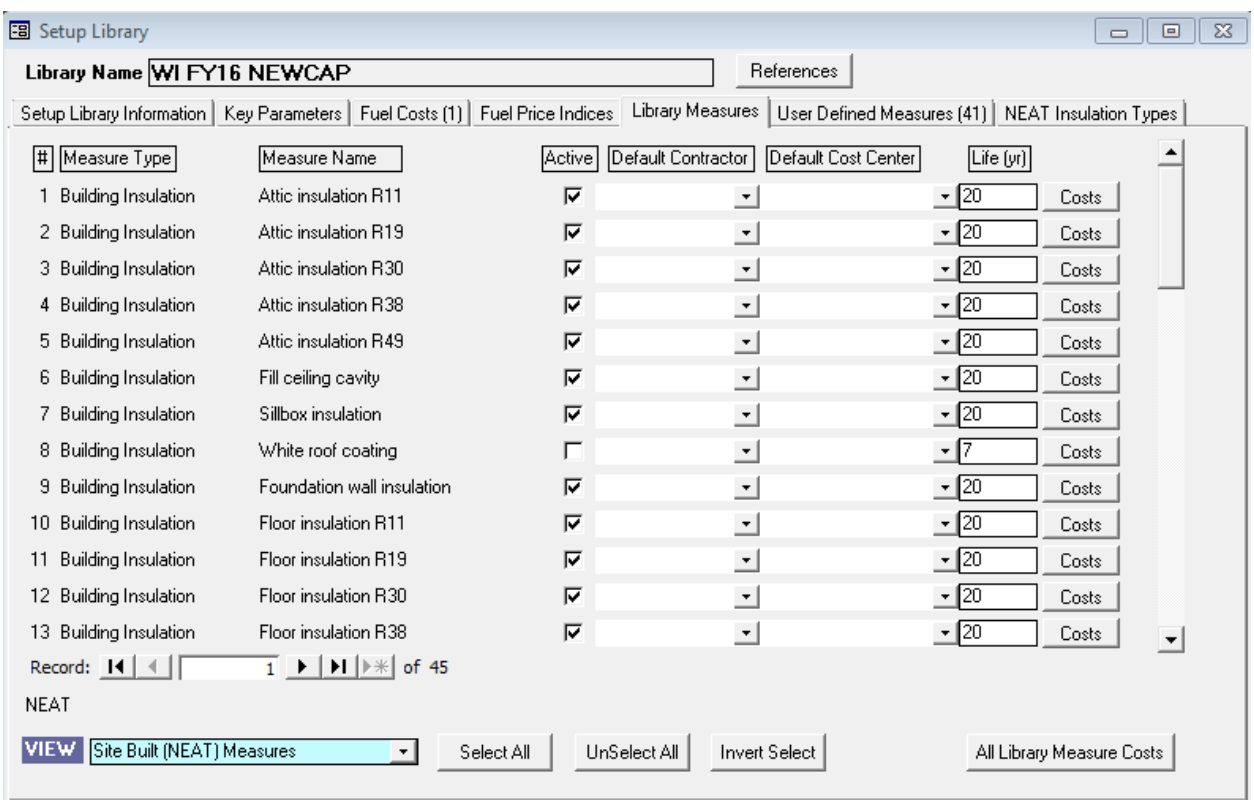
The *Fuel Price Indices* show the fuel price escalation index values for each fuel for the current year out to 25 years. These values are based on US average fuel price escalation factors

released by the Energy Information Agency (EIA). There is no need to modify these indices. Values are obtained from the annual Supplement to NIST Handbook 135.



Fuel Type	Year	Price Index	UPW Factor
Natural Gas	0	1.00	1.00
Natural Gas	1	0.96	0.93
Natural Gas	2	0.98	1.86
Natural Gas	3	0.98	2.76
Natural Gas	4	0.99	3.63
Natural Gas	5	1.00	4.50
Natural Gas	6	1.01	5.35
Natural Gas	7	1.03	6.19
Natural Gas	8	1.07	7.03
Natural Gas	9	1.10	7.87
Natural Gas	10	1.13	8.71
Natural Gas	11	1.14	9.53
Natural Gas	12	1.16	10.34
Natural Gas	13	1.17	11.14
Natural Gas	14	1.19	11.93
Natural Gas	15	1.20	12.69
Natural Gas	16	1.21	13.45
Natural Gas	17	1.23	14.19
Natural Gas	18	1.24	14.92
Natural Gas	19	1.26	15.64
Natural Gas	20	1.28	16.35
Natural Gas	21	1.32	17.06
Natural Gas	22	1.35	17.77

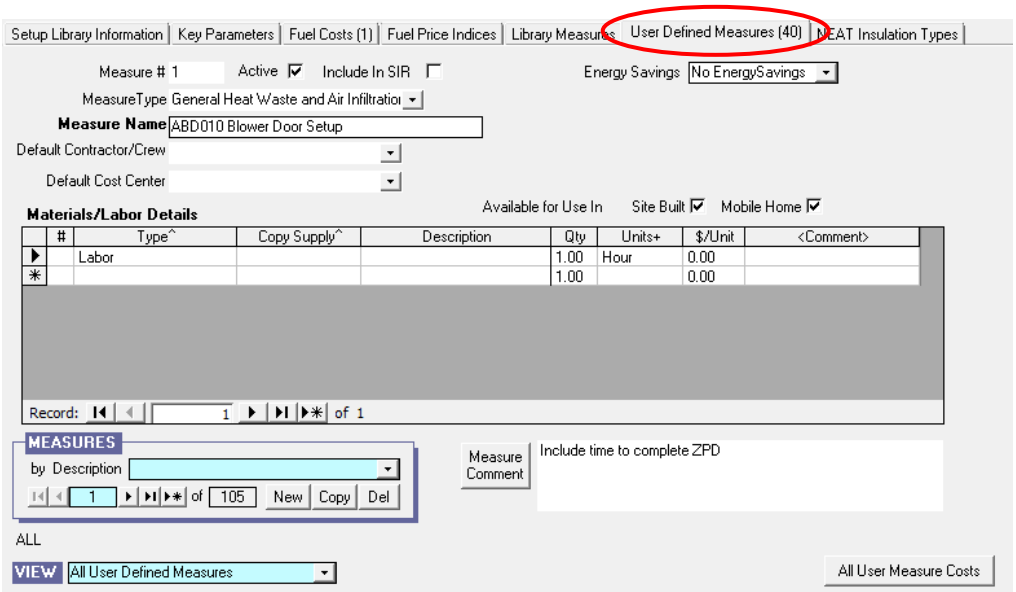
2.1.5 Library Measures



#	Measure Type	Measure Name	Active	Default Contractor	Default Cost Center	Life (yr)	
1	Building Insulation	Attic insulation R11	☑			20	Costs
2	Building Insulation	Attic insulation R19	☑			20	Costs
3	Building Insulation	Attic insulation R30	☑			20	Costs
4	Building Insulation	Attic insulation R38	☑			20	Costs
5	Building Insulation	Attic insulation R49	☑			20	Costs
6	Building Insulation	Fill ceiling cavity	☑			20	Costs
7	Building Insulation	Sillbox insulation	☑			20	Costs
8	Building Insulation	White roof coating	☐			7	Costs
9	Building Insulation	Foundation wall insulation	☑			20	Costs
10	Building Insulation	Floor insulation R11	☑			20	Costs
11	Building Insulation	Floor insulation R19	☑			20	Costs
12	Building Insulation	Floor insulation R30	☑			20	Costs
13	Building Insulation	Floor insulation R38	☑			20	Costs

This tab shows the list of standard measures determined by the division that will be considered by the audit analysis engine. Measures are active or inactive based on Wisconsin's weatherization program protocols. Do not change the active flags. Each measure listed on the *Library Measures* tab of the *Setup Library Main Menu* item has its own "Costs" button. This button displays agency specific measure prices based on data analyzed in WisWAP. Audits will use these costs to determine the recommended measures. The VIEW drop down box in the lower left corner is used to switch between NEAT and MHEA library measures.

2.1.6 User Defined Measures



Under the *User Defined Measures* tab, the default database lists energy conservation, repair and Health and Safety measures.

All repair measures are marked as "include in Savings to Investment Ratio (SIR)" by default to ensure that all repairs selected in an audit are included in the SIR.

Users should remember to follow H&S program guidance when selecting Health and Safety measures to be included in the SIR.

All energy conservation measures not modeled directly by the audit are also listed in the library. Some measures are placed here by the division rather than having the audits select the measures. Measures may or may not be included in the SIR by default.

Use the "Available for Use In" check boxes to specify the appropriate audit application (NEAT or MHEA or both). The VIEW dropdown in the bottom left of the form is used to switch the view between different categories of records.

Agencies may enter default costs for any of the user defined measures to assist in efficiency of data entry for users. Duplicate or additional measures can be added to allow for different default costs for certain measures.

2.1.7 User Defined Insulation Types

This tab names and characterizes insulation types for attic spaces, knee walls, walls, floors, sills, and foundation walls for use in the NEAT audit. All insulation types and their respective R-values are established and approved by the division and should not be changed by agencies.

Setup Library Information | Key Parameters | Fuel Costs (1) | Fuel Price Indices | Library Measures | User Defined Measures (40) | NEAT Insulation Types

	Attic		Knee Wall		Wall		
	Name	Rs/Inch	Name	R-Value	Name	Value	Units
Type 1	Cellulose, Blown	3.75	DIA105 R11 Fiberglass Batt	11	Cellulose, Dense Pack	3.71	R/in
Type 2	Fiberglass, Blown	3.09	DIA110 R19 Fiberglass Batt	19	Fiberglass, Dense Pack	4.18	R/in
Type 3	Cellulose, Dense Pack	3.71	DIA005 R11 Cellulose Enclos	13	DIW025 R11 Fiberglass Batt	11	R
Type 4	Fiberglass, Dense Pack	4.18	DIA010 R19 Cellulose Enclos	19	DIW030 R19 Fiberglass Batt	19	R
Type 5	Fiberglass, Batt	3.33	DIA115 R11 2 Part Foam	11			
Type 6	DIA115 2 Part Foam	6.7	DIA115 R19 2 Part Foam	19			

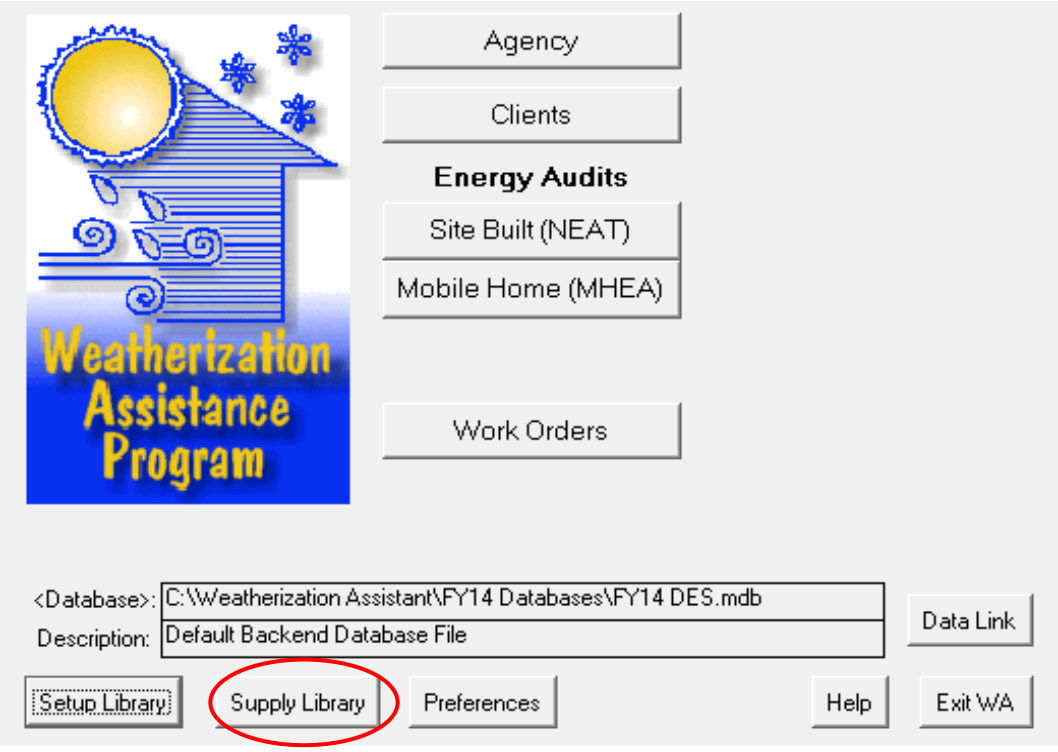
	Floor		Sill		Foundation Wall	
	Name	Rs/Inch	Name	R-Value	Name	R-Value
Type 1	Fiberglass Batt	3.33	DIS010 R 19 Fiberglass Batt	19	DIFO025 Thermax Board R7	7
Type 2	Cellulose, Dense Pack	3.71	DIS005 R11 Fiberglass Batt	11	DIFO015 R19 Fiberglass Batt	19
Type 3	Fiberglass. Dense Pack	4.18	DIS020 R19 2 Part Foam	19	DIFO010 R11 Fiberglass Batt	11
Type 4	2-Part Foam	6.7	DIS019 R12 2 Part Foam	12	DIFO006 R19 2 Part Foam	19
Type 5	DIFL045 Polystyrene Board F	5	DIS015 R10 Polystyrene Bo	10	DIFO005 R12 2 Part Foam	12
Type 6	DIFL060 Polyisocyanurate R	7			DIFO020 Exterior Foam Boar	5

Insulation type names can be up to 30 characters in length

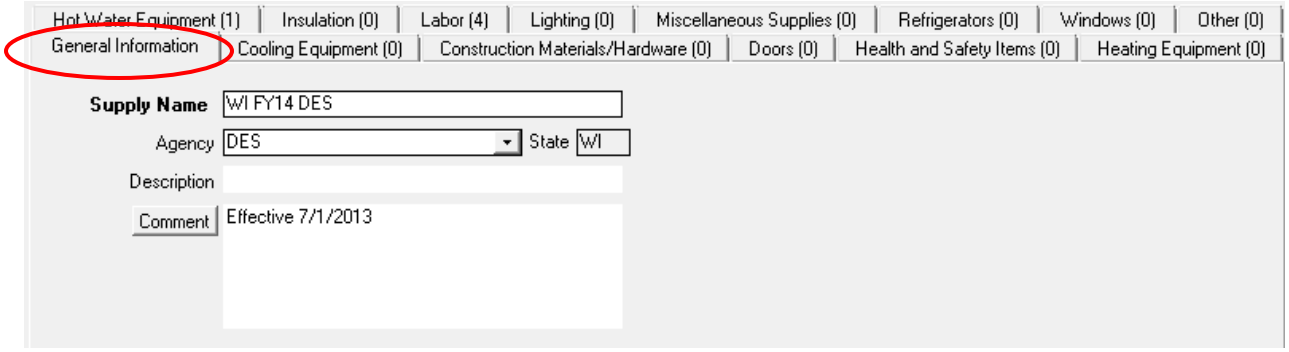
2.2 Supply Library Description

The NEAT and MHEA audits use the *Supply Library* as a repository for replacement refrigerators and water heaters used in the Baseloads tab in either audit. Agencies are required to keep an updated supply library with current bid prices.

Each of the material category tabs under the *Supply Library Main Menu* item may be viewed and edited in either *Form* or Subform *Data Sheet* views. (Right click to select and change the view to Subform Data sheet). The Subform *Data Sheet* view offers a convenient way of reviewing the materials in the library. Records in the view may be copied and pasted between Weatherization Assistant databases or from the program to a spreadsheet application such as Excel.



2.2.1 General Information Tab



Note: Boxes outlined in black indicate a required field.

2.2.2 Supply Name – Required

Enter a name to identify the *Supply Library*. Most often, an agency will have only one *Supply Library*. If more than one is created, the name may contain an abbreviated indication as to why one differs from another. For example, if an agency changes vendors during a fiscal year, an updated library can be created. Save any lengthy explanations for the *Description* and *Comment* fields. A default name appears if a new *Supply Library* is created. The name will use the installation's ID or the default name will contain the time the library was created. The entry is limited to 50 characters.

2.2.3 Agency – Required

This field identifies the agency to which the *Supply Library* is associated. Since the only way to create a new *Supply Library* is to copy an existing one or import one with a client, this entry will initially be complete.

2.2.4 State

This un-editable field displays the state associated with the *Agency* entered in the previous field.

2.2.5 Description – Optional

This field may describe the intended use of the *Supply Library*, particularly if the agency uses more than one supply library.

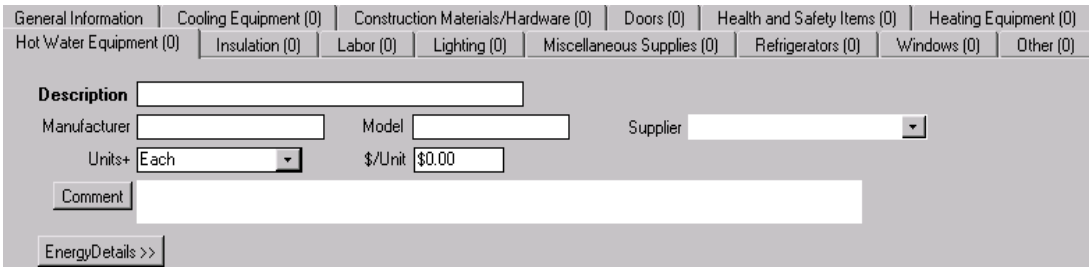
2.2.6 Comment – Optional

Comments related to the supply Library may be entered directly in the comment field on the form. The comment will not be displayed anywhere else in the program and is for the user's benefit only.

2.3 Hot Water Equipment and Refrigerator Forms

The *Supply Library's* listings for *Hot Water Equipment* and *Refrigerators* are the only categories of materials in the library with data that may be selected in an audit and used in the audit calculations themselves. Entries made under these categories determine the cost effectiveness of the water heater and refrigerator replacement measures. Information about a replacement refrigerator can be entered directly into NEAT's and MHEA's audit input forms, but data on replacement water heaters must be entered in the program's *Supply Library* in order for the audits to consider replacing a unit. Most of the entry items and controls are common to both refrigerator and water heater category tabs in the supply library.

2.3.1 Description – Required



Enter a description of the item category. Entries are limited to 80 characters. Descriptions can be unique to each agency's situation. Example being if an agency has separate bid/prices for each county they serve, the description can be tailored to state the water heater as such.

2.3.2 Manufacturer – Required

Enter the name of the manufacturer of the item. Entries are limited to 50 characters.

2.3.3 Model – Required

Enter the model of the described item. This information can alternatively be included in the description entry.

2.3.4 Supplier – Optional

Choose the supplier of the material. This dropdown list will be determined by the information the Weatherization agency enters into the *Supplier* screen accessed through the *Home* screen of the Weatherization Assistant Program. Agencies can choose to tailor the drop down any way that works for their internal reporting system.

2.3.5 Units – Required

Enter the unit(s) by which the item is costed. The choices for water heater equipment and refrigerators will be “each.”

2.3.6 Cost/Unit – Required

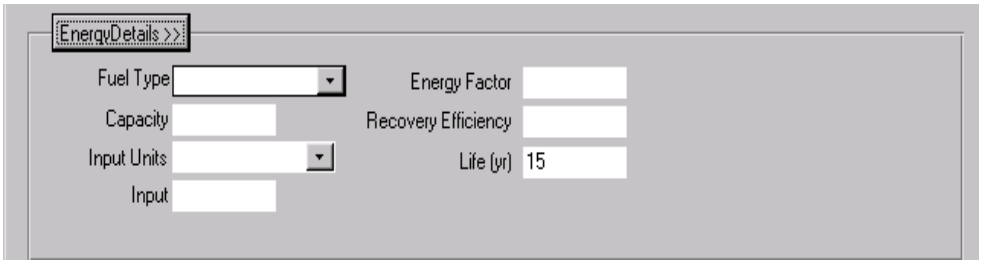
Enter the cost of the item in the Units entered in the previous field. Both the *Units* and the *$/unit* will be copied to any use of the item in the *Work Orders*.

2.3.7 Energy Details

For *Refrigerators* and *Hot Water Equipment*, entries in the indicated fields are required in order to provide sufficient information for use in the audits.

2.4 Water Heaters

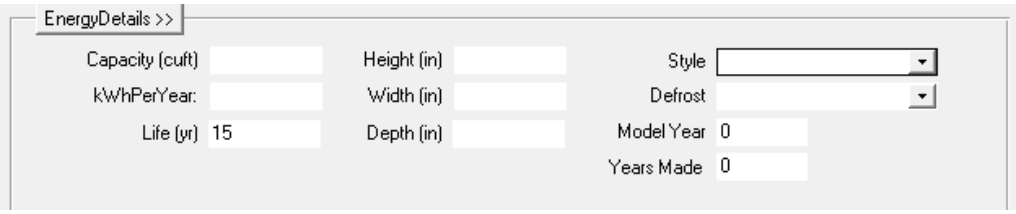
All water heaters that an agency uses shall be entered here. When a water heater is “considered” for replacement it is selected from the drop down list in the base-load tab. All data on the form is required in order to evaluate the efficiency of the water heater replacement in NEAT and MHEA.



- Fuel type choices are: Natural Gas, Electric, and Propane.
- Capacity is the gallon size of the water heater.
- The input rating is metered in units of kBtu or kW.
- The Energy Factor and Recovery Efficiency are ratings of a water heater’s efficiency and are available from AHRI, http://cafs.ahrinet.org/gama_cafs/sdpsearch/search.jsp?table=RWH, or from agency vendors.
- The standard life used is 15 years.
- **Tip**: When entering Recovery Efficiency ensure it is entered correctly. Example being a water heater with 75% recovery efficiency should be entered as .75.

2.5 Refrigerators

The Energy Details form for refrigerators includes data necessary for the NEAT and MHEA audits to evaluate the cost-effectiveness of replacing an existing refrigerator with a unit described here.



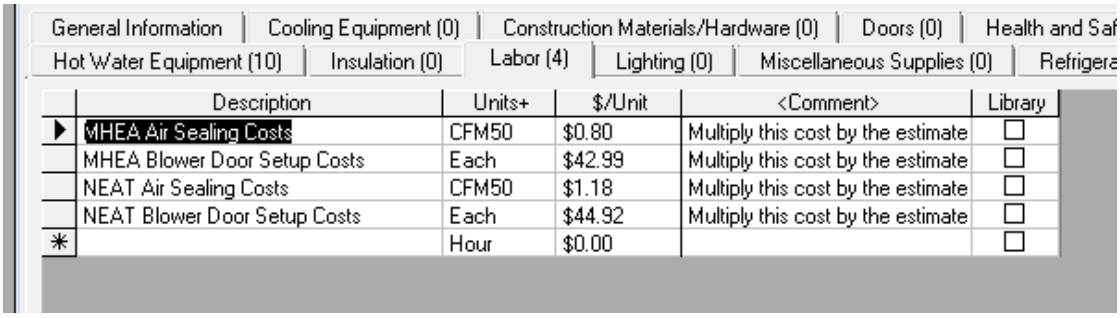
Required entries include:

- Capacity (cuft)
- Annual Consumption (kWh/Year) - available from the agency vendor or Energy Star:
- http://www.energystar.gov/index.cfm?fuseaction=find_a_product..showProductGroup&pgw_code=RF
- Expected life (15 years is standard)
- Model Year – when it was first sold, and the number of years it was available. Estimates are acceptable.
- Style: Top Freezer, Side by Side, Single Door, Single Door with Freezer, Bottom Freezer, and Other

Tip: Dimensions of the refrigerator are optional entries, but may be important if the existing unit is located in a restrictive space.

2.6 Labor

The labor tab is used as a placeholder for typical default air sealing costs and blower door setup costs at an agency. Agencies can also enter a record for their direct labor rate. None of these values are directly used by the audits.
Note: All other supply library tans are not required for agency use.

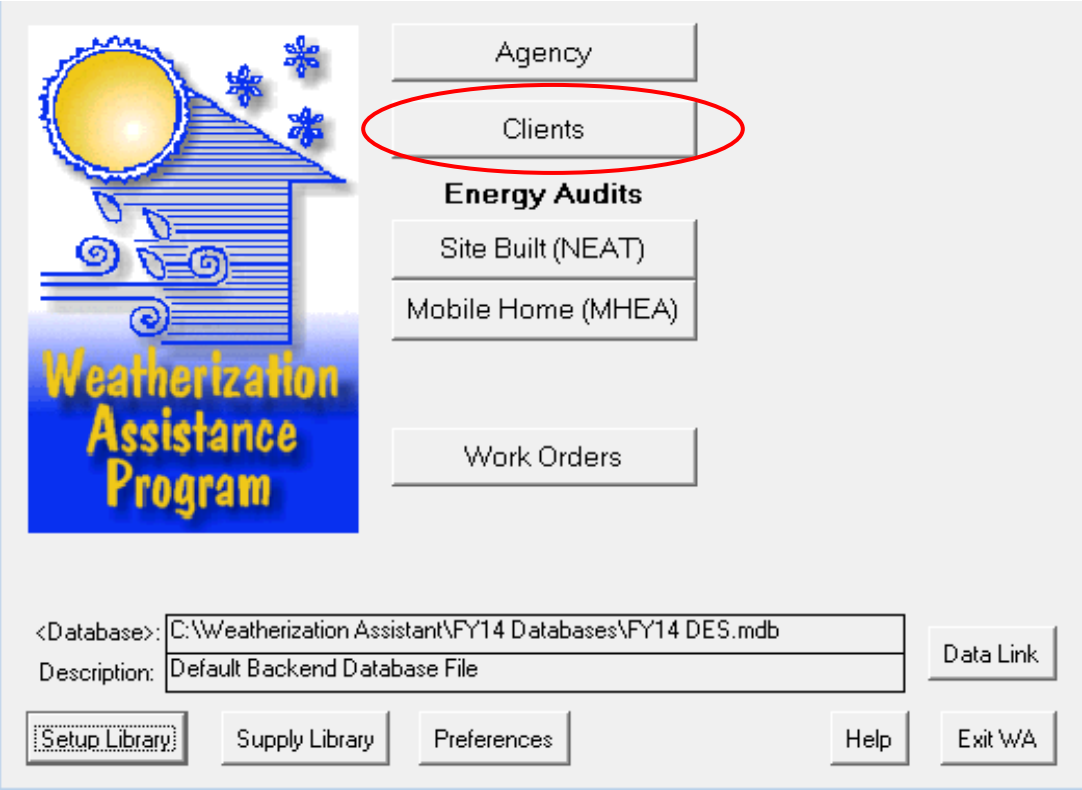


Description	Units+	$/Unit	<Comment>	Library
MHEA Air Sealing Costs	CFM50	$0.80	Multiply this cost by the estimate	☐
MHEA Blower Door Setup Costs	Each	$42.99	Multiply this cost by the estimate	☐
NEAT Air Sealing Costs	CFM50	$1.18	Multiply this cost by the estimate	☐
NEAT Blower Door Setup Costs	Each	$44.92	Multiply this cost by the estimate	☐
	Hour	$0.00		☐

Chapter 3 Client Records

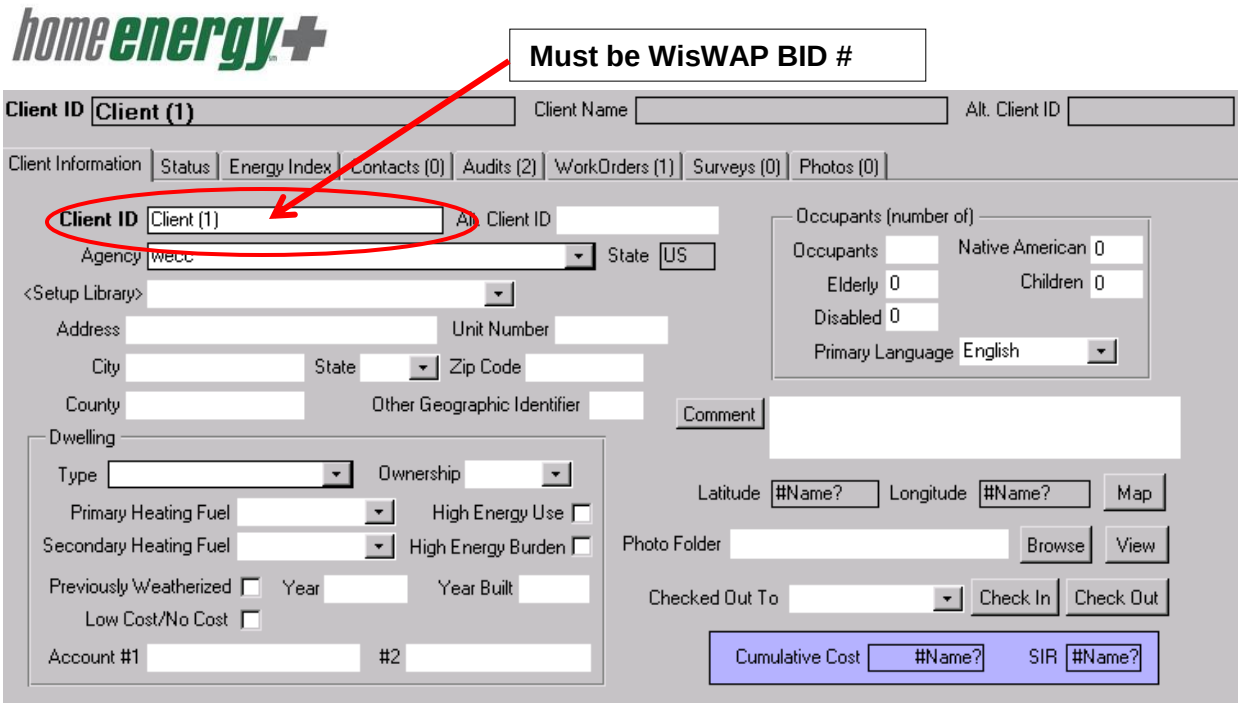
3.0 Description

Before a MHEA or NEAT audit can be completed, there must be a client record.



The *Client ID* screen is where client contacts, overall work status, and overall dwelling and occupant data are stored. Audits and work orders are organized under a client record. New client records are added from “Clients” on the main menu.

Client records are designed to be the key parameter identifying the client to your agency. Every client record must be unique. **In Wisconsin, the client record must be the WisWAP Building Identification Number (BID#).** Agencies can use the Alt. *Client ID* field for alternative ways to identify clients such as their agency job number or other criteria. NEAT/MHEA has other locations in which to enter the client’s name.

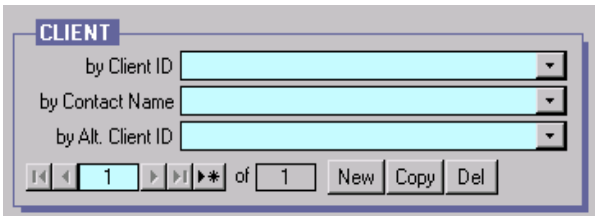


Note: Boxes outlined in black indicate a required entry field. Occupant's entry is also required on this screen.

3.1 Completing Client Data Records

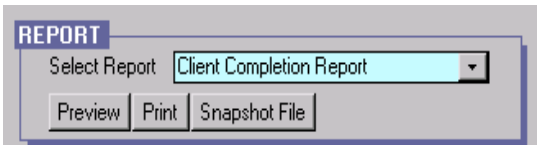
The *Client Information* screen catalogs general information about the client and the client dwelling. This tab also has the *Client Record Navigation* block in the lower left hand corner of the screen and the *Client Report Block* in the lower right hand corner of the screen.

3.1.1 Client Navigation Block



The Client Navigation Block may be used to find and access client descriptions or initiate new clients. Only clients associated with the agency bookmarked on the *Agency Information* tab will be displayed.

3.1.2 Client Report Block



The client report block provides access to reports and forms. Reports display information entered into Weatherization Assistant. Client Information Forms and NHEAT/MHEA Data Collection Forms (blank) can be printed to use in gathering new or additional information.

The NEAT/MHEA Data Collection forms are printed with client information once it has been entered.

3.1.3 Other Client Information Fields

3.1.3.1 Client ID – Required

In Wisconsin, this must be the WisWAP BID#. The *Client ID* is one of several fields used to locate information on an existing client.

3.1.3.2 Alt. Client ID – Optional

This field allows agencies to assign a second identity to each client such as the agency project number. The *Client Record Navigation* block can search for a client by this designation as well as the *Client ID*. The entry is limited to 50 characters.

3.1.3.3 Agency - Required

3.1.3.3 Agency − Required

This field automatically displays the name or identification of your agency.

3.1.3.4 Set up Library

This field is used to select the current setup library to be assigned to the client and any audits for the client.

3.1.3.5 Address, Unit Number, City, County, State, and Zip Code

3.1.3.6 Geographic Identifier − Optional

3.1.3.7 Dwelling Data

The information in the *Dwelling Data* block in the *Client Information* tab is primarily optional with the exception of the dwelling type. Agencies should consider whether to use the information in the optional fields for internal tracking or contract management.

Type − Required
Choose the type which best describes the dwelling: (1) Site Built, (2) Mobile Home, (3) Duplex, (4) Triplex, (5) 4-Plex, (6) Multifamily (5 or more units per building), (7) Shelter, and (8) Other.

Optional fields

- Ownership
- Primary Heating Fuel
- Secondary Heating Fuel
- High Energy Use
- High Energy Burden
- Previously Weatherized
- Low Cost/No Cost
- Year Built

3.1.3.8 Occupant Data-Required

The total number of occupants must be entered to ensure accuracy of water heater and refrigerator replacement SIR calculations. All other data entry is optional.

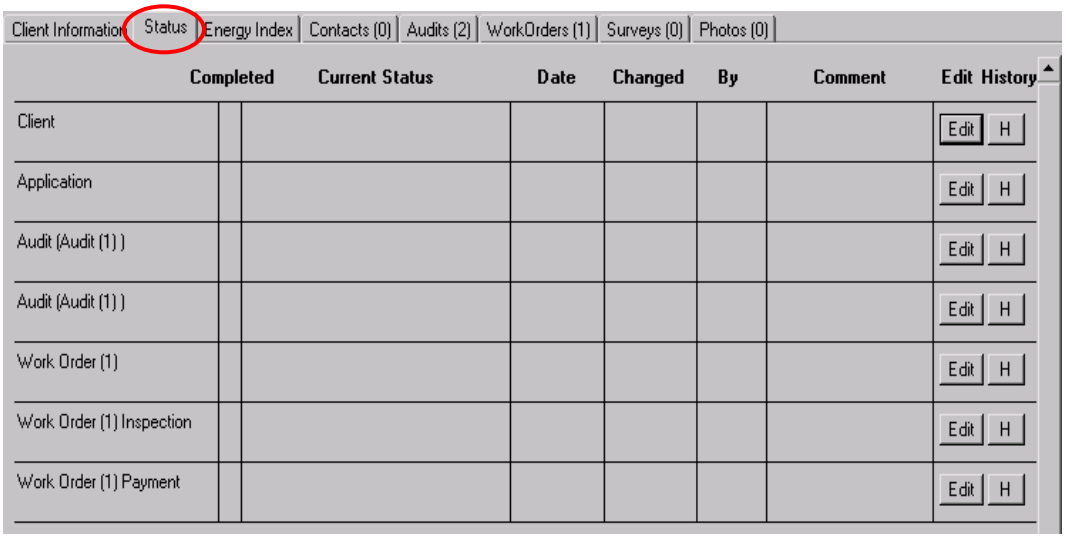
3.1.3.9 Comments – Optional

Tip: This is a good location to put comments in when not using actual fuel records.

3.2 Other Client Identification Screens

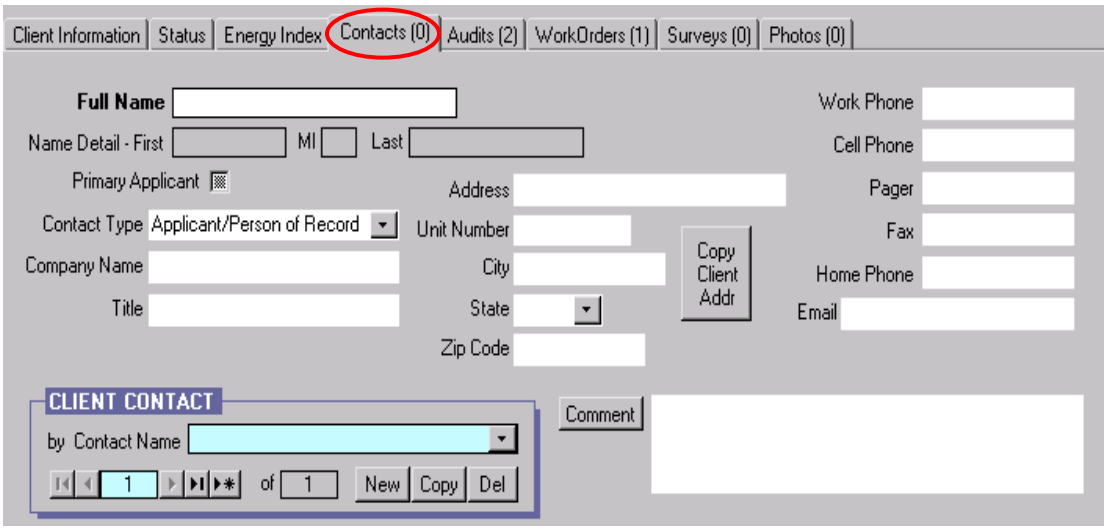
The *Contacts* tab must be filled out to assign a name to the client record. Typically this is the weatherization client's name. The *Status, Energy Index, Audit, Work Orders,* and *Survey* screens are not regularly used but available for the functions described. The *Photo Browser* tab is not used in Wisconsin.

3.2.1 Status Tab



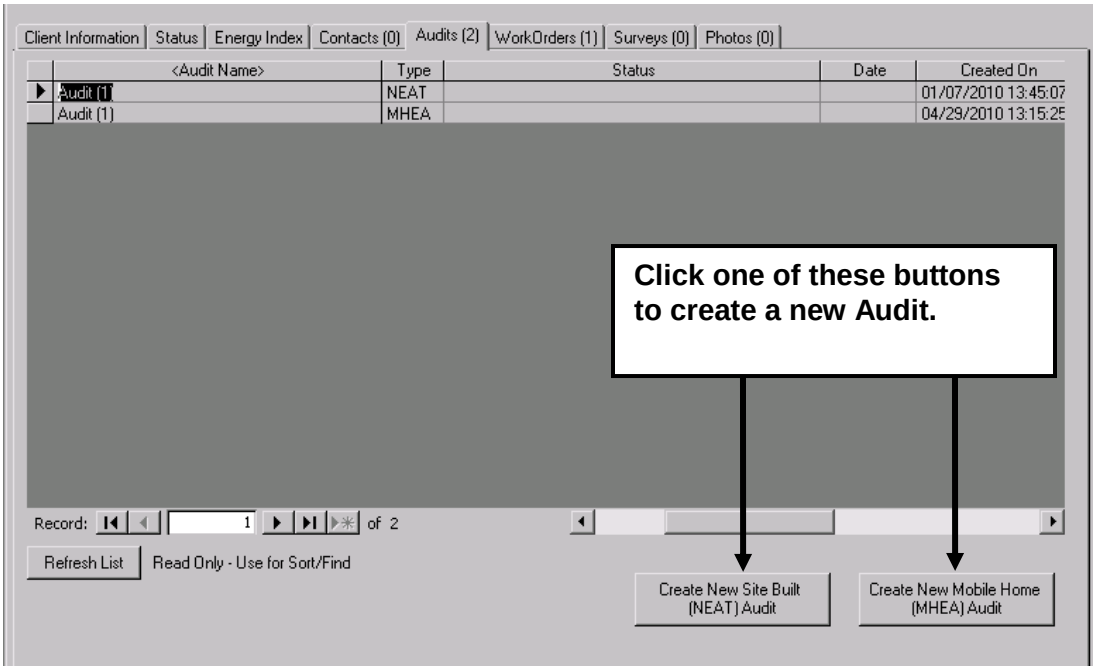
This tab shows the status of the client record as well as the status of all audits ran and work orders for this client.

3.2.2 Contacts Tab



The record marked “primary applicant” will be displayed whenever client records are selected from lists. Enter the name of the client to enable sorting and searching by name of client in the records.

3.2.3 Audit Tab



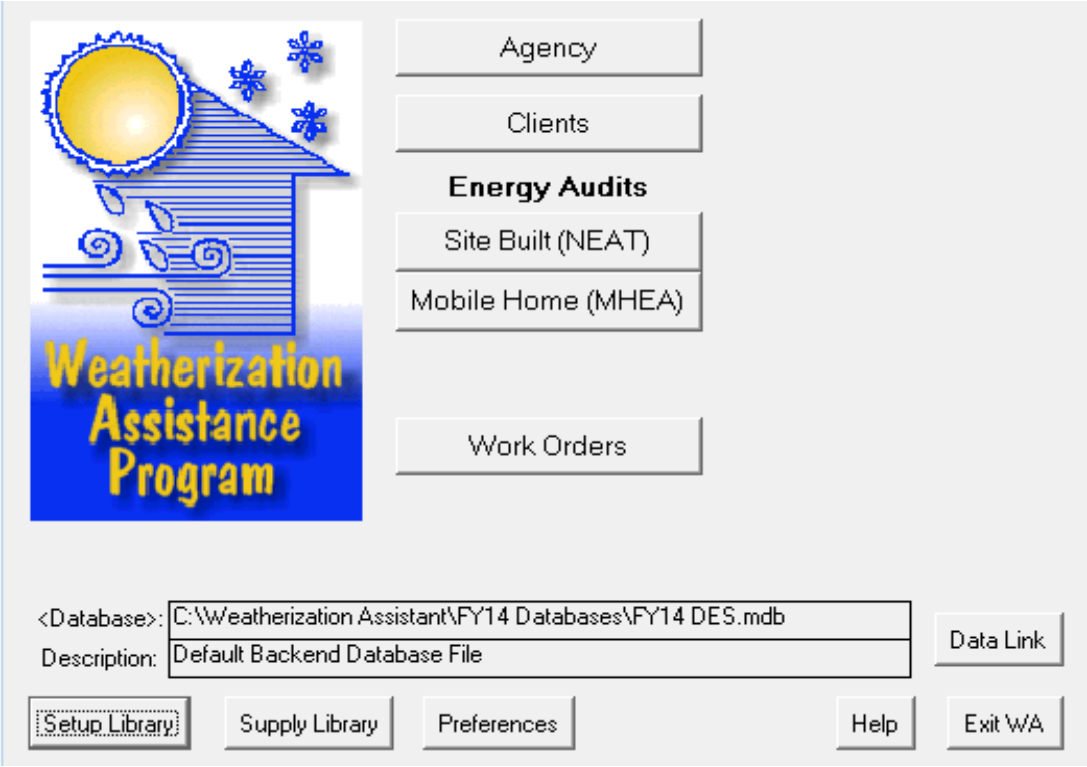
Use the Audit tab to list the audits associated with a client record. Buttons in the bottom right corner of this screen can be used to generate new NEAT or MHEA audits associated with the client. This is the best way to create a new audit to ensure that it is associated with the correct client information

Chapter 4 The NEAT and MHEA Audits

4.0 General Information

When performing energy audits for site built residential structures, use the National Energy Audit Tool (NEAT).

When performing energy audits for manufactured homes, use the Manufactured Home Energy Audit program (MHEA).



4.1 NEAT and MHEA Audit Information

This tab on the main NEAT and MHEA forms can be used to enter overall audit information about the house. Client information is entered using the Client button on the main menu. Then, the NEAT or MHEA buttons on the main menu can be used to enter overall audit information about the house.

4.1.1 Agency

This un-editable field displays the agency to which the client whose house is being audited is assigned.

4.1.2 Run Audit Button

After describing the house on the audit data forms, use the "Run Audit" button to have the audit perform its calculations and produce energy efficiency measure recommendations for the home. Within the same data block as the *Run Audit* button are un-editable fields showing the date and time the currently accessed audit was "Last Run On." If the audit has not yet been run for this

specific house description, the date field will display "Not Run." Multiple audits may be run, but the recommendations from any previous runs will be overwritten. To save the recommendations from previous audits on the same house, use the "Copy" button in the *Record Navigation* block (lower left hand corner) to copy the house description. Then, give the house description a new audit name (a variation of the original name), make any modifications to the house description, then use the *Run Audit* button to produce another set of recommendations.

Note: The Run Button is available from all Audit forms and may be activated from any of these forms once it has been decided that changes to the building description are complete.

4.1.3 Economics Summary

For completed audits with NEAT or MHEA recommendations, the *Economics Summary* block will display a summary of the recommendations:

- The number of Measures Recommended.
- The Total Initial Cost of the recommendations.
- The Life Cycle Savings to Investment Ratio (SIR) for all recommended work included in the SIR calculations.

If the audit has not been run on the house, the number of Measures Recommended will be "0" and the other fields will be blank. All of the fields within the *Economics Summary* block are un-editable.

4.1.4 Record Navigation Block

The Record Navigation block in the lower left corner of the form allows the user to find, copy, delete, and navigate to audits in the database.

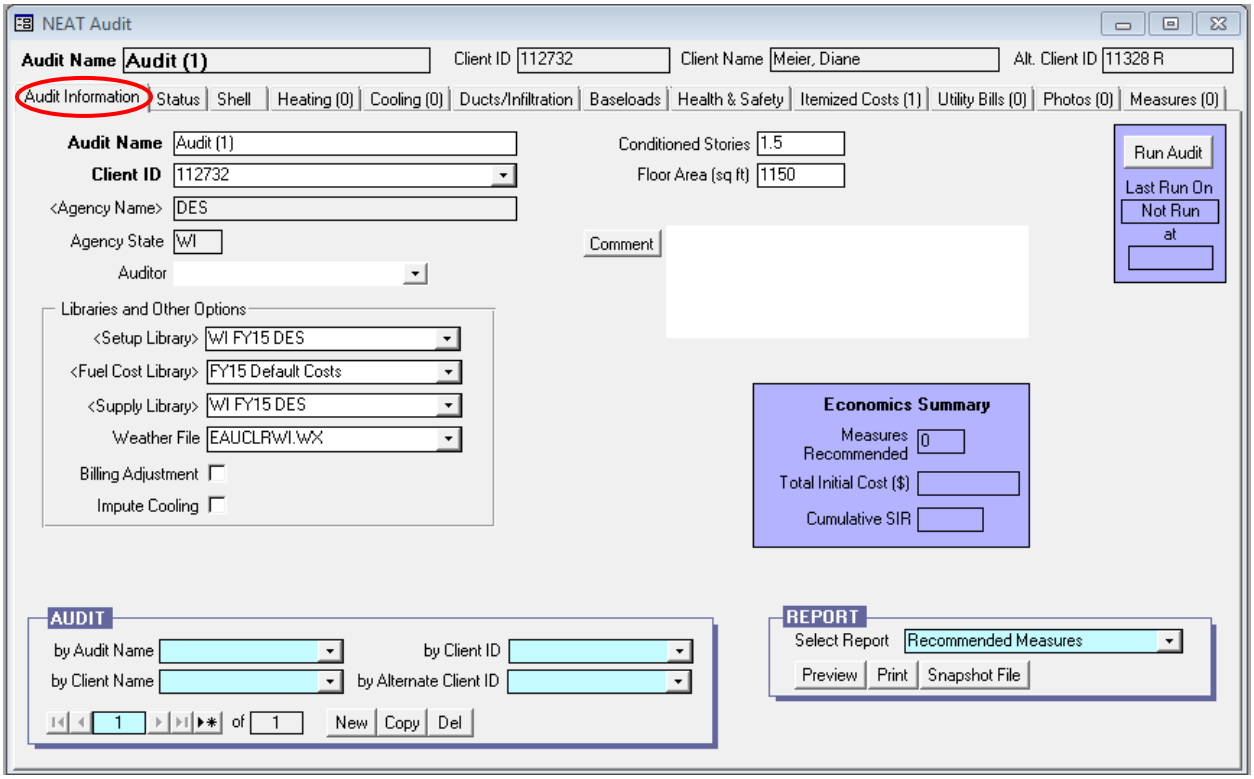
4.1.5 Report Block

The Report Block located in the lower right corner of the main NEAT and MHEA forms allows access to the various reports available in the audit. The reports may be displayed on the monitor, printed, or sent as an attachment to an e-mail, copied to a disc, or shared by some other means. Use the drop-down list to view and choose from the various reports.

4.2 Energy Audit Forms

Get to the NEAT energy audit form by pressing the Site Built (NEAT) or Mobile Home (MHEA) energy audit button on the main menu. The main form contains record navigation aids, command buttons, and multiple tabs for all the different audit information that is entered. The main form is where audits are copied, new audit records are defined, and audit information is entered. Users can make analysis runs, view recommended measures, and optionally, generate work orders.

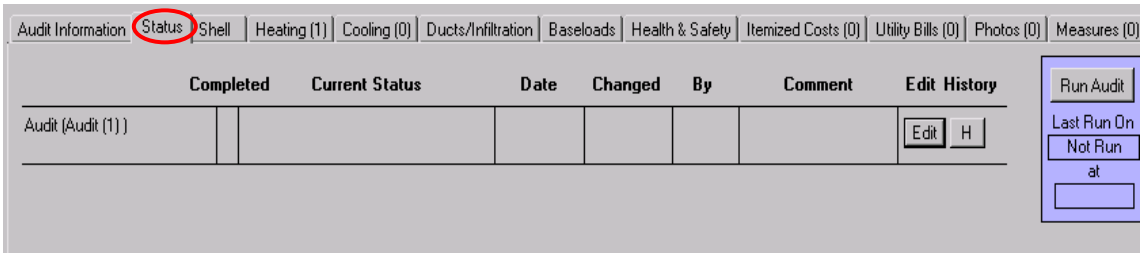
4.2.1 Audit Information



Note: Boxes outlined in black indicate a required entry field.
This tab displays general information about the audit. This tab also has the navigation block used to view different audit records as well as the reporting block to view or print specific reports. Users select the Setup and Supply libraries to use for the audit as well as the weather region.

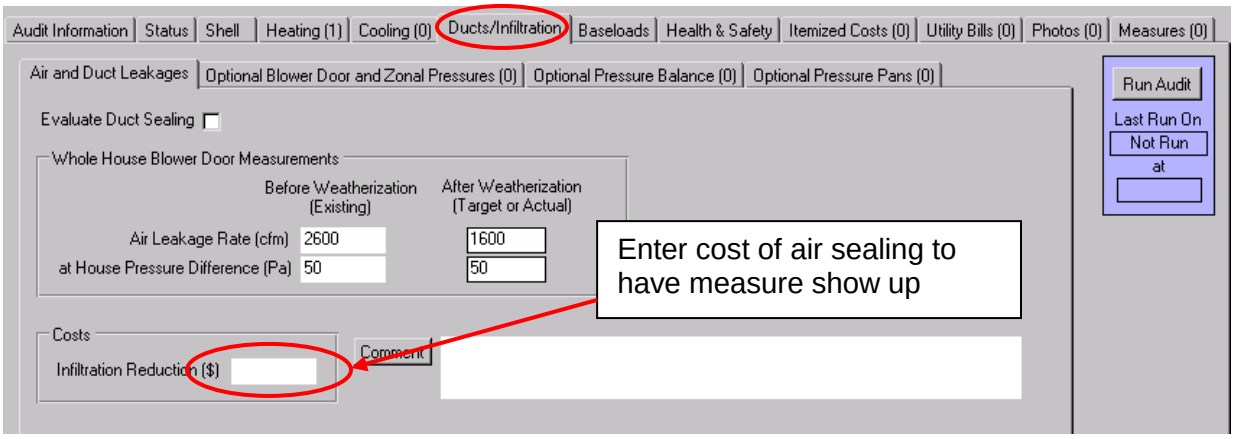
Tip: The audit information page is a good location to leave comments about the home and reasoning for not utilizing Pre-Wx Fuel consumption records.

4.2.2 Status



Use of the status tracking is optional. The status of the audit can be changed here or on the status tab of the client identification form. By selecting the history button it will show you the amount of runs associated with the audit.

4.3 Ducts and Infiltration



Note: Before Weatherization (Existing) and Infiltration Reduction ($) are required entries even though they are not outlined by a black box.

4.3.1 Evaluate Duct Sealing

When entering data to the MHEA audit, **do not check** the “Evaluate Duct Sealing” tab.

4.3.2 Whole House Blower Door Measurements

In the *Whole House Blower Door Measurements* box, enter the existing air leakage rate in CFM’s within the Before Weatherization (existing) box and use 50 Pascals as the House Pressure Difference. Auditors should use the measured As Is test taken during the audit.

4.3.2.1 After Weatherization – Target or Actual

In the After Weatherization (Target or Actual), enter the estimated final CFM number at 50 Pascals.

Tip: Utilize the modeling tab on the diagnostic workbook to give you a guide as to what CFM50 number to estimate.

4.3.2.2 Costs

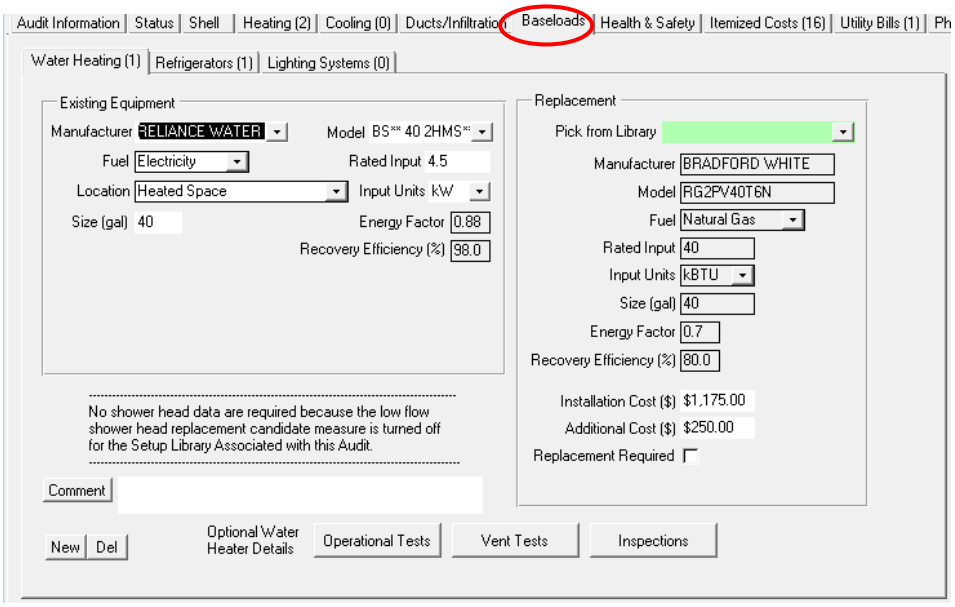
Enter the total estimated air sealing cost. Use the default air sealing rate provided to your agency prior to the start of each contract, multiplied by the total estimated reduction to calculate the cost. Adjust the cost when other measures will reduce air leakage such as dense packing sidewalls. Enter comments whenever the default rate is not used.

Note: Infiltration Reduction is the only measure that is performed regardless of SIR.

4.4 Baseloads

The term "baseload" refers to energy consumption from equipment or appliances whose usage is not directly affected by climatic conditions. In Wisconsin, the base load energy categories considered for reduction by weatherization are water heaters and refrigerators.

For 5-24 Unit Buildings use the 5-24 Unit Workbook to generate the savings for lighting packages, incorporating the savings information and costs into NEAT’s Itemized Cost section.



4.4.1 Domestic Water Heating (DWH)

4.4.1.1 DWH Manufacturer - Optional

Enter the existing water heater manufacturer's name. Use this field either to enter a manufacturer or to search the look-up tables for a matching entry.

4.4.1.2 DWH Model - Optional

Enter the existing water heater's model number. Use the manufacturer field to enter any model or to search the tables for a matching entry.

4.4.1.3 DWH Fuel Type - Required

Select the fuel used by the existing and replacement water heaters from the three choices: Natural Gas; Electric; or Propane. The entry is required for all hot water measures. If the manufacture and model have been successfully chosen from the database, this field will auto populate.

4.4.1.4 DWH Location - Required

Select one of three locations for the water heater:

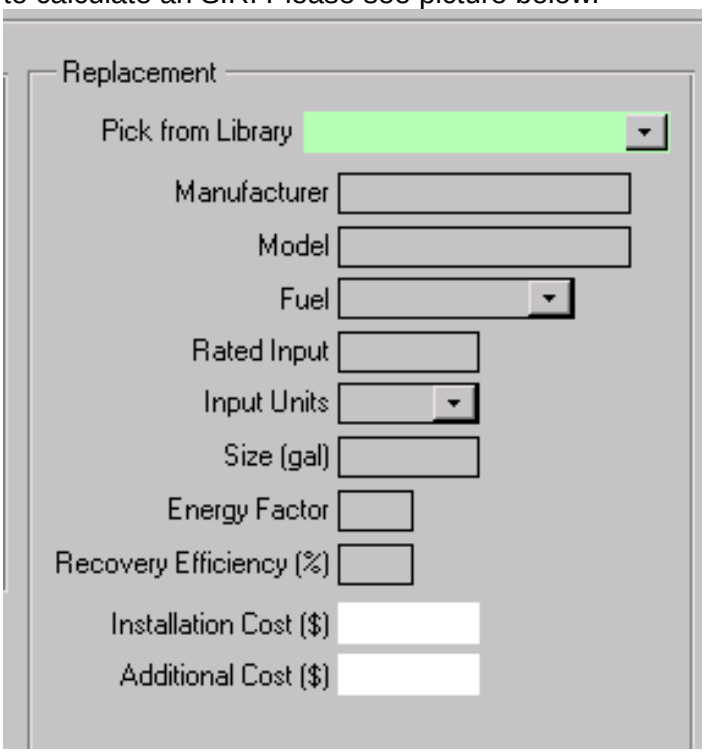
- Heated Space (purposefully heated by a heating system to maintain a desired temperature, usually utilizing a thermostat to control the space temperature. For example, a basement heated by supply registers or radiators in the space would be heated, as would a basement heated continuously by a space heater).
- Unconditioned Space (there are no sources of heat in the space other than conduction through walls, floors, and perhaps insulated ductwork).
- Unintentionally Heated Space (partially heated by a heat source in the space that adds heat unintentionally to the space. For example, a basement that is heated because furnace, boiler, or water heaters are located in the basement or because uninsulated ductwork runs through the basement).

4.4.1.5 DWH Tank Capacity – Required

Enter the standard rated tank capacity in gallons. If the manufacturer and model of the unit has been located in the database, it will automatically be entered. If the capacities have been entered for both the existing and replacement units and their values differ by more than 20%, the program will display a warning.

4.4.1.6 Replacement

After the Hot Water Equipment portion of the supply library has been completed, users can select a replacement water heater from the pick from library drop down list that the audit will use to calculate an SIR. Please see picture below.



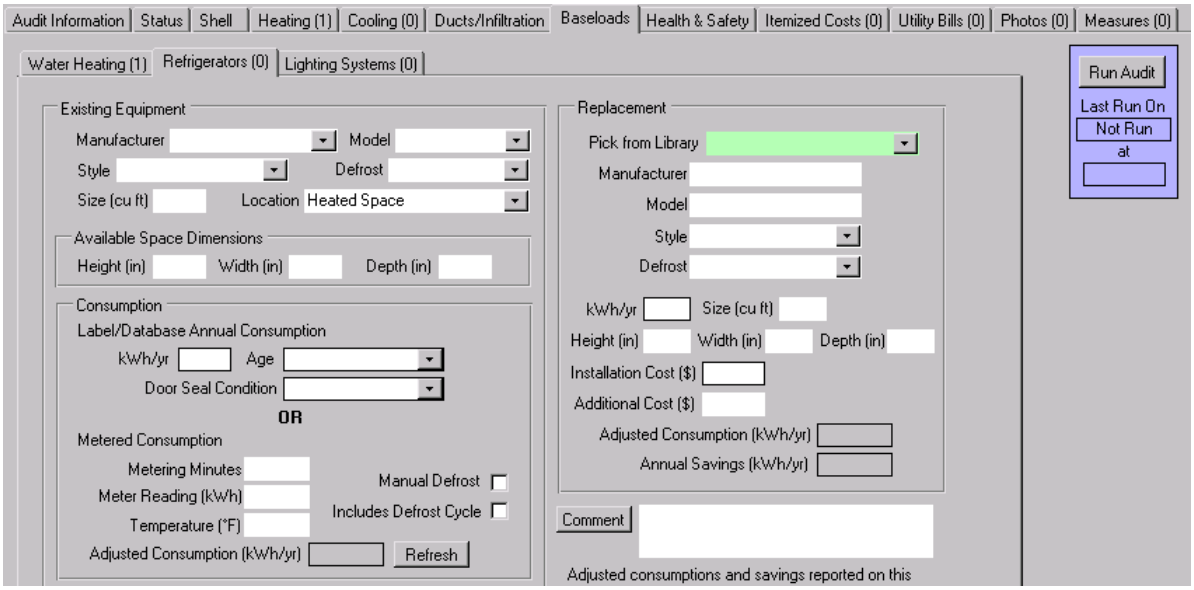
If the water heater has failed the H&S inspection, or the tank is leaking, users should check the Replacement Required and the Include in SIR check boxes. This will ensure that the replacement is selected by the audit.

A measure SIR of less than 1 shall be reported as an H&S replacement. A measure SIR that is greater than 1 shall be reported as an Energy Conservation Measure (ECM).

For 5-24 Unit Buildings model water heater conversion or replacement as a measure or improvement with the energy audit, based on the criteria listed in the specifications. When needed to model multiple water heater replacements, use the 5-24 Unit Workbook to generate savings information. Incorporate the savings information and costs into NEAT's Itemized Cost section. Building owners may opt to replace existing domestic hot water heating systems that do not meet a minimum 1.0 SIR test as a part of their contribution toward the weatherization of the building. The owner's contribution shall be equal to or exceed the buy-down amount needed to reach an SIR of 1.0. See below for more detailed instructions in regards to 5-24 Unit Buildings

1) Gas to gas replacements or system conversion: Model direct-fired gas storage water heaters for replacement which are greater than 5 years old and have an Energy Factor (EF) of <.61. Replace the water heating system if the replacement has a minimum 1.0 SIR when modeled with the energy audit. The replacement water heater shall be one of the following:
   a. Power-vented and have a minimum EF of .71 (for 40 and 50 gallon units) or a thermal efficiency of 95 percent.
      i. 30 gallon water heaters shall have a minimum EF of .63, and may be installed only when the unit cannot be upgraded to a 40 gallon unit.
   b. An indirect water heater working with a high-efficiency boiler system.
   c. A heat pump water heater with an EF of 2.0 or greater.
   d. One of the units listed above with a solar component. For solar water heaters modeled with the NEAT audit, use the itemized Cost section.
2) Fuel switch water heater conversions**:** Fuel switching replacement water heating systems from electric to gas or LP to natural gas is allowed when the total cost for fuel switching the system is modeled with the energy audit, the measure meets a minimum 1.0 SIR, and the building owner agrees to the conversion. Building owners may opt to replace existing water heating systems that do not meet a minimum 1.0 SIR test as a part of their contribution toward the weatherization of the building. The replacement system shall be properly sized and represent an increase in efficiency of at least 5 percent over the existing water heating system. The replacement shall be completed prior to the final inspection of the weatherization measures.
3) Electric to electric: Model the existing water heater system for replacement if the system is not properly sized, the water heater needs to be replaced based on safety concerns, or there is the potential to maximize energy efficiency. Replace the water heating system if the replacement has a minimum 1.0 SIR when modeled with the energy audit. The replacement water heater shall be one of the following:
   a. An electric storage water heater with a minimum thermal efficiency of 98 percent for commercial units or .95 EF for individual units.
   b. A heat pump water heater with an EF of 2.0 or greater.
   c. One of the units listed above with a solar component. For solar water heaters, contact the Home Energy Plus Help Desk (heat@wisconsin.gov) for assistance in calculating the savings costs.

4.4.2 Refrigeration



NEAT and MHEA include a refrigerator replacement measure. In order to evaluate the potential savings obtained from replacing an existing refrigerator with a newer, more efficient unit, the program needs to know an estimate of the existing and new refrigerator's annual energy use, in kWh/yr. This data can be obtained in one of three ways:

1) The databases containing many manufacturers' models of refrigerators data have been incorporated into the program. If the manufacturer and model are located in the look-up table provided, the required annual consumption will be entered automatically.

2) Refrigerators are sold with labels that list the estimated annual energy consumption in kWh/yr. If such an energy guide label is available for either the existing or new units (more likely for new units), it can be used as the source for this required input to the program.

3) Small meters exist which are capable of relatively easy monitoring of the consumption of a refrigerator. If using one of these meters, the program asks for the kWh consumed by the refrigerator during the monitoring period and the number of minutes monitored.

Additional inputs adjust the consumption data, when appropriate, for the ambient temperature of the space in which the refrigerator is located, the existing refrigerator's age, the condition of the door seals, and defrost cycles. The results of these adjustments, assuming the unit is in a heated space, are displayed in the un-editable "Adjusted Consumption" field at the bottom of the *Existing Equipment* block of data on the input form. For units in other than a heated space, insufficient information during the input prevents the adjustment based on space temperature.

Consumption data is also necessary for the replacement refrigerator. This data will be provided from the energy guide label on the replacement unit, or from values of pre-selected replacement

units in your library of replacement refrigerators. This library is defined under the *Refrigerators* tab in the *Supply Library*.

4.4.2.1 Refrigerator Capacity

Enter the size of the existing unit in cubic foot. These entries are always optional. However, if entered for both the existing and replacement units are not within 20%, the program will compare the entries and produce a warning.

4.4.2.2 Refrigerator Location

Select one of three locations for the refrigerator:

1) *Heated Space* (purposefully heated by a heating system to maintain a desired temperature, usually utilizing a thermostat to control the space temperature. For example, a basement heated by supply registers or radiators in the space would be heated, as would a basement heated continuously by a space heater);

2) *Unconditioned Space* (there are no sources of heat in the space other than conduction through walls, floors, and perhaps insulated ductwork);

3) *Unintentionally Heated* Space (partially heated by a heat source in the space that adds heat unintentionally to the space. For example, a basement that is heated because furnace, boiler, or water heaters are located in the basement or because uninsulated ductwork runs through the basement).

4.4.2.3 Available Space Dimensions − Optional

Enter the dimensions of the available space in inches, where the existing refrigerator is installed. These entries are always optional. However, if entered for both the existing and replacement units, the program will compare the entries and produce a warning if the entries indicate a possible size problem related to the replacement.

4.4.2.4 Refrigerator kWh/yr Label – Required

(Unless using metered consumption data, then it is not required)
Enter the annual kWh/yr consumption listed on the energy guide label for the existing unit, if one exists. Use the look-up tables to identify the existing unit; this value (if listed in look-up tables) will be entered automatically.

4.4.2.5 Refrigerator Age − Required

(Unless using metered consumption data, then it is not required)
Select one of the categories describing the age of the existing unit:

- Less than 5 years
- 5 to 9 years
- 10 to 14 years
- 15 or more years

If the look-up tables are used to identify the existing unit and the data is available from the tables, this data will be entered automatically. Note, however, the age from the tables will be

based on the first year the model was sold. If you know the existing model is newer than that indicated from the tables, change the entry.

4.4.2.6 Refrigerator Door Seal Condition − Required

(Unless using metered consumption data, then it is not required)
Enter the condition of the door seal on the existing refrigerator, the choices are:

- *Good,*
- *Fair-Some Wear*,
- and Poor-*Gaps Visible*

NEAT and MHEA will adjust table look-up and label values of annual consumption to reflect additional leakage through the door seals.

4.4.2.7 Refrigerator Metering Minutes

If you are using metered consumption data, enter the time period in minutes for which you metered the existing refrigerator. Metering should be performed for at least 180 minutes (3 hours). Attempt to prevent refrigerator door openings during the metering period. This entry is not required if the kWh/yr field has been used to provide the consumption data.

4.4.2.8 Refrigerator Energy Reading

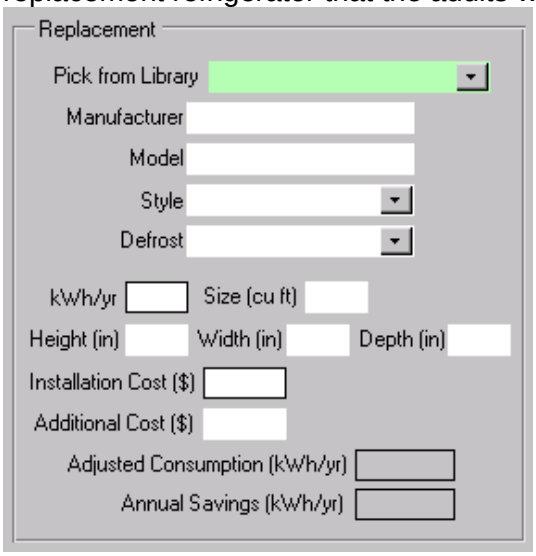
Enter the metered consumption in kWh for the period specified by the Metering Minutes. This entry is not required if the kWh/yr field has been used to provide the consumption data.

4.4.2.9 Refrigerator Ambient Temperature

Enter the metered ambient temperature around the refrigerator during the metering. This entry is not required if the kWh/yr field has been used to provide consumption data. The entry is used to adjust the metered refrigerator consumption of units whose location is other than a *Heated Space*.

4.4.2.10 Replacement

After the refrigerator tab in the supply library has been completed, users can select a replacement refrigerator that the audits will use to calculate an SIR.



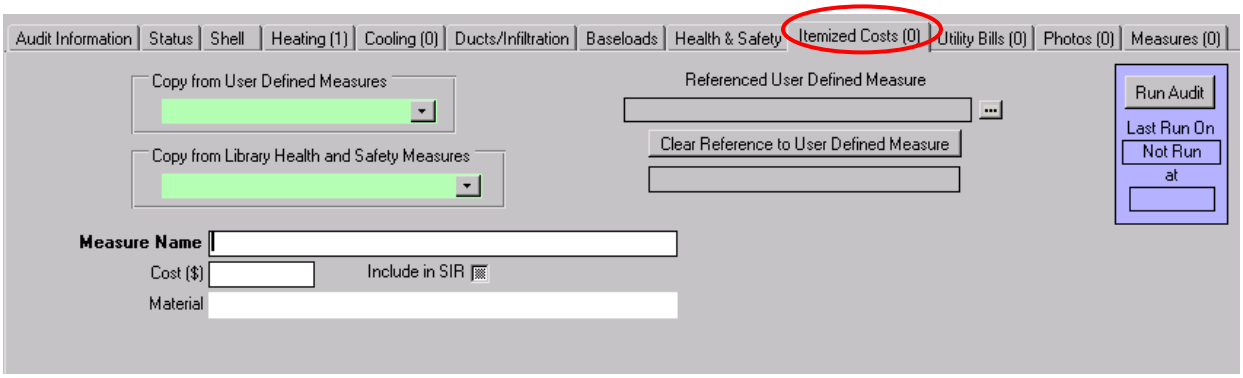
Click the Refresh button on the screen after you have entered or changed the data for the existing refrigerator to adjust kWh consumption for a more accurate SIR calculation.

For 5-24 Unit Buildings model all refrigerators with the energy audit. When needed, use the 5-24 Unit Workbook to generate savings information for multiple refrigerators. Incorporate the savings information and costs into NEAT's Itemized Cost section. Replace refrigerators if the measure has an SIR greater than or equal to1.0. Replacement refrigerators are limited to one per household. De-manufacture and properly dispose of pre-existing unit.

If the owner has a list of refrigerators owned in all units, verify the accuracy of the list in the 25 percent sample of units audited. If no list exists, verify during the audit the make and model and age of every refrigerator to be replaced.

Remove, de-manufacture, and properly dispose of functioning secondary refrigerators with R-12 refrigerant listed on the label, whenever possible. Offer a $100 incentive for removal. Incentives may be paid for the removal of one unit per tenant household.

4.5 Itemized Costs/User Defined Measures



Entries on the *Itemized Cost* form allow selection of all H&S, Repair, Slab Exterior Foundation Insulation, Freezers, Electric and Secondary Heating Systems and other relevant measures that are pre-set in the User Defined Measures library in the Setup Library.

Select the measure from one of the *Itemized Cost* list, enter the actual expected cost. Remember to click new before selecting subsequent entries. Uncheck "Include in SIR" for health and safety items when the total cost of H&S is less than $1000.00. **DO NOT** include the exempted measures listed below in calculating the $1000 nor include them in the SIR.

Type	**Measure Name**	**Include In SIR**
Baseloads	MWHC005 Gas power vent from conventional gas	Yes
Baseloads	MWHC010 Gas power vent from electric	Yes
Baseloads	MWHC035 Indirect Fired Water Heater	Yes
Baseloads	MWHT005 Flow Restrictors	No
Baseloads	MWHT010 Pipe Insulation	No
Baseloads	MWHT015 Reduce Temperature	No

Type	Measure Name	Include In SIR
Baseloads	MWHT020 Showerhead	No
Baseloads	MWHT025 Tank Insulation	No
Baseloads	PCFL005 CFL Bulbs	No
Baseloads	PCFL010 Torchiere Replacement	No
Baseloads	PCFL015 LED Exit Light	No
Baseloads	PCFL070 LED Bulb	No
Baseloads	URR005 Refrigerator Replacement	Yes
Baseloads	URR010 Refrigerator Removal	No
Baseloads	VFR005 Freezer Replacement	No
Baseloads	VFR010 Freezer Removal	No
Building Insulation	DIA120 Attic Prep - No Attic Insulation	Yes
Building Insulation	DIFO020 Exterior Foundation Insulation (Slab)	Yes
HVAC Systems	JBM005 Automatic Fill Valve	Yes
HVAC Systems	JBM010 Compression Tank	Yes
HVAC Systems	JBM015 Electric Vent Damper	Yes
HVAC Systems	JBM020 Outdoor Reset	Yes
HVAC Systems	JBM025Radiator New or Replacement	Yes
HVAC Systems	JBM030 Radiator Valves	Yes
HVAC Systems	JBM035 Backflow Preventer	Yes
HVAC Systems	JBM040 Modulating Aquastat	Yes
HVAC Systems	JBM045 Intermittent Ignition Device (IID)	Yes
HVAC Systems	JBM055 Zone Valves	Yes
HVAC Systems	JBM060 Boiler Distribution System Modifications	Yes
HVAC Systems	JHSM005 Clean and Tune	No
HVAC Systems	JHSM010 Disposable Filters	No
HVAC Systems	JHSM011 Cleanable Filters	No
HVAC Systems	JHSM015 Setback Thermostat	No
HVAC Systems	JHSM020 First Floor Ductwork	Yes
HVAC Systems	JHSM025 Second Floor Ductwork	Yes
HVAC Systems	JHSM030 Insulate Ducts	No
HVAC Systems	JHSM035 Seal Ducts	No
HVAC Systems	JHSR060 Electric Conversion	Yes

Type	Measure Name	Include In SIR
Health and Safety	XHAL005 CO Detector New or Replace	Yes if Total H&S >$1000
General Repairs	ZRAQ005 Dryer Venting	Yes
Health and Safety	XHAR005 62.2 Exhaust Ventilation	No
Health and Safety	XHAQ005 Worst Case Draft Test	No
Health and Safety	XHAQ006 Worst Case Depressurization w/o Draft	No
General Repairs	ZRRS040 Other Repair	Yes
Health and Safety	XHHW010 Water Heater Repair	Yes if Total H&S >$1000
Health and Safety	XHAQ035 Other Remediation Air Quality	Yes if Total H&S >$1000
Health and Safety	XHAQ045 Gas Leak Repair	No
Health and Safety	XHHS025 Furnace Repair	Yes if Total H&S >$1000
General Repairs	ZRRS045 Ventilation - Soffit/Roof/Gable	Yes
Health and Safety	XHHW007 Gas power vent from conventional gas	Yes if Total H&S >$1000
Health and Safety	XHEL015 Upgrade or Repair Electric	Yes if Total H&S>$1000
General Repairs	ZREL005 Upgrade or Repair Electric Service	Yes
Health and Safety	XHAQ007 Chimney Liner	Yes if Total H&S >$1000
Health and Safety	XHAL010 Smoke Detector New or Replace	Yes if Total H&S >$1000
Health and Safety	XHAL020 Combo Smoke/CO Detector	Yes if Total H&S >$1000
General Repairs	ZRHW005 Water Heater Repair	Yes
General Repairs	ZRHW010 Plumbing Repair or Replace	Yes
Health and Safety	XHHS020 Furnace Replace	Yes if Total H&S >$1000

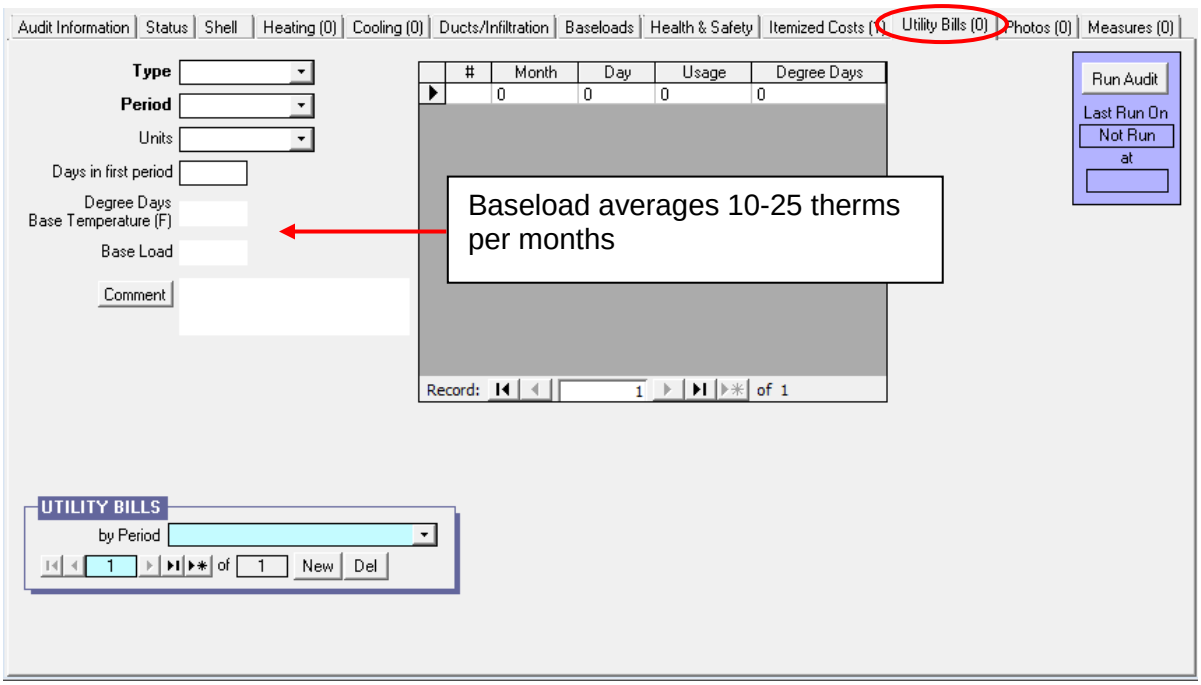
Type	Measure Name	Include In SIR
Health and Safety	XHHS030 Ducts Repair or Replace	Yes if Total H&S >$1000
Health and Safety	XHAP015 Appliance Repair or Replace	Yes if Total H&S >$1000
General Repairs	ZRHS030 Thermostat Replacement - Not Energy Star	Yes
General Repairs	ZRRS030 Door Replacement R9	Yes
General Repairs	ZRRS005 Chimney	Yes
General Repairs	ZRRS085 Repair Structure Other – Major Pressure Boundary	Yes
General Repairs	ZREL015 Knob and Tube Replace Attic	Yes
General Repairs	ZREL020 Knob and Tube Replace Walls	Yes
Health and Safety	XHHS010 Boiler Repair	Yes if Total H&S >$1000
Health and Safety	XHHS015 Boiler Radiators, Repair or Replace	Yes if Total H&S >$1000
Health and Safety	XHHW004 Electric to Electric .94	Yes if Total H&S >$1000
Health and Safety	XHHW005 Water Heater Replace	Yes if Total H&S >$1000
Health and Safety	XHHS005 Boiler Replace	Yes if Total H&S >$1000
Health and Safety	XHHW008 Gas power vent from electric	Yes if Total H&S >$1000
General Repairs	ZRRS035 Window Replacement Energy Star Rated	Yes
General Repairs	ZRRS020 Walls	Yes
General Repairs	ZRRS010 Floors	Yes
General Repairs	ZRRS015 Roof	Yes
Health and Safety	XHSS030 Lead Paint Remediation	Yes if Total H&S >$1000
Health and Safety	XHAR015 Heat or Energy Recovery Ventilator	No
Health and Safety	XHAR010 Exhaust Ventilation with Makeup Air	No

Type	Measure Name	Include In SIR
Health and Safety	XHHS035 Space Heater Replace	Yes if Total H&S >$1000
Health and Safety	XHHS040 Space Heater Repair	Yes if Total H&S >$1000
Health and Safety	XHHS050 Wood Repair	Yes if Total H&S >$1000
Health and Safety	XHHS045 Wood Replace	Yes if Total H&S >$1000
Health and Safety	XHHS055 Electric Replace	Yes if Total H&S >$1000
Health and Safety	XHHS060 Electric Repair	Yes if Total H&S >$1000
Health and Safety	XHAQ040 Cook Stove Repair	Yes if Total H&S >$1000
Health and Safety	XHHW015 Plumbing Repair or Replace	Yes if Total H&S >$1000
Health and Safety	XHSS035 Other Remediation Structure	Yes if Total H&S >$1000
Health and Safety	XHSS005 Chimney	Yes if Total H&S >$1000
Health and Safety	XHSS010 Floors	Yes if Total H&S >$1000
Health and Safety	XHSS015 Roof	Yes if Total H&S >$1000
Health and Safety	XHSS020 Walls	Yes if Total H&S >$1000
Health and Safety	XHAQ025 Dehumidifier New or Replace	Yes if Total H&S >$1000
Health and Safety	XHAS005 Attic with Vermiculite	Yes if Total H&S >$1000

Type	Measure Name	Include In SIR
Health and Safety	XHAS010 Attic with Non-Vermiculite ACM	Yes if Total H&S >$1000
Health and Safety	XHAS015 Sidewalls with Vermiculite	Yes if Total H&S >$1000
Health and Safety	XHAS020 Sidewalls Slate/Stucco Siding	Yes if Total H&S >$1000
Health and Safety	XHAS025 HVAC/Distribution	Yes if Total H&S >$1000
Health and Safety	XHAS030 Miscellaneous ACM	Yes if Total H&S >$1000
Health and Safety	XHAR007 Local Exhaust Ventilation	No
Health and Safety	XHAR009 Venting Existing Exhaust	No
General Repairs	ZRHS035 Fuel Switching	Yes

4.6 Fuel Records/Utility Bills

Both NEAT and MHEA allow comparison of consumption predictions with pre-retrofit billing data, then, will adjust the measure recommendations and savings to reflect actual consumption.



Note: Please add a comment on the Audit Information tab indicating why you are not using utility bills if that is the case

4.6.1 Entering Billing Data

Use the Therm Calculator that is found on the HE+ website to convert all fuel consumption to therms and to adjust for annual HDD variances.

To enter billing data, use up to 12 months of utility bills. If the client has discarded their bills, he or she may request consumption records from the local utility. Or, the client may sign a release, which grants authority to the weatherization agency to obtain the data. WHEAP staff may also be able to assist in getting this information. If the customer is using Natural Gas, you may be able to pull the billing data from WHEAP, which will provide the monthly breakout of Therms, and Cost.

The billing data features work best with metered fuels, such as natural gas and electric. Bulk fuels may require unit conversions, unless deliveries are relatively frequent and approximately the same amount of fuel remains in the tank at the time of each delivery, use of billing data for these fuels can lead to substantial inaccuracy.

Billing periods entered into NEAT or MHEA must be consecutive. They may extend from one year into the next, but must span one year or less. The number of periods entered must be 12 or less. For example, entries can be:

1) One annual consumption (**Wisconsin preferred method to enter consumption**)
2) Twelve consecutive monthly readings
3) Any number of consecutive periods, 12 or less

For 5-24 Unit Buildings Fuel consumption documentation requirements are:

1) Master metered 5-24 unit buildings shall have heating fuel consumption records for the preceding 12 months submitted by the building owner as a part of the certification process.

2) Buildings with individual mechanical systems in each unit shall have the actual consumption records for each unit. Tenants not certified as Home Energy Plus eligible (free riders) will need to provide fuel consumption records to the building owner or the grantee.
    a. When fuel records are unavailable, free riders will need to sign a release to allow access to their utility records.

3) When fuel records are not available for individual units, use the Therm Calculator worksheet in the 5-24 Unit Workbook. This calculator will project the total building fuel consumption using a median consumption projection for units without actual data, based on heating costs or partial consumption data.

Tip: Use annual consumption when possible and enter actual Pre-Wx consumption period days as the billing period. This allows for fewer entries, and provides better accuracy for bulk fuel users.

4.6.1.1 Utility Bill Type

Select Heating as the major purpose for which the fuel entered is used. The fuel may also supply non-heating or cooling end uses, such as cooking or domestic hot water heating. In these cases, you will have to enter an estimate of this "Base Load" in a subsequent field.

4.6.1.2 Utility Bill Period

Select that the data being entered pertains to a Pre-Retrofit or period. Only Pre-Retrofit data will be used for measure savings adjustments.

4.6.1.3 Utility Bill Units

Select the units of energy use data, either Therms or kWh, depending on the fuel source for the data being entered.

4.6.1.4 Days in first period

Enter the number of days included in the first billing period. Subsequent periods are assumed to be contiguous. Enter actual Pre-Wx consumption period days.

4.6.1.5 Base Temperature

The *Utility Bills Data Entry* screens provide an option for entering heating degree days (HDDs) for natural gas and electricity billing data. The degree-day information will not affect any adjustments to the measure savings. It allows comparison of degree-days used by NEAT and MHEA with those from the actual billing periods.

If degree-day information is entered, NEAT and MHEA require base temperatures for these HDD values. Assume a base temperature of 65°F for HDDs, unless a different base temperature is listed on the utility bill.

4.6.1.6 Base Load

Enter an estimate of the average base load consumption per month in the units chosen in “Units” above. The period consumption entered likely results from not only heating or cooling, but also from use of appliances, such as stoves, water heaters, or refrigerators. Billing analysis needs to separate this "base load" consumption from the heating and cooling consumption. This entry is an estimate of this base load consumption for an average 30-day month.

Do not enter the total amount of baseload consumption.

4.6.1.7 Utility Bill Entry Number

Provide entries beginning with "1" and increase integrally for successive entries.

4.6.1.8 Utility Bill Month of Meter Reading

Enter the number of the month in which the meter reading corresponding to the billing period was taken (e.g. January 1, February 2, etc.). When modeling with annual consumption this number can be entered as “1”.

4.6.1.9 Utility Bill Day of Meter Reading

Enter the day of the month on which the meter reading corresponding to the billing period was taken. When modeling with annual consumption this number can be entered as “1”.

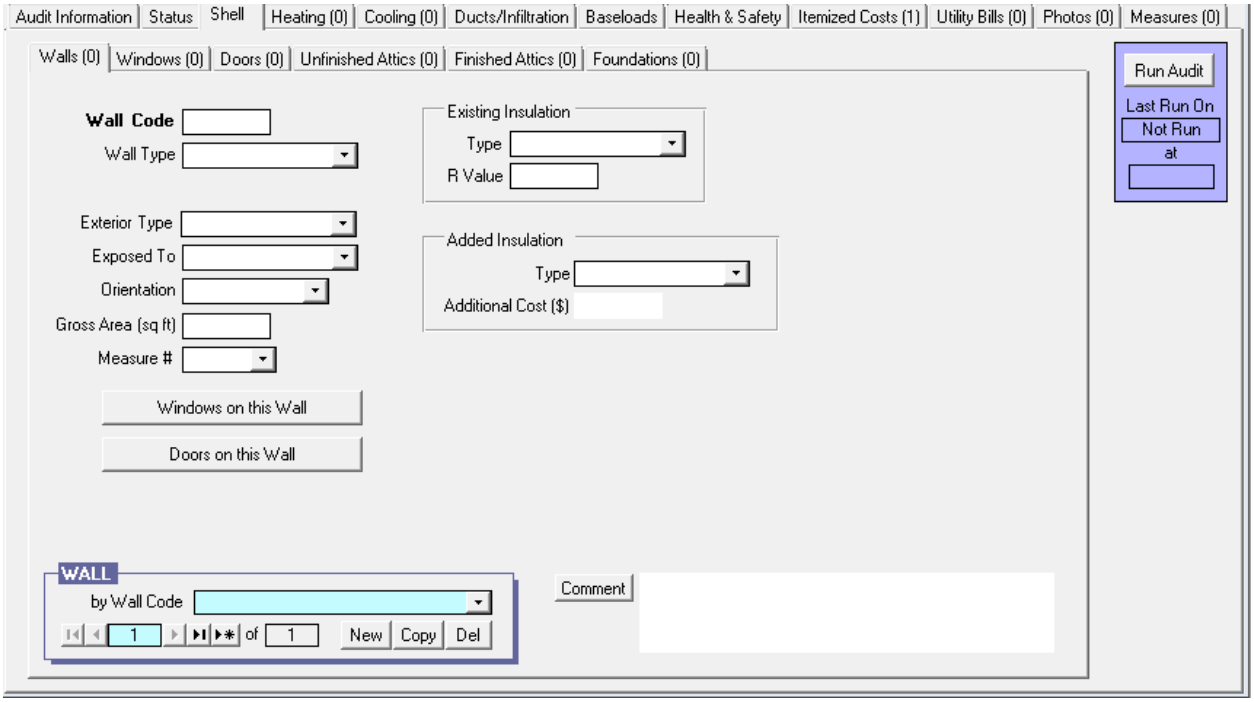
4.6.1.10 Usage During Metering Period

Enter the consumption during the billing period in units selected in the unit’s field on the form. When modeling with annual consumption enter the total therms used.

4.6.1.11 Degree Days During Metering Period

Enter the number of heating degree-days during the billing period. (Optional).

5.0 Shell



The shell tab contains sub tabs and forms used to describe the thermal envelope (or shell) of the home.

Note: Boxes outlined in black indicate a required entry field.

5.0.1 Walls

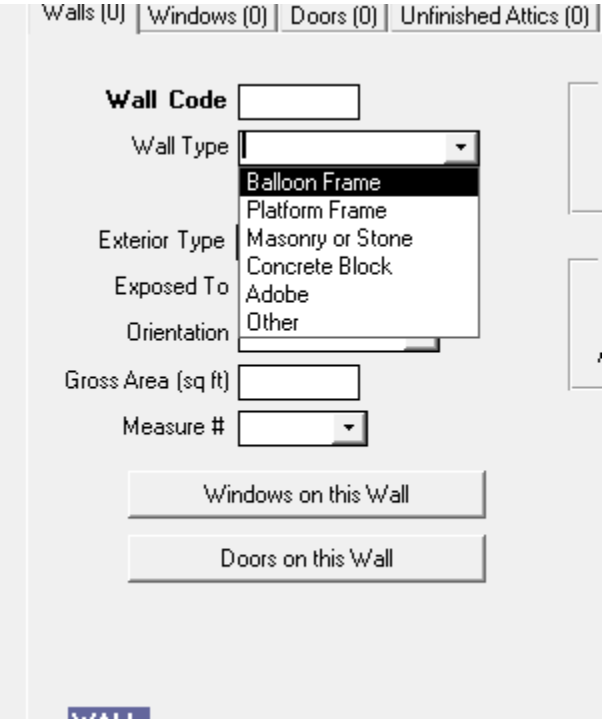
In NEAT at least one wall in each cardinal direction is required to be described. To simplify input, combine multi-storied walls having the same orientation, insulation and construction type.

5.0.1.1 Wall Code – Required

Wall codes are abbreviated names used to identify house components for later identification. When selected, (push tab), the wall code is automatically entered as WL1 (Wall 1). It is recommended that auditors change the codes to accurately represent each wall section. Codes may contain up to twenty letters or numbers and are not case-sensitive, but it is suggested the length be kept to three to five characters.

Tip: Name the walls North, South, East and West to help identify them to crews as well for if questions arise during weatherization that would require the auditor to “re-look” at the original energy audit.

5.0.1.2 Wall Type − Required



Select the type of load-bearing structure of the wall. The choices are Balloon Frame, Platform Frame, Masonry or Stone, concrete Block, Adobe, and Other. NEAT does not differentiate between a balloon frame and platform frame structure. This distinction is for the benefit of you.

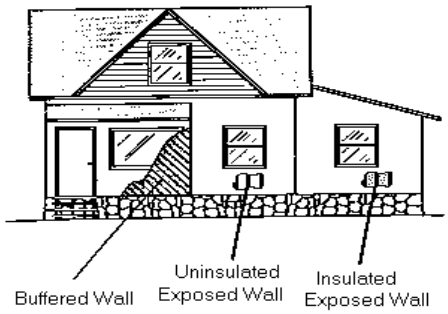
5.0.1.3 Stud Size − Required

Select size from drop down list. Default is 2X4. The choices are 2, 3, 4, 6 and 8. The material cost for insulating frame walls will be adjusted to reflect the available space in the wall cavity and determined by the stud size and any existing insulation.

5.0.1.4 Exterior Type − Required

Select the type of siding on the exterior wall. NEAT assumes a layer of wood sheathing under the siding. The choices are Wood, Metal, Stucco, Brick or Stone, None and Other.

5.0.1.5 Wall Exposure − Required



Describe the conditions seen by the outer surface of the wall. The surface can be "**Exposed**" to the outside air temperature, or "**Buffered**" by an unconditioned but enclosed space (such as a garage or porch). **Do not use the third option,** adjacent to an “Unconditioned Attic” space use “Buffered Wall” for this also

5.0.1.6 Wall Direction − Required

Select the closest cardinal compass direction the wall component faces:
(N) – North (S) – South (E) – East (W) – West

5.0.1.7 Gross Area − Required

Enter the total gross area of the exterior wall; include the square feet of the windows and doors. NEAT/MHEA will remove the square footage of the windows and doors for you. The entry must be in square feet and be greater than zero.

5.0.1.8 Wall Measure Number − Required

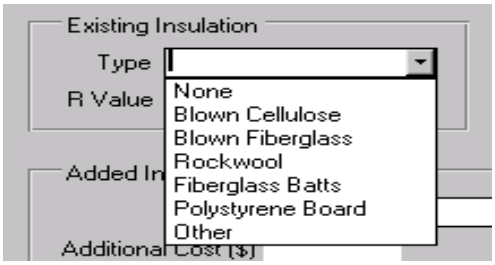
Give the same measure number to all wall segments that contain the same existing characteristics to provide a single SIR when calculated. **Caution:** Walls with separate measure numbers are evaluated individually and not all sections may be selected by the audit as a recommended measure.

Tip: Enter insulation voids as a separate record to allow NEAT to calculate an SIR all voids.

Tip: Walls with settled insulation should be modeled as two separate entries, one for the empty portion and one for the insulated portions. You may want to name these accordingly (i.e. east insulated, east uninsulated)

5.0.1.9 “Existing Insulation” Box

Type − Required



Select the type of insulation found in the wall, if any. The choices are None, Blown Cellulose, Blown Fiberglass, Rockwool, Fiberglass Batts, Polystyrene Board, and Other. Select "None" if walls are empty. If both cavity insulation and exterior sheathing insulation are present, enter the type that has the greatest R-value (you should also note this in the Comment field). Please comment on the reasoning to choose other.

Note: If Polystyrene Board is selected and the wall type is Balloon or Platform Frame, NEAT assumes that the Polystyrene Board and other insulation types are installed over the wall studs rather than between the studs as is assumed for the remaining insulation types.

5.0.1.10 R-value – Required

Enter the R-value of the insulation found in the wall. The default value displayed on the status bar assumes a 3-1/2 inch cavity and standard R-values per inch for the insulation type specified by the user in the previous entry. If both cavity insulation and exterior sheathing insulation are present, their total R-value combined should be entered for this field.

5.0.1.11 “Added Insulation” Box

Type − Required
Select blown cellulose, blown fiberglass, R19 batt or R11 batt if insulation. Select "None" if conditions prohibit insulating the wall and comment on the reasoning to choose none.

5.0.1.12 Additional Cost

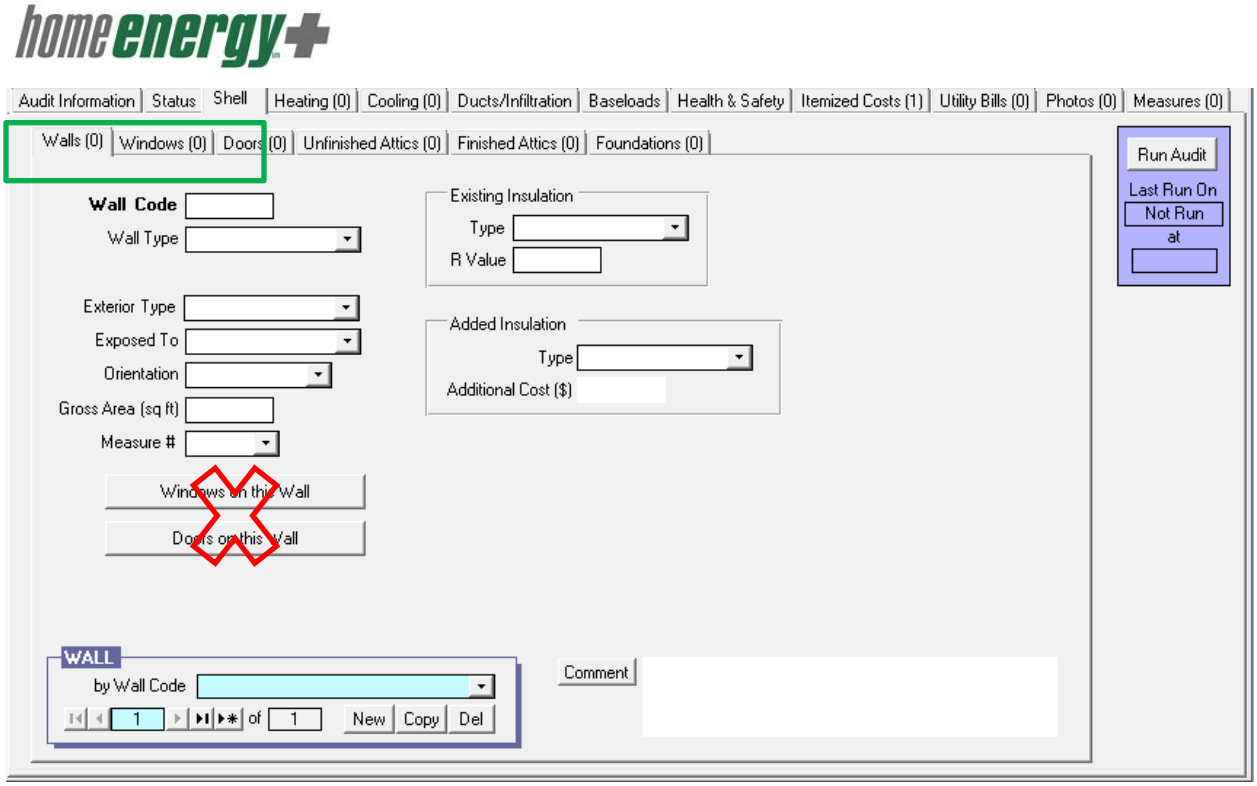
Enter additional cost associated with insulating a specific wall segment in units of dollars. These costs could be the difference between what is in the setup library to what is subcontracted to perform sidewall insulation. Increases and decreases to the cost will need to be completed. This would be a cost that is not normally associated with the wall insulation measure and, therefore, is not accounted for in the measure costs entered on the Library Measures. If a cost is entered, you should briefly explain the reason for this additional cost in the Comment field described below.

Job cost reduction costs shall be recorded in WisWAP and shall not be entered or modeled in Weatherization Assistant

5.0.1.13 Comment

You may enter comments pertinent to the wall segment directly in the Comment field on the form, or you may enter them in the Comment Editor by selecting the “Comment” button to the left of the field.

The WALL screen has two buttons where an auditor can enter windows and doors. Do not enter window or door information from this screen. Select the WINDOW tab and DOOR tab instead.


home energy+
Audit Information
Status
Shell
Heating (0)
Cooling (0)
Ducts/Infiltration
Baseloads
Health & Safety
Itemized Costs (1)
Utility Bills (0)
Photos (0)
Measures (0)
Walls (0)
Windows (0)
Doors (0)
Unfinished Attics (0)
Finished Attics (0)
Foundations (0)
Run Audit
Last Run On
Not Run
at
Wall Code
Wall Type
Existing Insulation
Type
R Value
Exterior Type
Exposed To
Orientation
Gross Area (sq ft)
Measure #
Added Insulation
Type
Additional Cost ($)
Windows on this Wall
Doors on this Wall
WALL
by Wall Code
1
of
1
New
Copy
Del
Comment

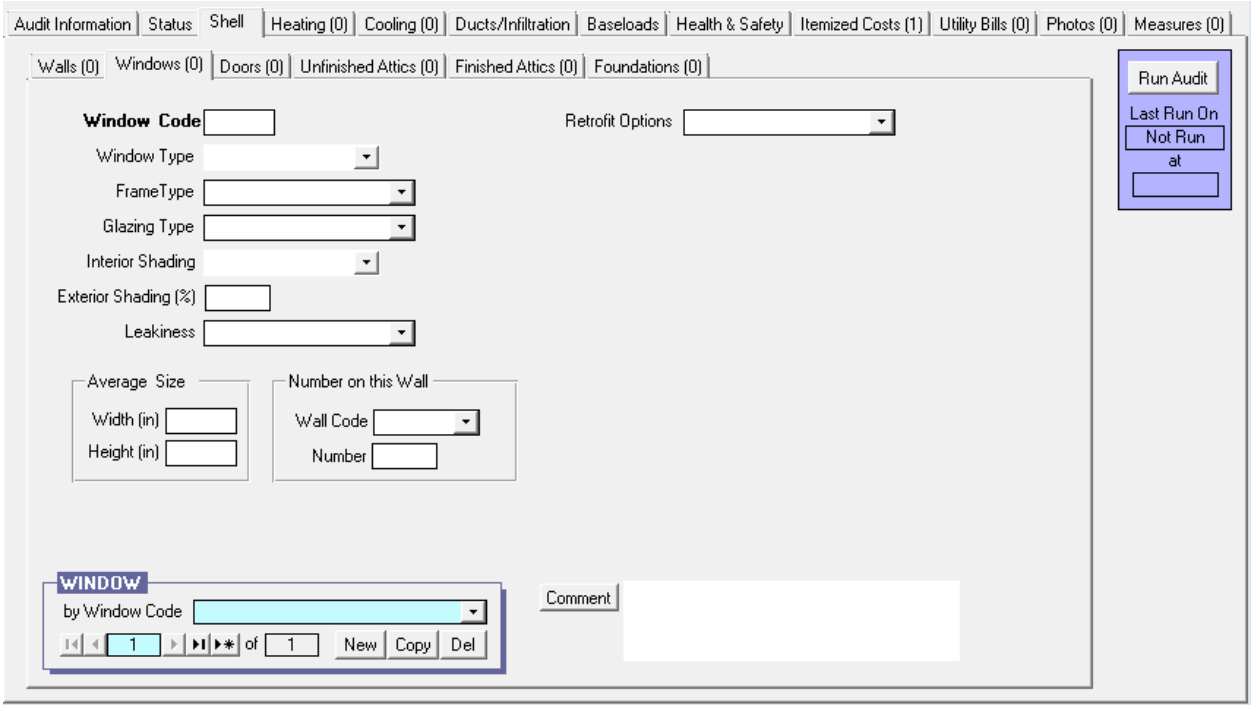
5.0.2 Windows

5.0.2.1 Window Code − Required

Window codes are abbreviated names specified by the user for later identification. They may contain up to twenty letters or numbers and are not case-sensitive. Usually three to five characters is adequate. The default window code when you hit tab is automatically entered as WN1 (Window 1). A total of 24 window descriptions may be entered.

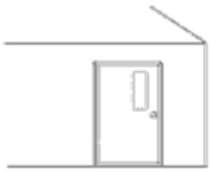
Tip: Use specific names and measurements if a window is going to be replaced or repaired.

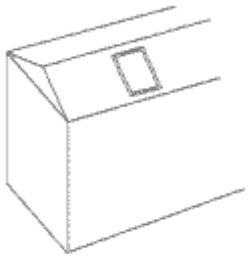
5.0.2.2 Window Type − Required



The window description is the type of window found. The window type choices are Jalousie, Awning, Slider, Fixed, Door Window, Sliding Glass Door, and Skylight. See detailed descriptions below for window types.

Jalousie	**Jalousie** windows are constructed of horizontal panes (about 6 inches wide) that open at the same angle when a crank near the bottom of the window is turned. Jalousie windows are always single pane. Often, very large gaps between the glass panes exit resulting in high infiltration rates through the window.

 Awning	**Awning** windows are hinged at the top or side of the window so that when opened (usually by turning a crank), the glass angles out from the home exterior. The glass either angles down or to the side, depending on where the window is hinged to the home.
 Vertical Slider	**Slider** windows usually have two panes of glass and either one or both panes slide past the other when the window is opened.
 Horizontal Slider	**Slider** windows usually have two panes of glass and either one or both panes slide past the other when the window is opened.
 Fixed	**Fixed** windows are sealed in the window frame and cannot be opened.
 Door	**Door** windows are sealed in the window frame of a door and cannot be opened.
 Sliding Glass	**Sliding glass doors** are large windows that extend to the floor and can be opened to enter or exit building

 Skylight	**Skylights** are glass or plastic windows in the ceiling of a home.

5.0.2.3 Frame Type − Required

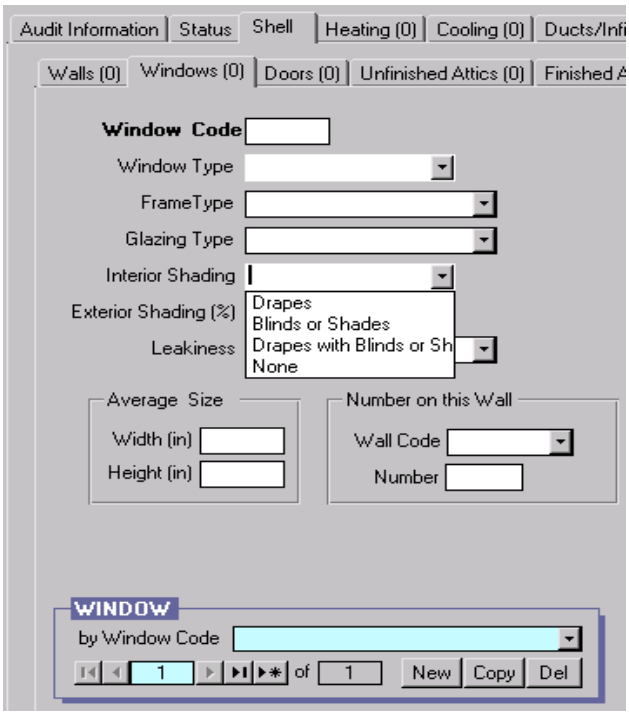
Select the correct window frame and sash construction materials. The choices are Wood or Vinyl, Metal, and Improved Metal. "Improved Metal" frames have a thermal break between the inside and outside framing members.

5.0.2.4 Glazing Type − Required

Select the window glazing type, depending on the number of panes of glass in the primary window, and the characteristics of any storm window that may cover the primary window. The choices are Single Pane, Single with Wood Storm, Single with Metal, Storm, Single with Bad Storm, Double Pane, and Double Pane Low-e.

Tip: NEAT treats a "Single with bad storm" as a single pane window without a storm.

5.0.2.5 Interior Shading − Optional



Interior shading can affect the insulating value of the window as well as the solar loads on the home. The options are Drapes, Blinds or Shades, Drapes with Blinds or Shades, and None. Interior shading devices affect the amount of heat gained or lost through windows. They slightly affect the window insulating value (U-value).

5.0.2.6 Percent Shaded − Required

Enter the approximate percentage of window area frequently shaded by eaves (typically 20%), porches (typically 100%), or other physical exterior barriers. Do not include the percent (%) sign. Default is 20%. Determine the percentage of shading that occurs during the winter. For example, deciduous trees lose their leaves in the winter, so their shading during that season may be minimal.

5.0.2.7 Window Leakiness − Required

Select the leakiness category that best describes the fit of this window description. The choices are Very Tight. Tight, Medium, Loose, and Very Loose. See examples of typical leakiness below.

Degrade the leakiness description one level if the windowpanes themselves are significantly loose in their mounting and/or 2 to 9 sq. in. of window is broken out. Degrade the leakiness two levels if 9 to 25 sq. in. of glass is missing. Specify the window to be Very Loose if more than 25 sq. in. of glass is missing in the window. .

Upgrade the leakiness description one level if a storm window in average or better condition is present.

Typical Leakiness

- Typical fixed window is Very Tight
- Typical casement is Very Tight
- Typical non-wood vertical slider is Tight
- Typical wood window in older homes is Medium
- Typical horizontal slider is Medium
- Typical jalousie window is Loose
- Typical awning and hopper windows are Very Tight
- Awning windows resembling jalousies are typically Medium

5.0.2.8 “Average Size” Box − Required

- Window Width and Height

  Enter the width and height (including the window frame) in inches of the window being described. NEAT will use these dimensions to estimate actual glazing area. NEAT will subtract this area from the gross wall area.

5.0.2.9 “Number on This Wall” Box − Entries Required

- Wall Code for Window

  Each window must be associated with the wall defined in the walls tab. The wall code dropdown box brings up a list of previously entered walls. This wall code entry is how NEAT subtracts the window areas from the appropriate gross wall area.

- Number of Windows

Enter the number of identical windows on the modeled wall that match the description given on the form.

5.0.2.10 Retrofit Options − Required

Select the kind of retrofit that is appropriate for this window record:

1) Evaluate All: The retrofit of this window is optional. The NEAT program will decide the most cost effective treatment option. Follow program protocols before selecting this option for possible replacement(s).Select this option only if the window(s) are located in the primary heating envelop and the window(s) have rotted or deteriorated frames or sashes.

2) Evaluate None: Select if window is not eligible for replacement

5.0.2.11 “Additional Cost” Box − Not required

Enter additional costs if needed. Typical additional costs would be extra framing or labor needed to install the window. Do not enter the cost of the window in this cell.

Job cost reduction costs shall be recorded in WisWAP and shall not be entered or modeled in Weatherization Assistant

5.0.2.12 Comment

You may enter comments pertinent to the window directly in the Comment field on the form, or you may enter them in the Comment Editor by selecting the “Comment” button to the left of the field.

Select COPY in the WINDOW box in the lower left hand corner of the WINDOW screen to add another window. The next sequential window code will appear, and data from the previous window will populate the fields. This will reduce data entry, as duplicate fields, such as window type, will already be populated. Remember to update “Window code” and other applicable cells.

5.0.3 Doors

Each door must be associated with a previously defined wall. A maximum of 10 doors can be entered per house (for all walls).

Storm or replacement doors are not evaluated in NEAT. They are normally not cost-effective measures, based on heat conduction savings. **Replacement doors may only be modeled as a repair in Wisconsin’s weatherization program.**

NEAT subtracts door area from the wall area and figures heat loss from the wall and door separately in cost calculations for wall insulation.

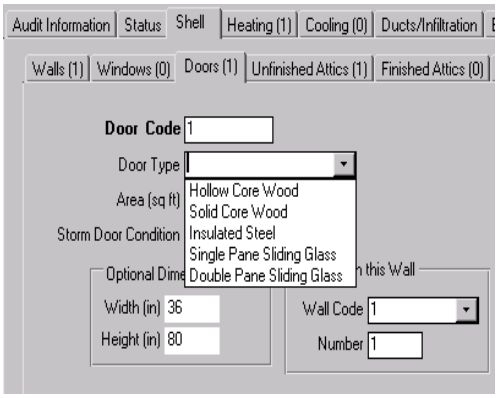
5.0.3.1 Door Code − Required

Door codes are abbreviated names specified by the auditor to identify specific house components for later identification. Auditors can change the codes if desired. They may contain

up to twenty letters or numbers and are not case-sensitive, but three to five characters are usually enough. When selected, "push tab" is the door code is automatically entered as DR1 (Door 1).

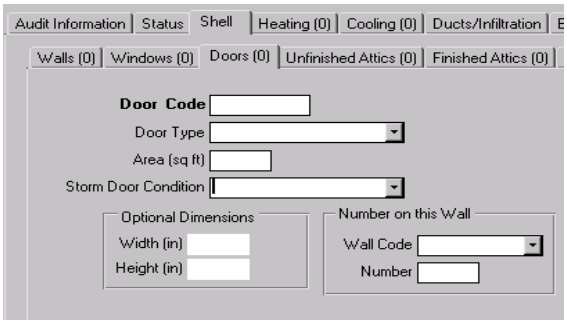
Tip: Name the doors in accordance with their location.

5.0.3.2 Door Type − Required



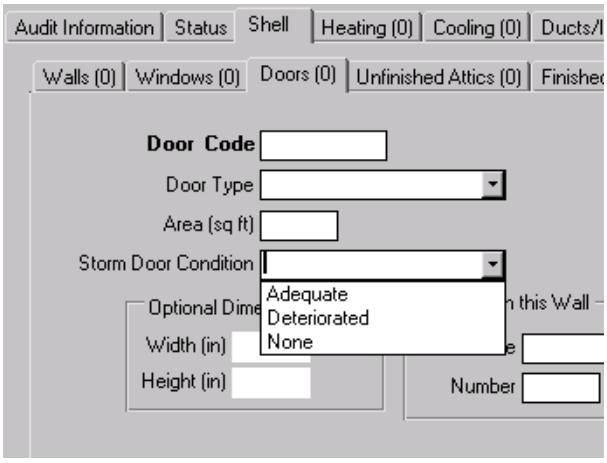
Select one of the five door types displayed. The choices are Hollow Core, Wood, Solid Core, Insulated Steel, Single Pane Sliding Glass, and Double Pane Sliding Glass. For a door with glazing, you will usually enter the door on the Doors form and the glazing on the Windows Form, although in some cases you may want to enter it just as a door or a window depending on which has the greatest fraction area.

5.0.3.3 Area Tab − Required



Enter the area, in square feet, of the individual door. If the number of doors indicated is greater than one, NEAT will compute a total door area as the area given here times the number of doors. Default is 20 square feet for a 36” x 80” door. A 32” x 80” door is 17.78 square feet. The quick formula to calculate a 32”x80” door is 32x80/144=17.78

5.0.3.4 Storm Door Condition − Required



Select one of the three choices for the condition of the storm door. The choices are Adequate, Deteriorated, and None. NEAT treats "Deteriorated" and "None" as the same.

5.0.3.5 Leakiness

Provide an estimate of how leaky the door is. The choices are Tight, Medium, and Loose. Typical characteristics of these three categories of leakiness are listed below

Tight: Doors will have the door and frame squared, no warping, functioning weather stripping in good condition around the door, a good seal at the threshold, no holes or structural damage, and latches that keep the door securely shut. If windows exist in the door, they will be fixed and well-sealed

Medium: Doors will have some characteristics of loose doors, but retain substantial integrity, However, they would likely benefit from air sealing efforts

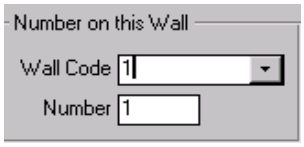
Loose: Doors will exhibit many, if not most, of the following problems, door and/or frame out of square, warping, weather stripping missing or severely damaged no seal at the threshold, holes or significant structural damage, and latches that do not keep the door securely shut.

5.0.3.6 “Optional Dimensions” Box

Record the width and height, in inches, of door openings. NEAT does not use these measurements in any of its calculations. It is simply for documentation purposes for the auditor.

5.0.3.7 “Numbers on this Wall” box − Entries required

The wall code dropdown displays a list of available walls that have been defined in the walls tab, select the matching wall code. This is how NEAT subtracts the door area from the appropriate gross wall area.



Enter the number of identical doors that match the description given on the form; the default is 1.

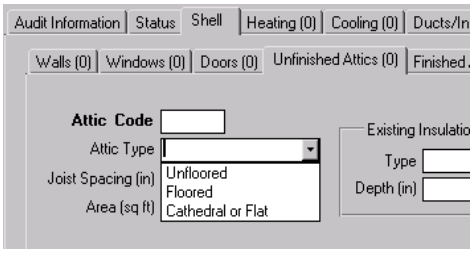
5.0.4 Unfinished Attic Areas

A maximum of seven unfinished attic areas may be entered.

5.0.4.1 Attic Codes − Required

Attic codes are abbreviated names specified by the user to identify specific house components for later identification. When the *Attic Code* button is selected, it will automatically create the code A1 (Attic 1). It is recommended that auditors choose to use a different identifier of up to twenty letters or numbers for easier identification by crews. Example: “main attic.”

5.0.4.2 Attic Floor Type − Required



Select one of the three choices, the choices are Unfloored, Floored, and Cathedral or Flat. NEAT does not treat "Unfloored" and "Floored" attics differently. This information is for the auditors benefit. An *Added Cost* may be associated with insulating "Floored" segments.

Tip: Model short slopes/slants as roof rafters under finished attics, not as cathedral.

Tip: Attics that are floored that can have insulation added above the floor shall be modeled as one measure. Do not separate these two out.

Tip: Shed style additions shall be modeled as cathedral/flat style attics based upon construction characteristics.

5.0.4.3 Joist Space − Required

The default value is 24”, but many houses have joists 16” apart.

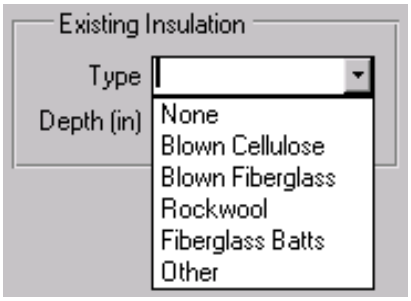
5.0.4.4 Area − Required

Enter the area in square feet of the ceiling or attic floor that borders the conditioned space. This value must be greater than 0. For "Cathedral" ceilings, enter the actual area of the sloped ceiling, which will require measuring the width and the lowest point to the highest point of the cathedral ceiling to get the actual area.

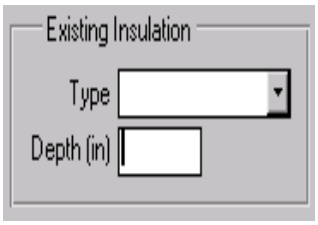
5.0.4.5 Roof Color

Enter the color of the roof. The two choices are white, Reflective or Shaded, and Normal or Weathered. Roofs completely shaded by trees in the summer should be categorized as white or reflective roof regardless of their finish.

5.0.4.6 “Existing Insulation” Box − Required entries



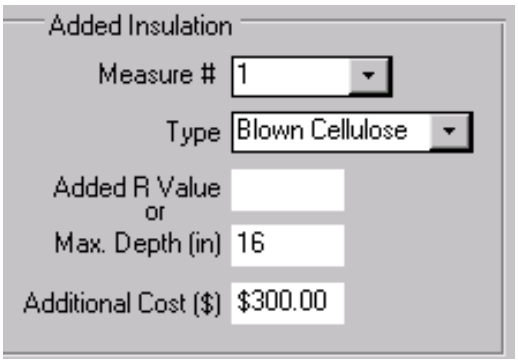
Select the type of insulation found in the attic area, if any. The choices are None, Blown Cellulose, Blown fiberglass, Rockwool, Fiberglass Batts, and Other. Select "None" if none exists. If “None” is selected, the *Existing Insulation Depth* field automatically disappears. If multiple types of insulation are present in the same attic, select other as the type and enter the average R-Value into the depth column, not inches. Add a comment to reflect this.



Enter the effective depth of insulation found in the attic taking into account bypasses and other construction defects that affect the overall R-Value of the existing insulation. Ignore compression around the eaves. This field disappears if "None" is chosen for the *Existing Insulation Type*. If insulation type is selected, and no entry is made in the field a default thickness equaling R-19 will automatically be entered. Enter a depth to match the selected insulation to match the effective overall R-value if multiple types of insulation are present.

Tip: If multiple types of insulation are present in the same attic, select other as the type and enter the average R-Value into the depth column, not inches.

5.0.4.7 Added Insulation Box



- Measure Number − Required

Use one measure number for all attic segments grouped with the same characteristics together in computing a single SIR when insulating.

Attic areas with additional installation costs, or having different levels of existing insulation, or which have maximum depth restrictions or specified added R-value should be given different measure numbers.

Note: If multiple attics are being modeled under the same measure number, ensure you are adding additional costs to reflect attic access's that may be needed. NEAT assumes a single attic access with each measure number.

- Type − Required

Select the type of insulation to add to the attic area. The choices are None, Blown Cellulose, Blown Fiberglass, Cellulose Dense pack, Fiberglass Dense pack, Fiberglass Batts, and 2-Pt Foam. Select "None" if conditions prohibit insulating the area (comment on reasons why none selected was modeled).

Tip: When modeling to dense pack a floored attic, select "Cellulose Dense pack" as the insulation type.

- Added R-value – Do not select this, as you are not allowing NEAT to select the most cost effective level of insulation to install.

- Insulation Maximum Depth − Optional as needed

Enter the total (existing plus added insulation) that can exist in the space. If no restriction exists, leave the field blank. For *"Floored" Attic Types*, enter the distance between the ceiling board and the attic floor (normally the joist height). NEAT will consider all standard levels fitting into the space remaining, as well as completely filling the space.

- Additional Cost for Attic Insulation

Enter any additional costs not normally associated with installation of attic insulation. The value is a lumped dollar amount, not per square foot. The amount will be added to the default cost. An example is H&S asbestos safe work practices costs. The additional cost may also be negative for example when there is no access work to be completed.

Job cost reduction costs shall be recorded in WisWAP and shall not be entered or modeled in Weatherization Assistant

All repairs related to attic measure(s) shall be modeled in the Itemized Cost tab instead and included it in the SIR.

5.0.4.8 Comment

You may enter comments pertinent to the attic segment directly in the Comment field on the form, or you may enter them in the Comment Editor by selecting the "Comment" button to the left of the field.

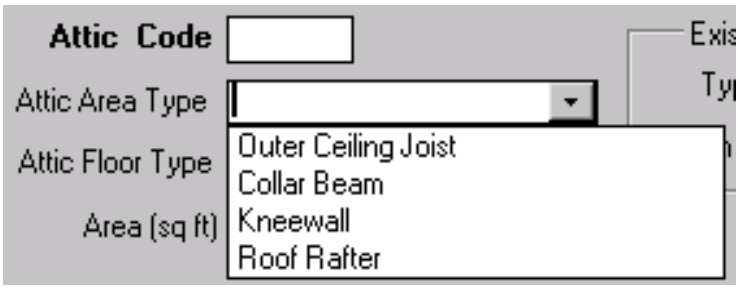
5.0.5 Finished Attics

The entries on the *Finished Attic tab* are similar to those for the *Unfinished Attic* tab. Four types of finished attic component can be described in NEAT: outer ceiling joist, collar beam, knee wall, and roof rafter. You are allowed to enter as many as 16 finished attic components in any combination of the four types.

5.0.5.1 Attic Codes − Required

Attic codes are abbreviated names specified by the user to identify specific house components for later identification. When the Attic Code button is selected, it will automatically create the code FA1 (finished Attic 1). It is recommended that auditors choose to use a different identifier (Collar Beam, Roof Rafter, Outer Ceiling Joist, and Kneewall) of up to twenty letters or numbers for easier identification by crews.

5.0.5.2 Finished Attic Area Type



The entries on the *Finished Attic* tab are similar to those for the unfinished attic. Select the Finished Attic Area Type from the drop down: Outer Ceiling Joist, Collar Beam, Kneewall, and Roof Rafter.

5.0.5.3 Attic Floor Type − Required

Select one of the two choices, floored or unfloored. NEAT does not treat "Unfloored" and "Floored" attics differently. This information is for the auditors benefit. An "Added Cost" may be associated with insulating "Floored" segments to take into account the additional labor needed for drilling holes, removing boards, etc. Enter restrictions to the total depth of insulation that can exist in a "Floored" segment in the *Added Insulation Max. Depth* in field.

5.0.5.4 Area − Required

Enter the area in square feet of the attic segment that borders the conditioned space. For "Roof Rafter" segments, enter the actual area of the sloped ceiling.

5.0.5.5 “Existing Insulation” Box – Required entries

- Type - Select the type of insulation found in the attic area, if any. Select "None" if none exists.

- Enter the average depth of insulation found in the attic. Ignore compression around the eaves. This field disappears if "None" is chosen for the *Existing Insulation Type*. If insulation type is selected, and no entry is made in the field a default thickness equaling R-19 will automatically be entered. Enter a depth to match the selected insulation to match the effective overall R-value if multiple types of insulation are present.

5.0.5.6 “Added Insulation” Box

- Measure Number - Required

- Type − Required
  Select the type of insulation to be added to the attic area. The choices are for Outer Ceiling Joist, Roof Rafter, and Collar Beam: None, Cellulose blown, Fiberglass blown, Cellulose Dense pack, Fiberglass Dense pack, Fiberglass Batt, 2-pt foam. For Kneewall the choices are: R-11 Fiberglass Batt, R-19 Fiberglass Batt, R-11 Cellulose enclosed, R-19 Cellulose enclosed, R-11 2-pt, and R-19 2-pt. Select "None" if conditions prohibit insulating the area.

  Tip: Select Cellulose Dense pack if dense packing a floored attic or roof rafters.

  Added R-value – Do not select this, as you are not allowing NEAT to select the most cost effective level of insulation to install.

- Insulation Maximum Depth
  Complete this field only if a restriction to the amount of insulation that can be entered such as in a floored attic. Always enter a depth for roof rafters. Enter the total (existing plus added insulation) that can exist in the space. For *"Floored" Attic Types*, enter the distance between the ceiling board and the attic floor (normally the joist height). NEAT will consider all standard levels fitting into the space remaining, as well as completely filling the space.

- Additional Cost for Attic Insulation
  Enter any additional costs associated with installation of attic insulation. The value is a lumped dollar amount, not per square foot. An example is H&S asbestos costs. The additional cost may be negative for example when there is no access work to be completed.

Job cost reduction costs shall be recorded in WisWAP and shall not be entered or modeled in Weatherization Assistant

All repairs shall be separated out and identified in the itemized cost tab.

5.0.5.7 Comment

You may enter comments pertinent to the attic segment directly in the Comment field on the form, or you may enter them in the Comment Editor by selecting the “Comment” button to the left of the field.

Note the following items regarding the finished attic form:

- *Attic Floor Type* is suppressed for the knee wall or roof rafter attic area types since these components cannot be floored or un-floored.

- *No Measure Number* is requested for the knee wall attic area type. Knee walls are automatically ranked separately.

- A selection of "None" in “existing insulation” for this field will prevent consideration of insulation for this component.

- It is recommended to NOT group finished attic sections because an insulation depth restriction will be applied to all segments grouped together.

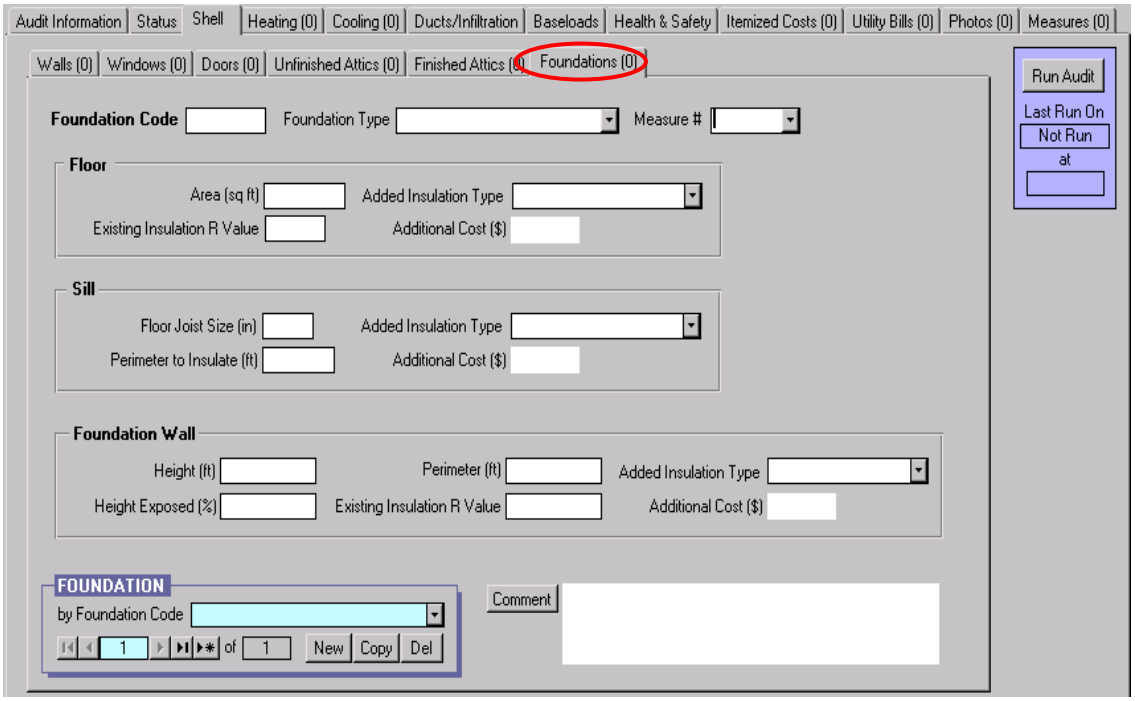
- If "None" is selected for the type for either the existing or added insulation, the corresponding depth entry will disappear.

Select “Copy” in the Attics box in the lower left hand corner of the shell screen to add another attic area. Attic Code (A2) will appear, and data from the previous attic will populate the fields. This will reduce data entry tasks as duplicate fields such as attic type, will be populated.

5.0.6 Foundations

Foundation spaces include basements (finished and unfinished), crawl spaces, slab on grade, and floors exposed to unheated spaces.

Note: NEAT will never recommend both floor insulation and sill and/or wall insulation for the same foundation



5.0.6.1 Foundation Codes

Foundation codes are abbreviated names specified by the user to identify specific house components for later identification. When the Foundation Code button is selected, it will automatically create the code F1 (Foundation 1) Auditors can choose to use a different identifier to identify how the foundation area relates to the house. It is recommended that auditors choose to use a different identifier of up to twenty letters or numbers for easier identification by crews.

5.0.6.2 Foundation Type

Select from one of the seven choices:

- Conditioned: The space is purposefully heated (or more rarely cooled) by a heating system to maintain a temperature at or near the rest of the dwelling (example being a basement heated by supply registers or radiators in the space would be conditioned, as would a basement heated continuously by a space heater. Space has thermostat control.

- Non-Conditioned: There are no sources of heat in the space other than conduction through walls, floors, and perhaps insulated ductwork.

- Vented Non-Conditioned: Same as Non-Conditioned and vented directly to the outdoors.

- Unintentionally Conditioned: There is a heat source in the space that adds heat unintentionally to the space so that the temperature of the space is maintained above the outside temperature or ground temperature. (Example a basement that is heated because a furnace or water heater is located in the basement or because uninsulated ductwork runs through the basement).

- Uninsulated Slab: On grade.

- Insulated Slab: On Grade.

- Exposed Floor: Overhangs, garage ceilings, and a home built on stilts or using pier and beam construction such that ambient air can freely flow beneath the house.

5.0.6.3 Foundation Measure Number

Group all similar foundation spaces together when computing a single SIR. Give separate measure numbers to spaces with different existing levels of insulation or where costs of insulating differ.

5.0.6.4 “Floor” Box

Depending on your foundation type, the remaining fields will vary. Any choice, other than *Uninsulated* or *Insulated Slab*, will display the following “Floor” Box, asking for the following information:

- **Area − Required**

  Enter the area in square feet of the floor directly above the foundation space. For slab-on-grade, enter the area of the slab floor in the living space. Entries must be greater than zero.

- **Existing Insulation R-value – Required**

  Enter the R-value of the existing insulation in the floor over the basement or crawl space. The default is zero, uninsulated.

- **Added Insulation Type – Required**

Select the type of insulation you plan to model, the choices are, None, Fiberglass Batt, Cellulose Dense pack, Fiberglass Dense pack, 2-pt foam, R-10 Polystyrene Board, and R-7 Polystyrene Board. Select “None” if the floor should not be insulated.

- **Additional Cost for Insulation – Optional – As needed**

  Enter any additional costs associated with insulating the foundation space. The value is a lumped dollar amount, not per square foot. The amount will be added to the cost computed from the floor area and cost per square foot. Examples of additional costs could be material and labor costs associated with freeze protecting water pipes in floors.

Job cost reduction costs shall be recorded in WisWAP and shall not be entered or modeled in Weatherization Assistant

Use exposed floor to model area under bump out windows or cantilevered floor sections.

The ceiling of a tuck under garage is modeled as an exposed floor area.

5.0.6.5 “Sill” Box

If the foundation type is anything other than insulated or uninsulated slab on grade, a data box for “Sill” insulation will be present.

- **Floor Joist Size − Required**

  Enter the actual size of the floor joists in units of inches.

- **Added Insulation Type – Required**

  Select the type of insulation you plan to model, the choices are, None, R-19 Fiberglass batts, R-11 Fiberglass batts, R-19 2-pt foam, R-12 2-pt foam, and R-10 Polystyrene Board. Select “None” if the box sill cannot be insulated.

  Tip: Model several options to provide the maximum SIR

- **Perimeter to Insulate − Required**

  Enter the length, in feet, of the floor perimeter bordering the outdoors that is not insulated. Do not include the perimeter that borders another foundation space.

  Enter 0 if the entire perimeter is insulated, blocked up, or you do not plan on insulating.

- **Additional Cost for Insulation – As needed**

  Enter any additional costs associated with insulating the foundation space. Separate entries are provided for the floor and wall insulation options, provided each are being evaluated. The value is a lumped dollar amount, not per square foot.

Job cost reduction costs shall be recorded in WisWAP and shall not be entered or modeled in Weatherization Assistant

5.0.6.6 “Foundation Wall “Box

When conditioned, unconditioned, vented conditioned or unintentionally conditioned are chosen, a “Foundation Wall” box is present. Complete the fields in this box.

- **Total Wall Height − Required**
  Enter the actual height, in feet, of the basement or crawl space wall. Estimate an average if the height is not uniform. The entry must be greater than zero. Include the height of the box sill to ensure continual insulation from sub-floor to ground for interior foundation in crawlspaces. If the wall height entered is less than two feet, NEAT will not evaluate the installation of floor, sill, or foundation wall insulation for the space because of access concerns.

  Exception: When modeling for exterior foundation insulation, the exterior height of the foundation plus the 6” below grade shall be entered as the foundation height.

- **Wall Height exposed − Required**
  Estimate the amount of wall exposed to the outside. For example, if the wall height in the foundation is 6 feet, and there is approximately 2 feet exposed outside, the exposure is 33%.

- **Foundation Perimeter − Required**
  Enter the length, in feet, of the floor perimeter bordering the outdoors. Do not include the perimeter that borders another foundation space. The value must be greater than zero. The default is the perimeter of a square with area given in the *Floor Area* field. The value is used with the wall height to determine the space's wall area bordering the outside or ground.

- **Foundation Wall Existing Insulation R-value − Required**
  Enter the R-value of insulation currently on the crawl space or basement wall. NEAT assumes this coverage is uniform. If only part of the wall is insulated, either (1) adjust the perimeter to subtract out the insulated portion and enter zero, or (2) enter an area-weighted average R-value. Entry is optional with default zero.

  Note: Typical foundation walls have an R-value of 1 even when not insulated.

- **Additional Insulation – Required**
  Select the type of insulation you plan to model, the choices are, None, R-7 Thermax Board, R-19 Fiberglass Batt, R-11 Fiberglass Batt, R-19 2-pt foam, R-12 2-pt foam, and R-5 Exterior foam board. Select “None” if the foundation will not be insulated.

- **Additional Cost for Insulation – Optional, as Needed**
  Enter any additional costs associated with insulating the foundation space. The value is a lumped dollar amount, not per square foot.

Job cost reduction costs shall be recorded in WisWAP and shall not be entered or modeled in Weatherization Assistant

5.0.6.8 Insulated or Uninsulated Slab on Grade Foundations:

If the foundation is either insulated or uninsulated slab on grade, only the area of the slab and the perimeter measurements are required. Exterior foundation insulation for uninsulated slabs is modeled using the itemized cost tab and the energy savings formula provided in that tab.

5.0.6.9 Comment

You may enter comments pertinent to the foundation segment directly in the Comment field on the form, or you may enter them in the Comment Editor by selecting the "Comment" button to the left of the field.

5.1 5-24 Unit Shell

Buildings with 5 to 24 units will be modeled using the NEAT audit. In most cases, the entire building exterior shell will be modeled with NEAT. NEAT modeling may include separate audits for each unit or the units may be modeled for cumulative measures and average conditions. This is contingent on the building design. As noted above, actual data from a representative sample of 25 percent of a building's units is required using either audit. Additional requirements are listed below:

1) Actual fuel records or Therm Calculator projections shall be used in conjunction with the energy audit.

2) Use the 5-24 Unit Workbook, available on the T&TA site at http://homeenergyplus.weccusa.org under the Technical Assistance tab, to generate savings information for multiple measures. The savings information and costs shall be incorporated into NEAT's Itemized Cost section to evaluate multiple measures.

3) Single measures or measures not addressed in the 5-24 Unit Workbook shall be modeled in the appropriate NEAT tab.

4) Instructions for modeling 5-24 unit buildings using the Weatherization Assistant software are posted on the Home Energy Plus website under Multifamily Resources (5+):
    a. http://homeenergyplus.wi.gov/category.asp?linkcatid=494&linkid=122&locid=25

5.1.1 Ceiling or Attic Areas

Model all ceiling/attic spaces for insulation up to as instructed in sections 5.0.4 and 5.0.5. Model the maximum capacity that the space can accommodate and the energy audit will model. Install the level of insulation the energy audit selects with an SIR greater than or equal to 1.0. Determine the effective R-value of the existing insulation based on the number of gaps in the insulation coverage. Seal applicable key junctures and bypasses prior to insulating. Incorporate related repair cost into the ceiling/attic insulation costs.

5.1.2 Sidewall Insulation

Model all uninsulated exterior walls of heated spaces to the maximum structurally allowable as instructed in 5.0.1. Install insulation if the SIR is greater than or equal to 1.0. Incorporate related repair cost into the sidewall insulation costs.

5.1.3 Foundation Insulation

Model foundation walls or floors that define the heating envelope, including the exterior walls of unintentionally conditioned crawlspaces, sill boxes, and slab-on-grade assemblies, for insulation with an energy audit as instructed in section 5.0.6. Start with modeling the maximum R-value the energy audit allows, based on structural capacity. Install the R-value that generates the highest SIR greater than 1.0, or provides the best R-value within the package of improvements. Install insulation only if the SIR is greater than or equal to 1.0. Incorporate related repair cost into the foundation insulation costs.

5.1.4 Window Replacement

Model windows that meet the replacement criteria as an improvement as instructed in section 5.0.2. Replacement windows shall meet ENERGY STAR® standards. Replace the window as an ECM if the SIR is greater than or equal to 1.0. Building owners may opt to replace existing windows that do not meet a minimum 1.0 SIR test as a part of their contribution toward the weatherization of the building. The owner's contribution shall be equal to or exceed the buy-down amount needed to generate an SIR equal to or greater than 1.0.

5.1.5 Door Replacement

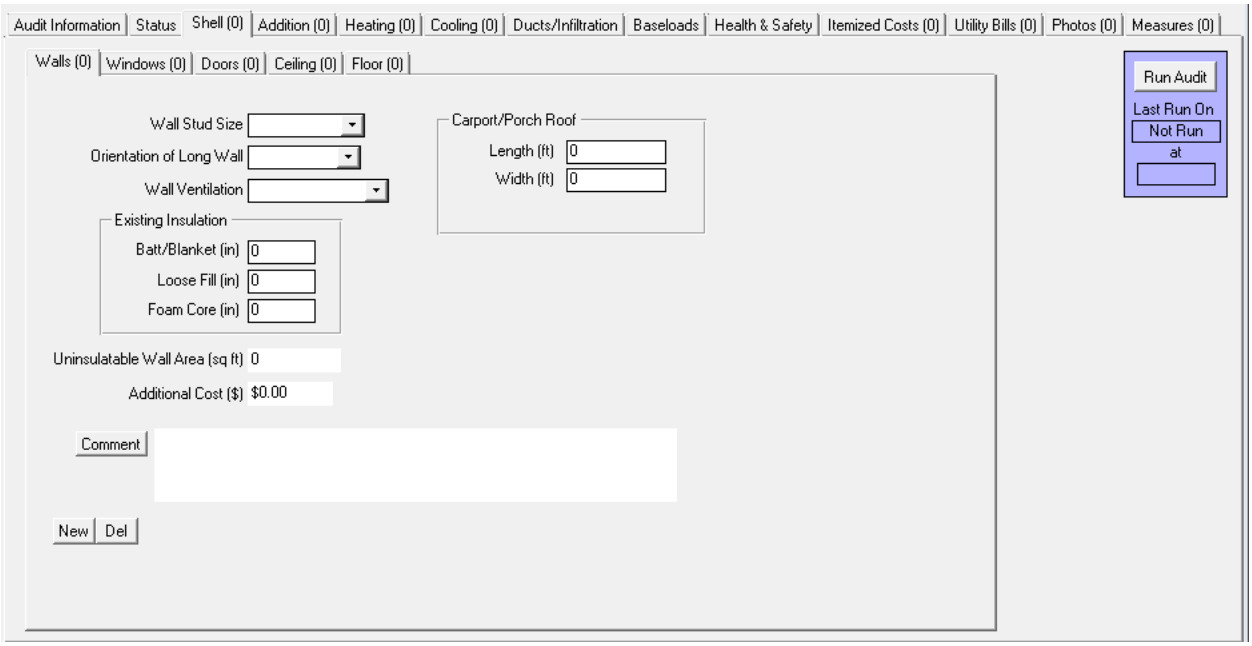
Model doors that are deteriorated beyond repair for replacement as an improvement or a repair as instructed in section 5.0.3. Doors may be replaced within the entire improvement package or when the building has a cumulative SIR equal to or greater than 1.0.

5.2 MHEA Shell- Includes Addition Entry

This tab contains sub tabs and forms used to describe the thermal envelope (or shell) of the mobile home.

MHEA also provides the additions tab to enter information about one addition to the manufactured home. An addition is part of the living space, conditioned by the heating and cooling systems servicing the remainder of the manufactured home. If the addition is separated from the manufactured home (e.g., by closing the door to an entrance vestibule), it should not be included in the energy audit.

If more than one addition is present, it may be best to utilize NEAT to model the home. The Wx program manual helps guide your decision in this process



Note: Boxes outlined in black indicate a required field.

5.2.1 Walls

MHEA assumes that the house is rectangular in shape and the walls of the manufactured home are all of the same construction type; therefore, there is only a single wall information screen. Remember that any additions to the home are treated separately on the Additions tab.

5.2.1.1 Wall Stud Size − Required

The wall stud is the wood framing between the interior and exterior manufactured home walls. The choices are 2, 3, 4, and 6. Manufactured homes are typically constructed using standard wood framing. MHEA uses this information to calculate the wall R-value and the volume of the wall cavity available for added insulation.

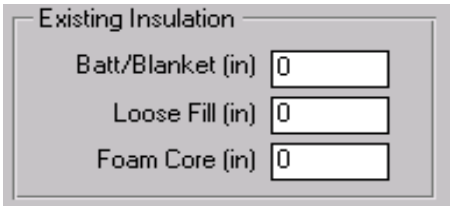
5.2.1.2 Orientation of Long Wall of Home − Required

Select the cardinal direction of one of the long walls. A good rule of thumb is to select the wall on which the main entrance is located. MHEA uses this information to calculate solar loads on the home.

5.2.1.3 Wall Ventilation − Required

Indicate whether the walls are vented or not vented. A manufactured home wall may be intentionally or unintentionally ventilated. An intentionally ventilated manufactured home may have corrugated metal siding open at the bottom to provide space for air to flow between the exterior and interior wall materials. MHEA degrades the wall R-value for ventilated walls.

5.2.1.4 Existing Insulation Box



Insulation Type/Thickness – Required
MHEA assumes that exterior walls of the manufactured home may have Batt/Blanket, Loose Fill, or Foam Core insulation. Enter the thickness of existing insulation in inches. If a thickness of 0 inches is entered, MHEA assumes that type of insulation does not exist.

MHEA uses this information to calculate the wall R-value and to calculate the volume in the wall section that is available for additional insulation.

5.2.1.5 Uninsulatable Area (ft2) – Not Required

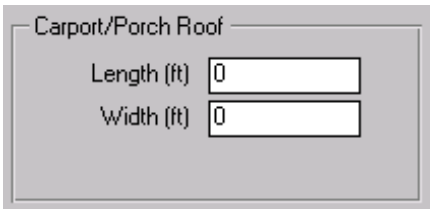
Enter the gross area of the wall in square feet that is not accessible for insulating MHEA already accounts for wall studs and framing around windows and doors. An example of an Uninsulatable wall is a wall segment between an attached unconditioned space and the home.

5.2.1.6 Added Insulation Cost – Not Required

Enter any additional costs not normally associated with installation of wall insulation. The value to be entered is a lumped dollar amount, not per square foot. The default is zero.

Job cost reduction costs shall be recorded in WisWAP and shall not be entered or modeled in Weatherization Assistant

5.2.1.7 Carport/Porch Roof Box – Required

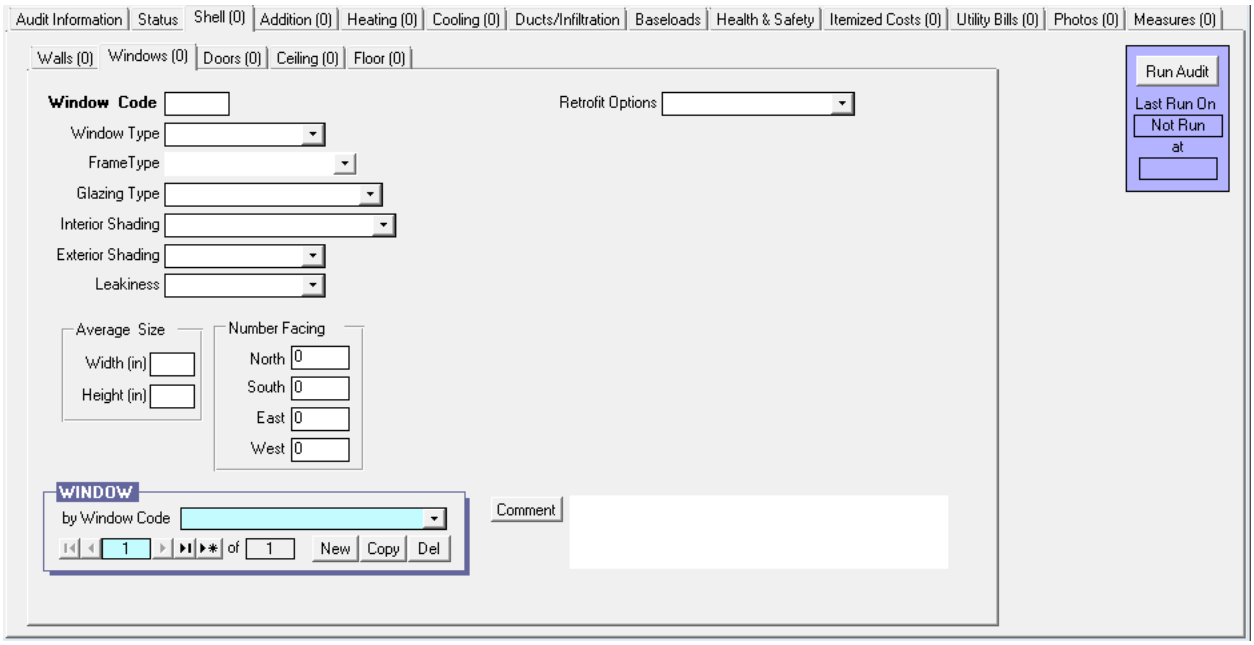


A carport/porch roof is a shelter with no walls that extends out from one wall of the manufactured home. Indicate the length along the mobile home (in feet) and width out from the mobile home (in feet) of this carport/porch roof. If no carport/porch roof exists, enter a length and width of zero feet. Often, this shelter is used to park a car or shade an outdoor sitting area as well as unheated additions should be entered here too.

5.2.1.8 Comment

You may enter comments pertinent to the walls directly in the Comment field on the form, or you may enter them in the Comment Editor by selecting the “comment” button to the left of the field.

5.2.2 Windows



The *Window* form under MHEA’s Shell tab is used to enter information all the windows installed in the main portion of the manufactured home. A total of 24 windows descriptions may be entered. Windows of the same type and size can be entered on a single record regardless of

their orientation. Indicate in the *Number Facing* fields how many windows having the same description face each of the cardinal directions.

5.2.2.1 Window Code − Required

Window Codes are abbreviated names specified by the user to identify specific window descriptions for later identification. They may be used to link components on a floor plan drawn by the auditor to those entered into MHEA. They commonly contain three to five letters or numbers and are not case sensitive.

Tip: Use specific names if a window is going to be replaced or repaired.

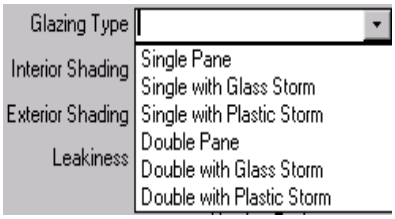
5.2.2.2 Window Type – Required

The window description is the type of window found. The choices are Jalousie, Awning, Slider, Fixed, Door Window, Sliding Glass Door, and Skylight. See section 5.0.2.2 for detailed descriptions of each window.

5.2.2.3 Window Frame Type – Optional

Select the correct window frame and sash construction materials. The choices are Wood or Vinyl, Metal, and Improved Metal (i.e., metal frame with a thermal break).

5.2.2.4 Window Glazing Type − Required



Select the glazing type depending on the number of panes of glass in the primary window and the characteristics of any storm window that may cover the primary window.

- **Single Pane:** windows have one plate of glass in the window frame.

- **Single with Glass Storm** window have a single pane of window glass with a second (usually removable) single pane of glass installed at one inch or so from the windowpane. MHEA assumes that the storm window (second, removable pane) is installed on the interior side of the window.

- **Single with Plastic Storm:** have a single pane of window glass with a second (usually removable) single pane or sheet of plastic installed at one inch or so from the windowpane. MHEA assumes that the storm window (second, removable pane) is installed on the interior side of the window.

- **Double Pane:** windows have two plates of glass in the window frame.

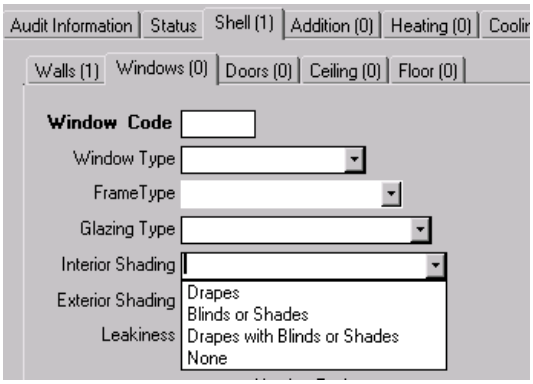
- **Double with Glass Storm:** window is two panes of window glass with an additional (usually removable) single pane of glass installed at one inch or so from the windowpane.

MHEA assumes that the storm window (second, removable pane) is installed on the interior side of the window.

- **Double with Plastic Storm:** window is two panes of window glass with an additional (usually removable) single pane or sheet of plastic installed at the one-inch or so from the windowpane. MHEA assumes that the storm window (second, removable pane) is installed on the interior side of the window.

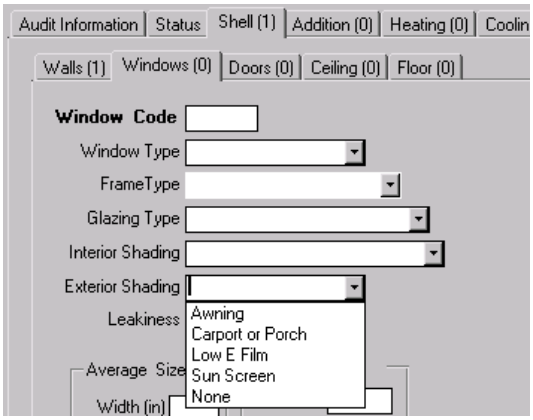
Note: If the existing storm window is on the exterior side of the window, the window should be considered as not having a storm window.

5.2.2.5 Interior Shading − Required



Select the interior window covering that are present which, when closed, prevent sunlight from entering the home and also slightly increase the insulating value of the window. The options are Drapes, Blinds or Shades, Drapes with Blinds or Shades, and None. Interior shading affects both the insulating value of the window/window shading combination as well as the solar loads on the home. Indicate drapes with shades if the occupant has both on the window. Interior shading devices affect the amount of heat gained or lost through windows. If there is no interior window shading, select "None".

5.2.2.6 Exterior Shading – Required



Select the type of exterior window shading present outside the window and which reduces the sunlight striking the window. The choices are Awning, Carport or Porch, Low-e Fil, Sunscreen, and None. Exterior shading reduces the solar load on the mobile home. Low E film is a reflective film applied to the exterior surface of glass windowpanes by the window manufacturer. A sun screen is a mesh screen that is installed or hung on the exterior side of a window. An awning is mounted above a window and extends out from the exterior of the home. A carport/porch roof is a shelter that has no walls and extends out from one wall of the manufactured home.

If there is no exterior window shading, select "None".

5.2.2.7 Window Leakiness

Select the leakiness category that best describes how leaky the window is. The choices are Very Tight, Tight, Medium, Loose, and Very Loose.

Degrade the leakiness description one level if the windowpanes themselves have become significantly loose in their mounting and/or 2 to 9 sq. in. of glass is missing. Degrade the leakiness two levels if 9 to 25 sq. in of glass is missing. Specify the window to be Very Loose if more than 25 sq. in of glass is missing.

Upgrade the leakiness description one level if a storm window in average or better condition is present.

Typical Leakiness:

- Typical fixed window is Very Tight
- Typical casement is Very Tight
- Typical non-wood vertical slider is Tight
- Typical wood window in older homes is Medium
- Typical horizontal slider is Medium
- Typical jalousie window is Loose
- Typical awning and hopper windows are Very Tight
- Awning windows resembling jalousies is typically medium

5.2.2.8 Average Size

Enter the width and height of the windows (including the window frame) in units of inches being described.

5.2.2.9 Number of Windows Facing Each Orientation

Indicate the number of windows on each wall facing the closest cardinal direction of the manufactured home that fit the description shown on the form. Do not enter information about windows on the portion of a wall shared with an addition.

5.2.2.10 Retrofit Options

Select the kind of retrofit that is appropriate for this window record. The choices are:

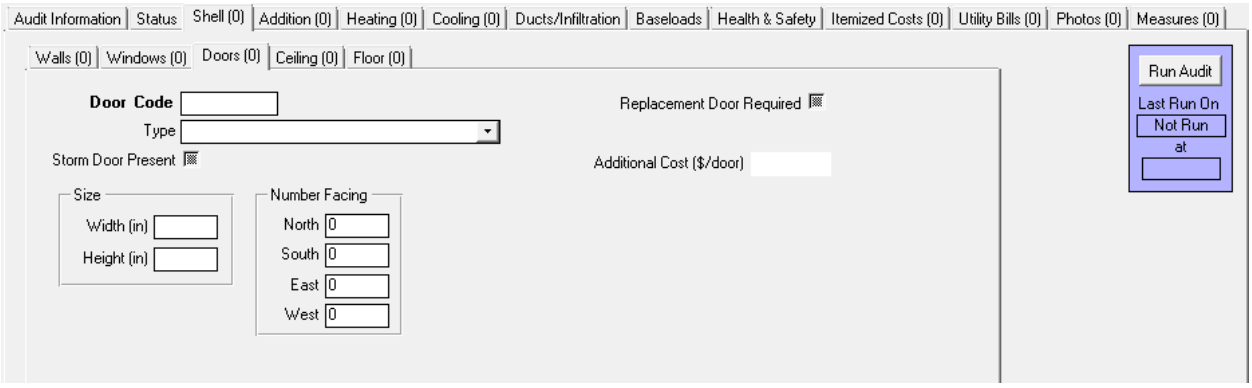
- Evaluate All: The retrofit of this window is optional. MHEA will decide the most cost effected treatment option. Use this option to model for insider storm windows or replacement windows.

- Evaluate None: None of the above retrofits will be considered for this window description. Select this option unless insider storm windows are a possible option.

When “evaluate all” is selected, a second box opens to allow for entry of additional costs.

Select “Copy” button in the lower left hand corner of the Shell screen to add another window. Window Code (WN1−2) will appear, and data from the previous window will populate the fields. This will reduce data entry as duplicate fields such as shading will already be selected.

5.2.3 Doors



Describe door types, sizes, and orientation. MHEA subtracts door area from the wall area and figures heat loss from the wall and door separately. A total of ten door descriptions may be entered.

5.2.3.1 Door Code − Required

Door Codes are abbreviated names specified by the user to identify specific door descriptions for later identification in MHEA reports. They typically contain three to five letters or numbers and are not case-sensitive.

5.2.3.2 Door Type − Required

Indicate the type of door found in the manufactured home, the choices and descriptions are listed below:

- **Hollow Core Wood** − constructed of two lightweight panels of wood.
- **Solid Core Wood** − constructed of a solid piece of wood.
- **Standard Manufactured Home Door** − constructed of a metal, vinyl, or a fiberglass skin with a solid insulating core (such as polyurethane).

5.2.3.3 Storm Door Present – Check Box

Indicate whether a storm door exists.

5.2.3.4 Average Size − Required

Enter the width and the height of the door opening in the units of inches.

5.2.3.5 Number of Doors Facing Each Orientation − Required

Indicate the number of doors on each wall of the manufactured home facing the closest cardinal direction. Do not enter information about doors on the portion of a wall shared with an addition. MHEA assumes all door descriptions are exposed to the outside.

5.2.3.6 Replacement Door Required − Do not check this box

If this box is checked, MHEA will consider the replacement mandatory and recommend it whether the SIR is greater than the minimum acceptable value. In Wisconsin, door replacements **must** be considered a repair item as an itemized cost.

5.2.3.7 Include Cost in SIR − Check Box − Not Required

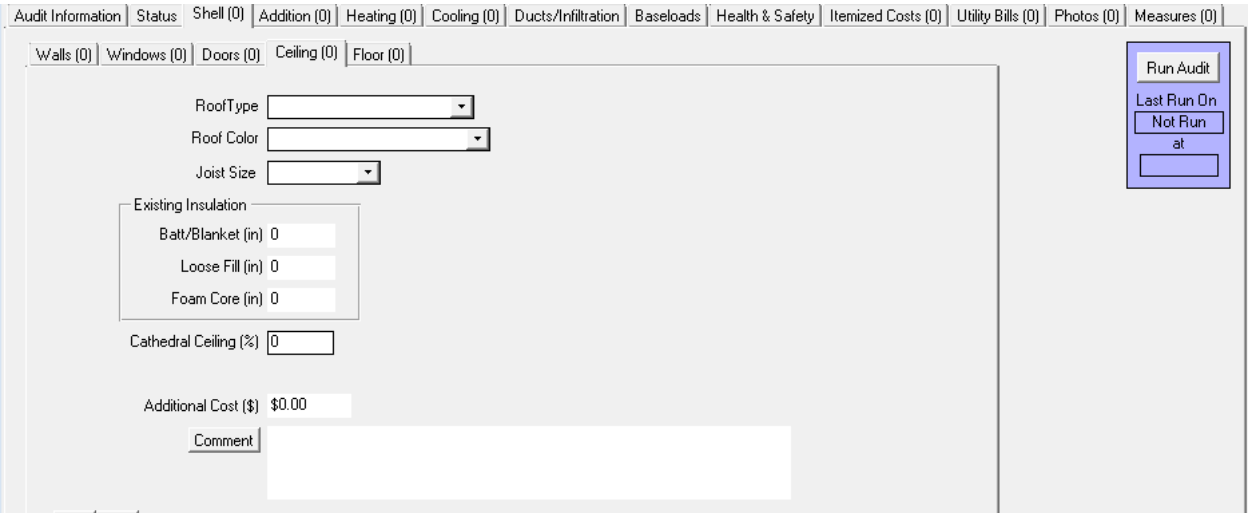
Because door replacements must be considered a repair item in Wisconsin's weatherization program, **this check box should not be selected**.

5.2.3.8 Comment

You may enter comments pertinent to the door directly in the Comment field on the form, or you may enter them in the Comment Editor by selecting the "Comment" button to the left of the field.

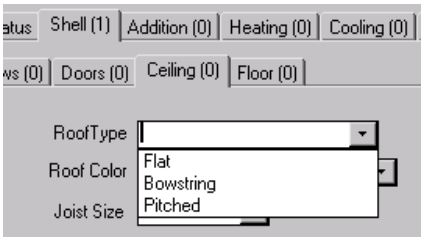
Select "Copy" button in the lower left hand corner of the *Shell* screen to add another door. Door Code (D2) will appear, and data from the previous door will populate the fields. This will reduce data entry as duplicate fields such as door type will already be selected.

5.2.4 Ceilings



Enter information describing the roof/ceiling section of the manufactured home.

5.2.4.1 Roof Type − Required



Based on the roof type selected, MHEA will calculate the volume of the roof/ceiling section. The choices and descriptions are listed below.

- **Flat** roofs have an interior surface (ceiling) and an exterior surface (roof) attached directly to either side of the wood framing, similar to wall construction. MHEA assumes 2 x 6 framing separates the ceiling and roof.

  Roof/Ceiling Joist Size will appear as a required entry if the auditor selects a flat roof option. The roof/ceiling joist is the wood framing that supports the interior ceiling and the exterior roof. Indicate the dimensions of the roof/ceiling joists. MHEA needs this information to calculate the roof/ceiling R-value and the volume addition roof/ceiling section.

- **Bowstring** roofs have a lightweight exterior roofing material (usually aluminum) that is stretched over the roof frame structure. The roof has a slight curve with the highest point in the middle of the home width. MHEA uses the home width and your input for *Height of Roof* at the center to calculate the volume of a bowstring roof section.

  Height of Bowstring Roof
  If *Bowstring Roof* is selected, enter the maximum height in units of inches of the roof above the ceiling, disregarding any existing insulation. This assists MHEA in determining the available space for additional insulation.

- **Pitched** roofs are sloped to a higher peak point. When viewing the home width from the outdoors, the roof line creates a triangle. Pitched roofs are also often shingled, unlike flat and bowstring roofs. MHEA uses the width of the home and the assumed value for the roof pitch to calculate the volume of a pitched roof section.

  Added Insulation in Pitched Roof
  For Pitched roofs, enter the number of inches of insulation to be added to the existing insulation (if any).

  NOTE: In some cases, there will be a second roof constructed over the original manufactured home roof. Enter construction information describing the original manufactured home roof since it is under this roof that insulation may be added. Enter the roof color of the second exterior roof.

Warning: If the specified level is not cost-effective, MHEA will not recommend the ceiling insulation measure. Try running MHEA again for a lesser level of insulation to see if cost-effectiveness for the measure can be established.

MHEA will not consider adding more than 12 inches. Entering 0 will prevent roof insulation from being considered.

5.2.4.2 Roof Color − Required

Enter the color of the roof; the two choices are White, Reflective of Shaded, and Normal or Weathered. Choose *White* or *Reflective* if the roof appears white or shiny metallic is clean, has little or no discoloration due to weathering. Roofs completely shaded by trees in the summer should be categorized as White or Reflective regardless of their finish. The majority of roofs will be classified as Normal or Weathered.

5.2.4.3 Existing Insulation Box − Required

Enter the amount of existing Batt/Blanket, Loose Fill, or foam Core insulation. Enter the thickness of existing insulation by type in inches measured at the center of the roof/ceiling section. Enter 0 or leave the field blank for insulation types that do not exist.

MHEA uses this information to calculate the roof/ceiling section R-value and to calculate the volume in the roof/ceiling cavity for flat and bowstring roofs that is available for additional insulation. Depth should be based on performance rather than nominal thickness. For example, a 6” batt with 10% gaps or voids should be de-rated to 5 or 5 ½ ".

5.2.4.4 Percent Cathedral Ceiling – Required

Enter the approximate percent of floor area that lies beneath a cathedral ceiling. A Cathedral ceiling is a sloped or vaulted ceiling where the ceiling and roof planes are parallel. For example, if a cathedral ceiling is above the living room and the living room floor area is about one third the total home floor area, the percent cathedral ceiling is about 33%.

Note: If the roof type selected is flat or pitched and the percent of the cathedral ceiling is greater than 0, the Step Wall Orientation field will appear. Some manufactured home ceilings slope up to the top of a short wall. This short wall then steps vertically down to the average home height. Select the closest cardinal direction that the step wall faces. Enter no step wall if a step wall does not exist.

5.2.4.5 Additional Ceiling Installation Cost – As Needed

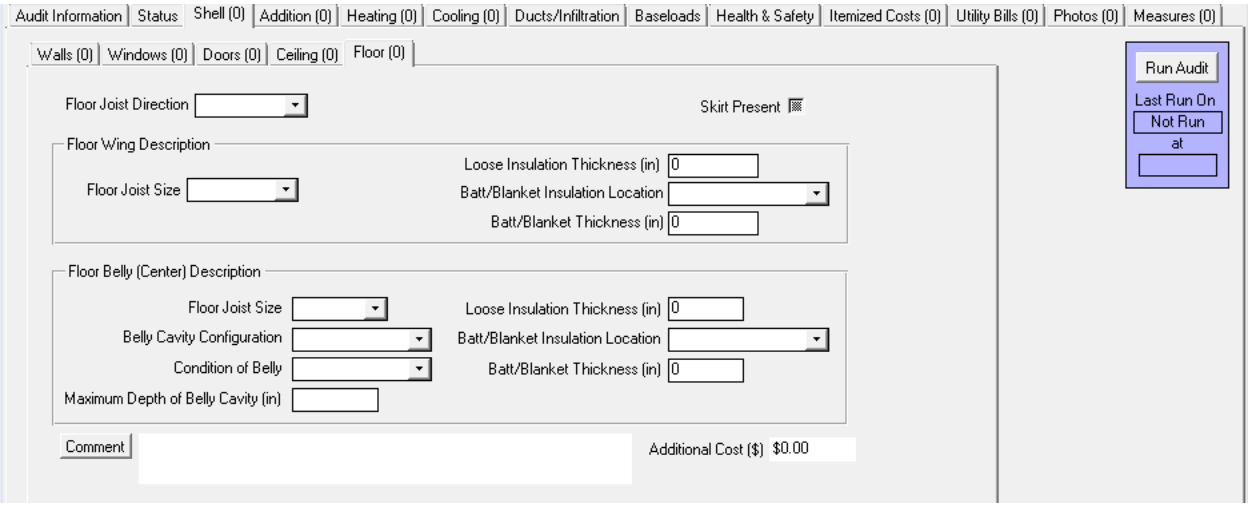
Enter any additional costs not normally associated with installation of ceiling insulation. The value is a lumped dollar amount, not per square foot. Installing an attic access is an example of work requiring additional cost. The default is zero.

Job cost reduction costs shall be recorded in WisWAP and shall not be entered or modeled in Weatherization Assistant

5.2.4.6 Comment

You may enter comments pertinent to the roof/ceiling section directly in the Comment field on the form, or you may enter them in the Comment Editor by selecting the “Comment” button to the left of the field.

5.2.5 Floors



The *Floor* input screen contains information about the manufactured home floor/belly section. The Floor form is divided into four sections: a general description, floor wing description, floor belly (center) description, and the Comment and Additional Cost fields.

5.2.5.1 Floor Joist Direction − Required

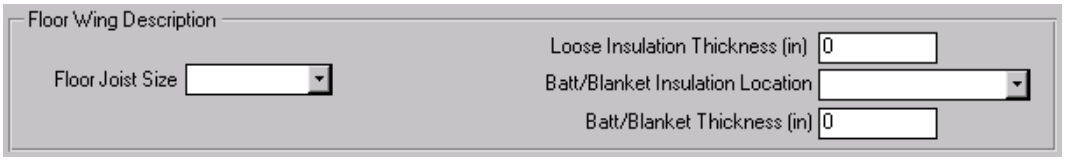
The floor joist is the wood framing that supports the interior floor. Enter the direction the floor joists are installed. The choices are Lengthwise and Widthwise. The floor joist direction is needed to calculate more accurately the volume of the belly section, and indicates where a central air supply duct is located (between joists or below joists), and the R-value of the floor.

- **Lengthwise** floor joists are installed parallel to the long dimension (length) of the home.
- **Width-wise** floor joists are installed parallel to the short dimension (width) of the home.

5.2.5.2 Skirt Present Check Box − Required

Indicate whether a skirt exists around the exterior of the home. The skirt must be solid and intact, not simply a decorative lattice. If skirting exists, MHEA adjusts the exterior R-value to account for the absence of wind when the total R-value of the floor/belly section is calculated.

5.2.5.3 Floor Wing Description Box – Required



Floor Joist Size
Indicate the dimensions of the floor joists in the wing sections. The choices are 4, 6, and 8. Sometimes the floor joist size is different in the wing section that in the belly section. MHEA needs this information to calculate the floor R-vale and the volume of the floor/belly section.

Insulation Type/Thickness
Enter the amount of existing batt\blanket and loose-fill insulation. If a thickness of 0 inches is entered, MHEA assumes that insulation of that type is not present. MHEA uses the existing insulation thickness to calculate the floor/belly R-value and to calculate the volume in the floor/belly section that is available for additional insulation. Depth should be based on performance rather than minimal thickness. For example, an older 2" batt could be de-rated to 1 ½ "if not in ideal condition.

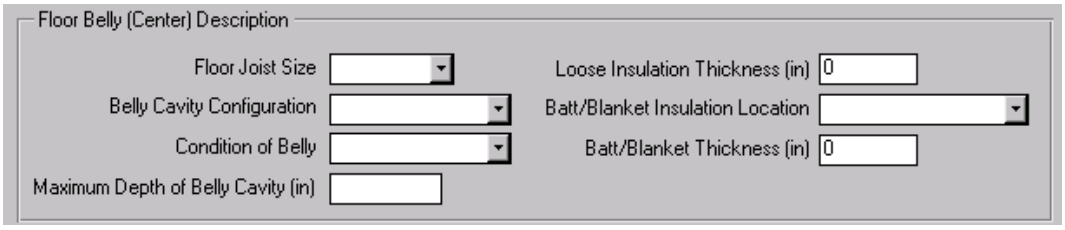
Batt/Blanket Insulation Location
Indicate where the batt/blanket insulation is located in the wing sections. The choices and descriptions are listed below.

- **Attached to Flooring:** refers to the case if the batt/blanket insulation is attached to the underside of the flooring.

- **Between Joists:** refers to the case if the insulation lies between but at the bottom of the joists, leaving the potential for an air space between the top of the insulation and the flooring.

- **Attached to Joist:** refers to the case if the insulation is attached to the underside of the floor joists.

5.2.5.4 Floor Belly Description Box – Required



- **Floor Joist Size**
  Indicate the dimensions of the floor joists in the belly sections. MHEA needs this information to calculate the floor R-value and the volume of the floor/belly section. The choices are 4, 6, and 8. Sometimes the floor joist size is different in the wing section that in the belly section. MHEA needs this information to calculate the floor R-vale and the volume of the floor/belly section.

- **Belly Cavity Configuration**
  Enter the configuration of the belly center cavity. The belly cavity is the deep section that runs the length of the home and usually houses the main supply air duct. The choices and descriptions are listed below.

Square: refers to the case if the cavity configuration has vertical sides and a horizontal base. (Usually, the main iron support beams act as the vertical sides).

Rounded: refers to the case if the belly wrap is draped in the middle portion of the home. Usually, the wrap is draped between the main iron support beams of the home.

Flat: refers to the case if the belly cavity configuration is one in which there is no center belly section lower than the belly wing section. This type of belly is often found on homes where the main air supply duct is located between lengthwise floor joists or where the main supply air duct is located in the roof section.

- **Condition of Belly**
  By observation, enter the condition of the existing belly wrap. The choices and descriptions are listed below.

  Good: A belly in good condition does not have any tears, holes, or other openings and is tightly attached around its entire perimeter.

  Average: An average belly wrap condition has some small tears, holes, or other openings in the belly wrap or may not be well attached at its perimeter.

  Poor: A belly wrap with large tears, holes, or other openings or which is not well attached at its perimeter.
  MHEA needs the belly wrap condition to calculate the effectiveness of existing insulation in the floor/belly section.

  NOTE: If the belly is in other than good condition and it is anticipated the belly will need insulation, include as "Additional Cost" the cost of repairing the belly with insulating type materials. Or, include this cost as an "Itemized Cost" and it will not be associated with the belly insulation measures.

- **Maximum Depth of Belly Cavity (in.)**
  Enter the maximum depth of the belly (in inches) as measured from the underside of the flooring to the lowest part of the belly, disregarding any existing insulation.

- **Insulation Type/Thickness**
  Enter the amount of existing batt\blanket and loose-fill insulation. When a thickness of 0 inches is entered, MHEA assumes that insulation of that type is not present. MHEA uses the existing insulation thickness to calculate the floor/belly R-value and to calculate the volume in the floor/belly section that is available for additional insulation. Depth should be based on performance rather than nominal thickness. For example, an older 2” batt should be de-rated to 1 ½" if not in ideal condition.

5.2.5.5 Added Floor Insulation Cost – As Needed

Enter any additional costs not normally associated with installation of belly insulation. The value is a lumped dollar amount, not per square foot. The default is zero. Additional cost of repairing the belly wrap material shall in the itemized cost tab be entered if the condition of the material needs to be improved prior to any blown insulation measure for the floor.

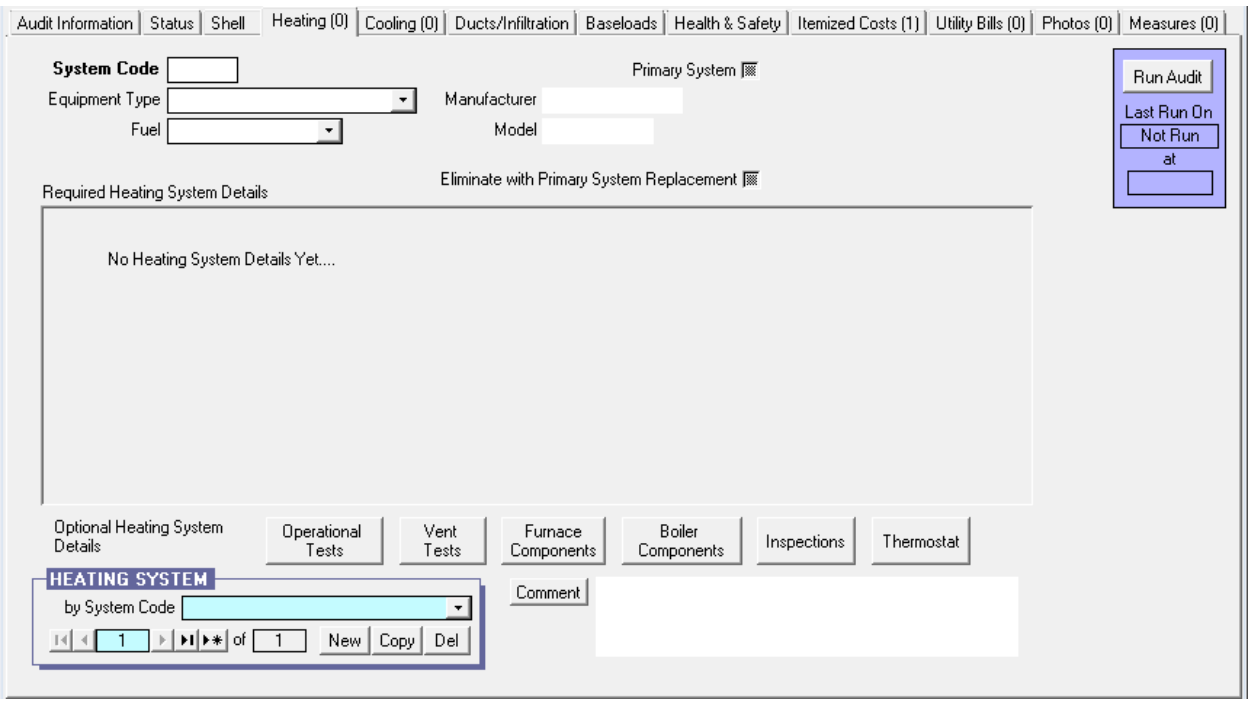
Job cost reduction costs shall be recorded in WisWAP and shall not be entered or modeled in Weatherization Assistant

Note: If insulating materials are used for repairing the belly, model the costs here and if floor insulation has an SIR of 1 or greater, then the measure can be reported as floor insulation and not a repair.

6.0 NEAT Heating Systems

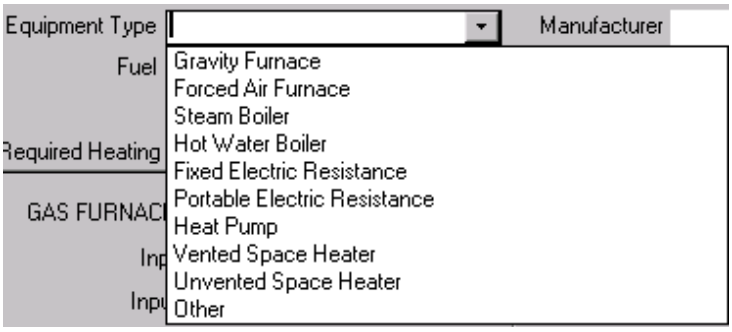
This form is used to enter information about the heating system(s) for the house. Enter as many systems as are required, but heating retrofits will apply only to the "Primary" system (assumed to supply the majority of the heat). You may encounter homes where even the primary heating system is inoperative. Do not attempt to describe these systems to NEAT by entering a value of 0 for either the Steady-State Efficiency (SSE) or Heat Supplied. Rather describe the existing heating equipment as supplying the amount of heat as it was intended to supply and an efficiency that is typical, but at the lowest end of the possible range, for equipment of its type.

6.0.1 Heating System Code − Required



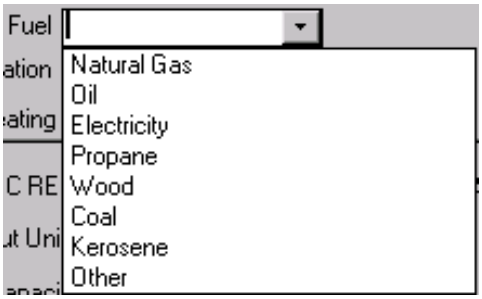
Heating System codes are abbreviated names specified by the user to identify specific components for later identification. System codes should be three to five characters in length. All heating system codes must be unique for a given Job. When the *Heating System Code* button is selected it will automatically create the code HS1, (heating system 1). If multiple heating systems are in a home, it is recommended to identify each heating system with its own unique code.

6.0.2 Heating System Equipment Type − Required



Select the type of equipment from the list shown above that best describes the heating system. Secondary systems may be described on subsequent heating system forms. The *System Details* form will vary slightly depending on the system type selected here.

6.0.3 Heating System Fuel Type – Required



Choose the fuel type consumed from the list shown above by the heating system being described. When the *Fuel Type* is entered, the System Details form will appear and will vary depending on the fuel selected as indicated in (below).

Fuel Type	System Details
Natural Gas	Gas Furnace Details
Oil	Oil Furnace Details
Propane (LPG)	Gas Furnace Details
Electricity	Electric Resistance Details Form Required
Wood	Space Heater Details
Coal	Space Heater Details
Kerosene	Space Heater Details
Other	Depends on Equipment Type

Tip: Other is setup for Wood Pellets.

6.0.4 Heating System Location − Required

Choose one of three locations for the heating system:

1) Heated space (purposefully heated by a heating system to maintain a desired temperature, usually utilizing a thermostat to control the space temperature. For example, a basement heated by supply registers or radiators in the space would be heated, as would a basement heated continuously by a space heater).

2) Unconditioned space (there are no sources of heat in the space other than conduction through walls, floors, and perhaps insulated ductwork).

3) Unintentionally heated space (partially heated by a heat source in the space that adds heat unintentionally to the space. For example, a basement that is heated because furnace, boiler, or water heaters are located in the basement or because uninsulated ductwork runs through the basement).

6.0.5 Percent of Heat Supplied − Required

Enter the estimate of the percent of total floor space heated by this system, or if multiple heating systems, the percentage that each heating system heats the building. The sum of the percentages for all heating systems described must be 100% or less.

6.0.6 Primary Heating System − Check Box

NEAT supports only one primary heating system per house. Heating retrofits will apply only to the primary system.

The primary system should be what is listed on the customer's application and referral. If the actual primary heating system is not as what is listed on the customer's application and referral, contact the local WHEAP agency prior to completing. If unable to be resolved at the local level, submit the question or issue to the HE+ Help Desk

If this box is left unchecked, the system is assumed to be a secondary system, unless it is the only system described. Checking the primary system box for any heating system will automatically uncheck the box for any other systems entered.

6.0.7 Manufacturer Name and Heating System Model − Optional

6.0.8 Eliminate with Primary System Replacement − Check Box

This checkbox is available for secondary systems only. Use this checkbox to identify any secondary system that will be eliminated by replacing the primary system. The heat supplied by any secondary heating system will automatically be attributed to the replacement primary system. Any costs associated with the elimination of the secondary heating system must be included with the cost of replacing the primary heating system. If the combination of the primary replacement and with secondary elimination is selected as an ECM, proceed with work. If the combination is not selected as an ECM, uncheck the box for elimination of the secondary system. If the eliminate with primary replacement box is unchecked, a secondary heating system may be left in place when the audit selects the primary heating system replacement as an ECM.

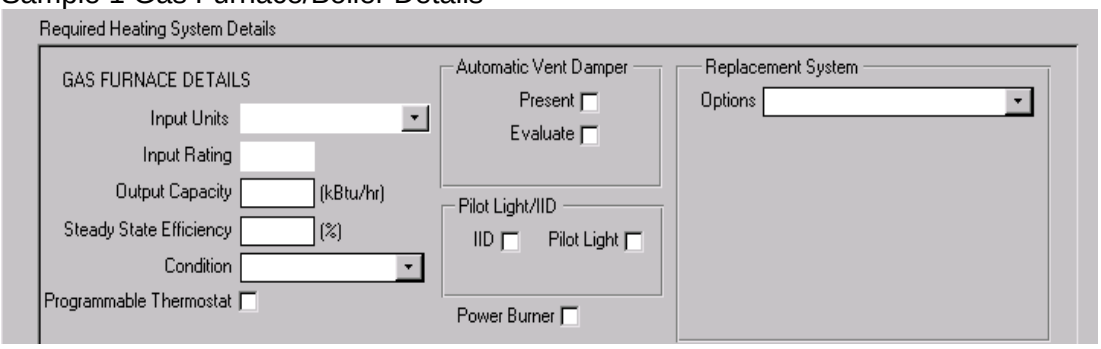
If the combination of replacing the primary system and eliminating the secondary is not selected as an ECM, the full cost may be modeled as an H&S heating system replacement with proper

documentation. If the cumulative SIR is ≥1.0, then proceed with work. If cumulative SIR is <1.0, model only the cost of the primary system replacement as a H&S measure and leave the secondary system in place.

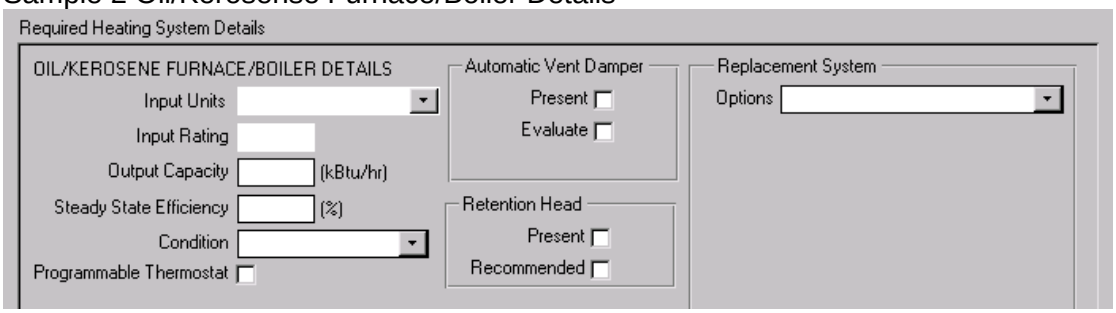
6.0.9 Heating System Details − Required

Depending on the heating system type and the heating system fuel selections, one of several *Furnace System Details* boxes will appear. (See below). Complete the information requested in the *Heating System Details* box that appears after audit information is entered. See Samples below − Choose option accordingly.

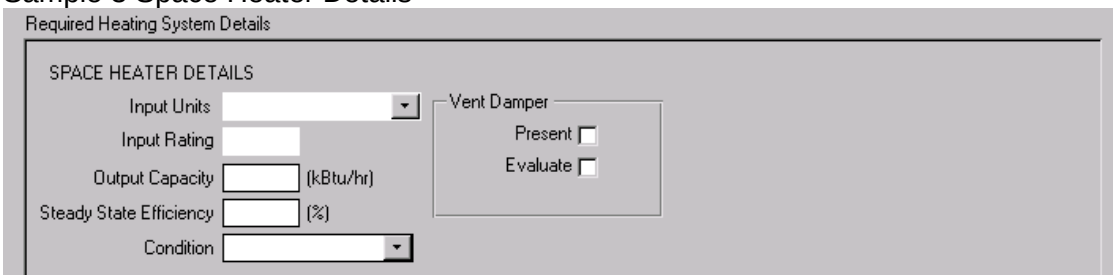
Sample 1 Gas Furnace/Boiler Details



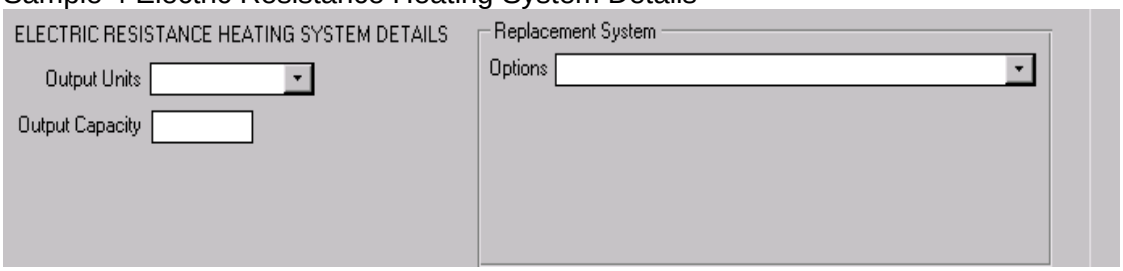
Sample 2 Oil/Kerosense Furnace/Boiler Details



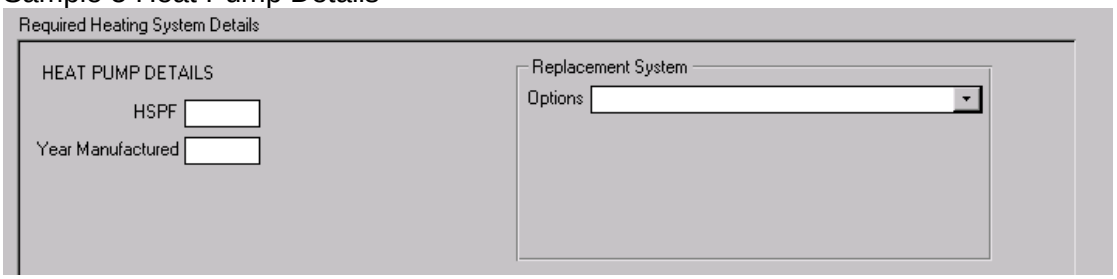
Sample 3 Space Heater Details



Sample 4 Electric Resistance Heating System Details



Sample 5 Heat Pump Details



The items below appear on some or all of the heating system details screens. Enter information as needed.

6.0.9.1 Input Units − Required

Indicate the units for the *Input Rating* entry that follows. The choices are No Input, kBtu per Hour, Gallons per Hour, Lbs. per Hour, and Cubic Centimeters per Minute. Then enter the actual value of the input rating in the Input Rating field. The input rating can be measured, or taken directly from the nameplate of the heating system. If an *Input Rating* is not available for the system being described, select "No Input" for this field and the *Input Rating* field will disappear. The *Input Rating* is used only with the *Output Capacity* to provide a default heating system *Steady State Efficiency percentage*. If the steady-state efficiency of the heating system will be measured by performing a flue-gas analysis or if the steady-state efficiency will be obtained by some other means, then, there is no need to obtain an input rating and the "No Input" menu item should be selected.

6.0.9.2 Output Capacity − Required

Enter the output of the heating system in units of kBtu/hr. The value can be measured, taken directly from the nameplate of the heating system, or approximated. If a value for *Input Rating* is entered, it will be used with the *Output Capacity* to provide a default *Steady State Efficiency*. The default for Output Capacity is based on system type. If steady state efficiency and an Input Rating have been entered, the Output Capacity is calculated by “tabbing” on this empty cell.

6.0.9.3 Steady State Efficiency − Required

Enter the measured or estimated (if furnace is inoperable at time of audit) steady-state efficiency of the heating system. If *Input Rating* has been entered, the default value will be derived from it and the value of *Output Capacity*. Otherwise, the default is based on system type. This parameter affects the savings of most envelope measures and should be as accurate

as possible. It is not recommended to replace a heating system based on anything but a measured efficiency.

Tip: High Efficiency Gas: Add 3 points to the tested SSE on units that test at 90 or higher. Example: Tested SSE = 91.4 enter 94.4

6.0.9.4 General Condition − Required

Select one of three choices to describe the current condition of the heating system. The choices are Good, Fair, Poor (but working).

6.0.9.5 Programmable Thermostat − Check box

Indicate whether the existing thermostat control allows automatic setback of the heating set point. The presence of a programmable thermostat will affect the annual consumption computed by NEAT and prevent the measure from being evaluated.

6.0.9.6 Vent Damper Present

Indicate whether the heating system flue is equipped with an automatic vent damper. Presence of an existing automatic vent damper will prevent installation of one from being evaluated.

6.0.9.7 Pilot Light Present

Indicate whether the heating system uses a pilot light.

6.0.9.8 System Retrofit Options

This entry tells NEAT about the status of the primary heating system and how it should be evaluated relating to replacement or switching fuels.

The following options are available:

- **Evaluate All** - **Always Select This Option** Evaluate all heating systems for replacement (standard and high efficiency). Replacement system efficiencies and costs for both standard and high-efficiency replacements will be requested in subsequent fields.

- **Evaluate None** – **Do Not Select This Option**

6.0.9.9 Replacement System AFUE

Enter the AFUE (Annual Fuel Utilization Efficiency) for the replacement unit. Entries will be required for either or both the standard and high-efficiency units, depending on the choice made for *System Retrofit Options*. The actual AFUE should be entered from agency procurement document for replacement equipment.

Note: Standard efficiency unit entries are solely to satisfy Weatherization Assistants request to fill these boxes in. Do not install standard efficiency heating systems as part of Wx.

6.0.9.10 Estimated Replacement Labor and Material Costs

Enter the labor and material costs associated with replacing the primary heating system. Default values are those specified in the *Setup Library*. Entries are displayed for either or both the standard and high-efficiency units, depending on the choice made for *System Retrofit Options*.

NEAT adds the labor and material costs in computing the SIR and reporting costs. Thus, the total cost (labor plus material) may be entered in either field, with $0.00 entered for the other of the two fields, with no adverse consequences. Do not enter $0.00 in both Labor and Material Cost fields for either replacement unit. The labor and material costs should be entered from agency procurement contracts for replacement equipment.

6.0.9.11 Heat pump HSPF

If a heat pump is the primary system, the default value of 6.5 may be used.

Optional Heating System Details: Wisconsin Auditors do not use these tabs.

6.1 Fuel Switching/Conversion of Heating Systems

6.1.1 Fuel Switching/Conversion of Heating Systems Audit Procedures

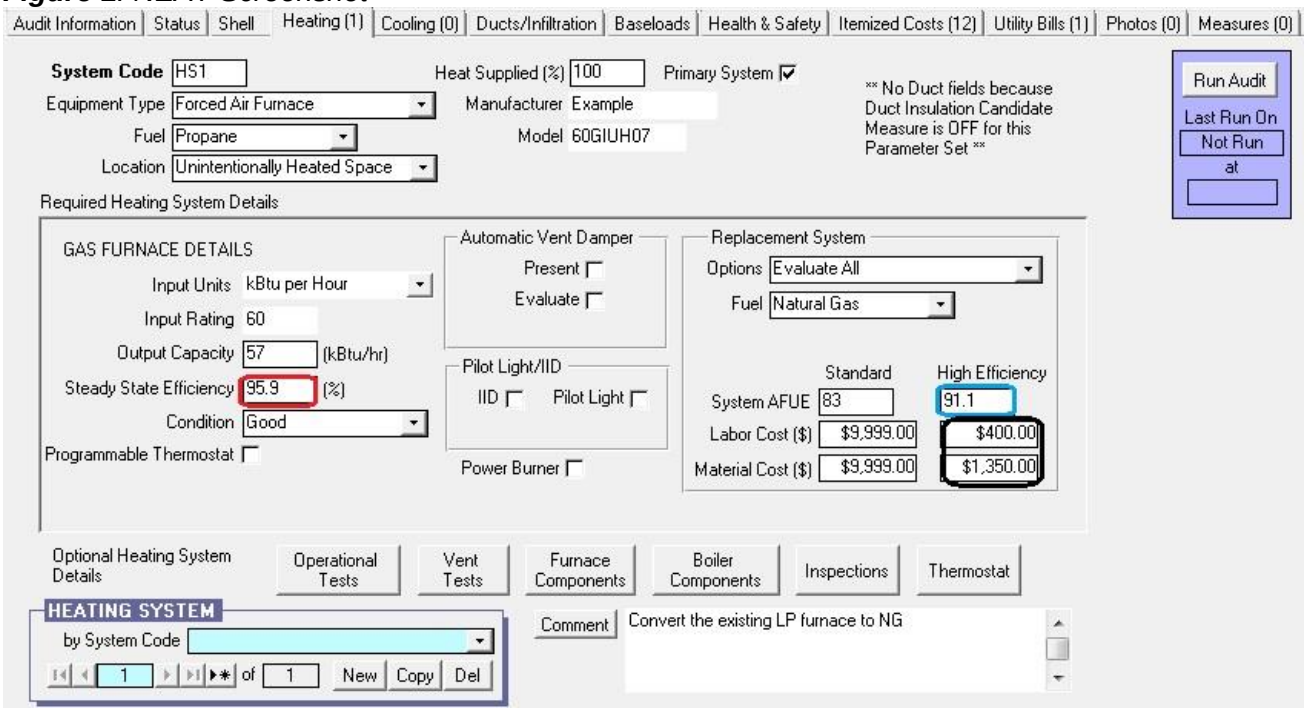
1) Model the replacement heating system in the Heating System tab as an Energy Conservation Measure (ECM). All costs associated with the heating system replacement, including emptying, disposing and/or moving existing fuel tank, shall be included in the modeled replacement costs for the evaluation of the SIR. If the gas lateral installation exceeds the maximum footage covered by the utility the cost of the additional footage can be modeled with the replacement cost. If the SIR for both the measure and the job are 1.0 or greater, then the fuel switch of primary heating system is allowed.

2) Model a water heater conversion as an ECM. Fuel switching replacement water heating systems from electric to gas, oil to gas or LP to natural gas is allowed when the total cost for fuel switching the system is modeled with the energy audit, the measure meets a minimum 1.0 SIR, and the building owner agrees to the conversion.

3) Model and replace existing oil heating system to natural gas following the policies and protocols.

4) Model existing LP heating system to natural gas following the protocol below when existing heating system is not replaced (see page 3, Figure 1):
    a. Under GAS FURNACE DETAILS (red outlined box), enter the **actual** measured SSE (do **not** add 3%).
    b. In the Replacement System Section under High Efficiency (blue outlined box), enter the measured SSE x 0.95.
    c. In the Replacement System Section under Labor and Material Cost (**black outlined boxes**), enter **all** conversion costs including gas line and interior piping modifications. There should not be any cost in the Itemized Cost category for fuel switching; this measure is for reporting purposes only.

***Figure 1**: NEAT Screenshot*



6.1.2 Electric to Fossil Fuels

1) Complete the Fuel Switch Calculator. This is located on the HE+ Website at: (http://homeenergyplus.weccusa.org/workbooksandcalculators). Actual Pre-Wx monthly electric consumption must be entered.

2) Enter savings results from calculator in NEAT audit as an itemized cost included in the SIR. IF selected by NEAT, the conversion can be completed.

3) Enter information into the heating system tab using the replacement system if selected by NEAT, This will result in lower SIR's on other measures because completing a heating system conversion was selected first before interaction with other possible measures.

6.2 5-24 Unit Heating Systems

Model heating systems as instructed in section 6.0 for replacement with an energy audit under the conditions listed below. The combustion efficiency of heating systems shall be measured. The annual efficiency shall be entered into the energy audit. Fuel switching replacement heating systems from oil, LP, or electric (furnace only) to natural gas is allowed when the total cost for fuel switching the system is modeled with an energy audit (or an SIR calculator) and the measure has an SIR of at least 1.0. The replacement of both primary and secondary heating systems is allowable as long as each replacement meets a minimum SIR of 1.0.

Building owners may opt to replace existing heating systems that do not meet a minimum 1.0 SIR test as a part of their contribution toward the weatherization of the building. Miscellaneous heating system repair measures that are required for the heating system to function properly shall be incorporated with the cost of the heating system replacement. The owner's contribution shall be equal to or exceed the buy-down amount to generate an SIR equal to or greater than 1.0. Note: as stated in the General Policy and Specifications, the buy-down of measures shall not result in other cost-effective measures being dropped from the improvement package. All measures that were cost-effective after the initial energy audit is conducted shall remain on the list of measures to be completed at the property.

1) Gas Heating Systems - Natural Draft: Model all gas-fired heating systems for replacement. Inspect fan-assisted systems for potential safety issues and model for replacement if safety issues cannot be repaired.

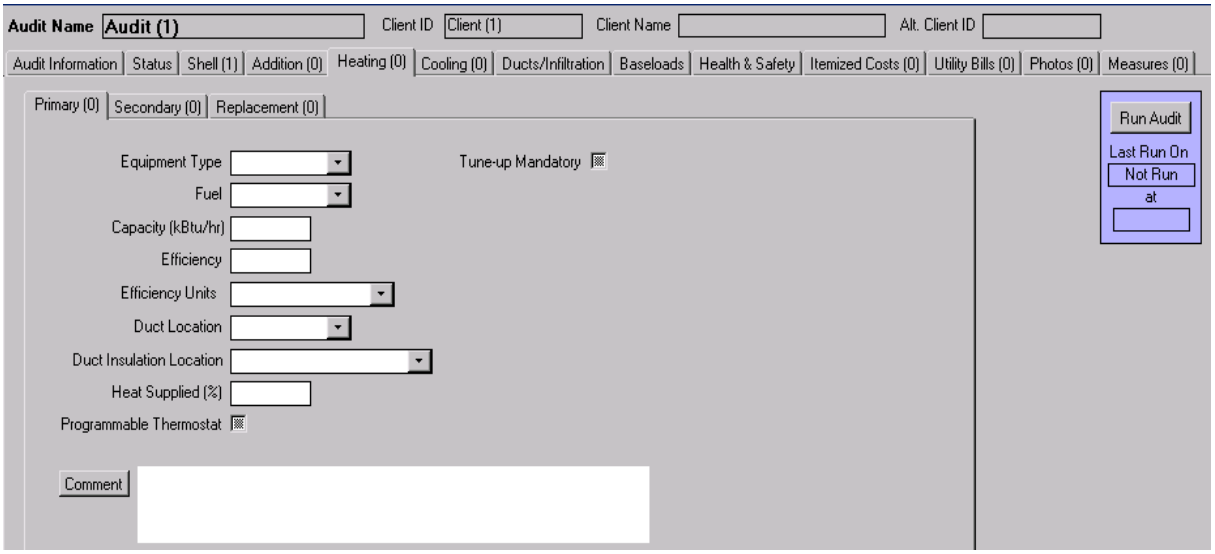
2) Gas Heating Systems - Sealed Combustion: Inspect systems for potential safety issues and model for replacement if safety issues cannot be repaired.

3) Oil Heating Systems: Model for replacement if the existing system is 10 years or greater in age. Inspect systems less than 10 years old for potential safety issues and model for replacement if safety issues cannot be repaired.

4) Space Heaters: Model for replacement if the existing space heater is 10 years or greater in age. If necessary, use the 5-24 Unit Workbook to generate savings information for multiple space heaters, incorporating the savings information and costs into NEAT's Itemized Cost section. Include all of the costs associated with the fuel switch in the replacement costs. Inspect systems less than 10 years old for potential safety issues and model for replacement if safety issues cannot be repaired.

5) Electric Furnace Conversion: Model for replacement with gas furnace with the energy audit or the Electric Heating System Conversion Calculator. Model conversion to a hydronic (boiler-driven) fan coil unit with TREAT. Include all of the costs associated with the fuel switch in the replacement costs. Inspect all units that will not be replaced for potential energy conservation measures and safety issues.

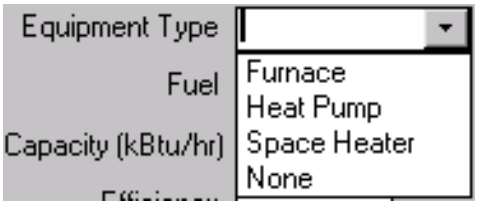
6.3 MHEA Data Entry – Heating



6.3.1 Primary Heating System

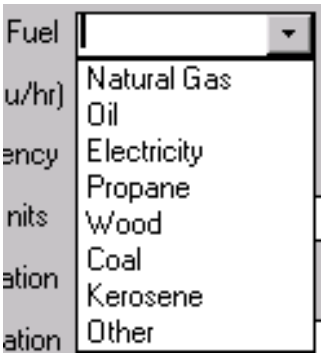
The primary system is the system that supplies the majority of the heat to the home and on which MHEA will consider installing energy efficiency measures. You must describe an existing primary heating system before MHEA will execute.

6.3.2 Equipment Type – Entry Required



Select what type of heating system in in the home. The choices are Furnace, Heat Pump, Space Heater, and None.

6.3.3 Fuel Type – Entry Required



Select the fuel type associated with the primary heating system. The choices are Natural Gas, Oil, Electricity, Propane, Wood, Coal, Kerosene, and Other. Heat pumps are automatically considered electric.

6.3.4 Capacity

Enter the rated input capacity in kBtu/h for natural gas, electric, propane, oil, kerosene furnaces and space heaters. The capacity can often be obtained directly from the nameplate of the heating system or from an inspection of nozzle sizes, etc. If this information is not available, the output capacity can be approximated or, in rare cases, measured. Enter the rated output capacity for heat pumps. Capacity input for coal and wood systems is not required.

6.3.5 Efficiency

Enter the measured heating efficiency of the primary heating system. The heating efficiency is the fraction of heat supplied to the living space by the equipment after fuel is consumed to produce the heat. Enter the SSE if tested using a combustion analyzer.

High Efficiency Gas: Add 3 points to the tested SSE on units that test at 90 or higher to better calculate the AFUE. Example: Tested SSE = 91.4 enter 94.4

An electric furnace or un-vented space heater is 100% efficient as long as it is located in the living space of the manufactured home. De-rate an electric furnace located in a closet with an exterior access by as much as 10% depending on the leakiness of the closet.

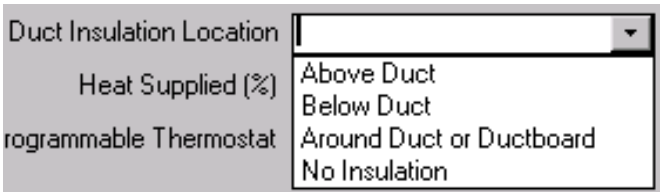
6.3.6 Heating System Efficiency Units

Select the unit of efficiency entered in the *Equipment Efficiency field*: *Steady State* will be the common selection. Coefficient of Performance (COP) and Heating Season Performance Factor (HSPF) are used in rating heat pump equipment. See glossary for definitions of the various efficiency ratings.

6.3.7 Heating Duct Location

Select the location of the main supply air duct for the heating system. The choices are Floor, Ceiling, and None. Usually, manufactured homes have a single duct that runs along the center of the home, or two ducts, each running along the length of the home and connected by a cross-over duct. Indicate if the main supply duct is located under the floor or above the ceiling. In some cases, no main supply air duct exists. Enter none, if the supply air duct has been disconnected from the central heating system and there are no plans to reconnect it

6.3.8 Heating Duct Insulation Location



Select the location of the main supply air duct for the heating system. The choices are Floor, Ceiling, and None. Usually, mobile homes have a single duct that runs along the center of the home, or two ducts, each running along the length of the home and connected by a cross-over

duct. Indicate if the main supply duct is located under the floor or above the ceiling. In some cases, no main supply air duct exists. Enter none, if the supply air duct has been disconnected from the central heating system and there are no plans to reconnect it

Tip: Pick “Around Duct or Duct board” if any insulation is present.

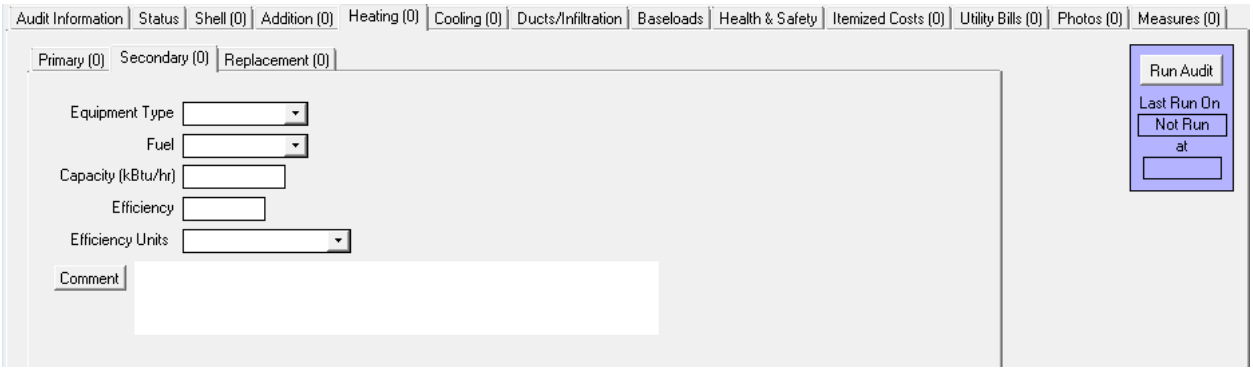
6.3.9 Percent of Total Heat Supplied (%)

If there are two heating systems in the home, estimate the amount of heat supplied by the primary heating system. Enter this value as a percent of the total heat supplied by both heating systems. If no entry is made, MHEA assumes that the primary system supplies 100% of the required heat.

6.3.10 Programmable Thermostat Installed?

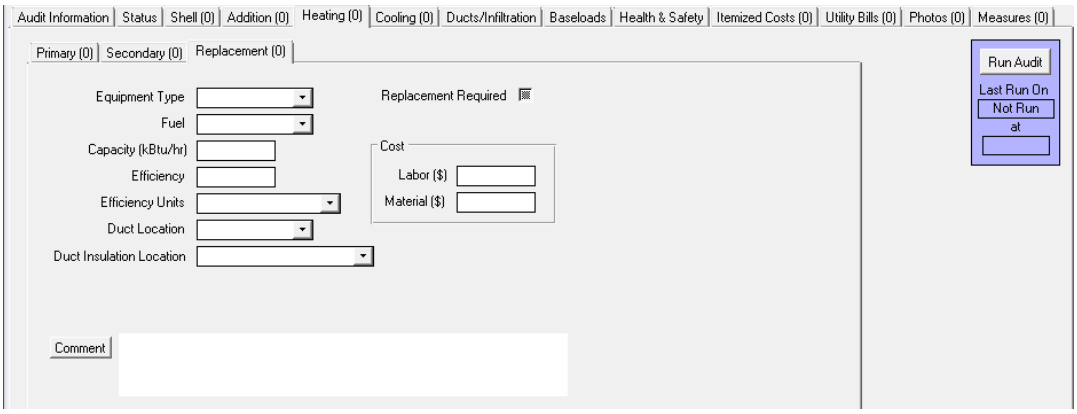
Indicate whether the thermostat is programmable. A programmable thermostat will affect the annual consumption computed by MHEA.

6.3.11 Secondary Heating System



Once data for the primary system is completed, a secondary system can be added if the primary system does not provide 100 percent of the heat. Inputs present on the *Secondary Heating Equipment* form are identical to entries on the *Primary Heating Equipment* form. Required entries include *Equipment Type*, Fuel Type, and *Capacity*. An optional *Comment* field also exists.

6.3.12 Replacement Heating System



Note: In Wisconsin, replacement information must be added for fossil fuel systems.

Click the tab labeled “Replacement” to access the *Replacement Heating Equipment* description form. The form is similar to the *Primary Heating Equipment* form. Specify the equipment to be installed if replacement is part of the retrofit package**. DO NOT** check the replacement required check box.

6.3.13 Capacity

Enter the heating system capacity in kBtu/h of the replacement heating system to be installed.

6.3.14 Heating System Efficiency Units

Select the unit of efficiency entered in the *Equipment Efficiency* field: *AFUE* should be selected. The AFUE rating that is to be entered should be obtained from agency procurement documents. *COP* and *HSPF* are used in rating heat pump equipment and are not common in Wisconsin. See the glossary for definitions of these efficiency ratings.

6.3.15 Labor and Material Costs

Enter the Labor and Material cost associated with replacing the primary heating system. MHEA adds the labor and equipment costs in computing the SIR and reporting costs. Thus, the total cost (labor plus equipment) may be entered in either field, with $0.00 entered for the other of the two fields, with no adverse consequences. Do not enter $0.00 in both Labor and Material Cost fields for either replacement unit. The labor and material costs that are to be entered should be obtained from agency procurement documents.

Chapter 7 Wisconsin Protocols and Specific Modeling Procedures

7.0 Audits

Wisconsin requires an energy audit for every unit to be weatherized, with the exception of Mobile Homes which primary heat source is Natural Gas, these homes are treated by use of the Mobile Home Measures List. Wisconsin uses the Weatherization Assistant Energy Audit software to determine what measures are completed on dwelling units.

- For bulk fuel Mobile Homes utilize MHEA. Exceptions: When the building has more characteristics of a site built home use NEAT. Examples would be multiple additions or a full heated basement.

- For 1-4 Unit Buildings and 5-24 Unit Buildings, use NEAT.

7.1 Ducts and Infiltration

Use the auditor measured As Is blower door test as the Before Weatherization Whole House Blower Door Measurement. Use the auditor estimated Final blower door test as the After Weatherization Whole House Blower Door Measurement. (Using the estimated number provided in the modeling tab of the diagnostic workbook can be considered a good number to use)

In 5-24 unit buildings, complete pre- and post-retrofit blower door tests whenever feasible. Seal all probable heat bypasses and key junctures. Repair or replace glass as needed. Whenever feasible, based on site-specific conditions, use diagnostic tools such as depressurization, infrared scanners, and smoke pencils to determine the appropriate sealing locations in the building, specific units, and common areas. Provide sealing work that will improve the thermal boundary of the building and address the tenant comfort zone. Air sealing procedures may differ between low-rise and high-rise buildings. Combustion safety procedures may differ between central versus individual combustion appliance zones (CAZ). For energy audit purposes, estimate the air leakage in the building by taking the square footage of the building surface above grade by a leakiness factor. Use the chart below as a guide for estimating air leakage per cubic feet per minute (CFM) per 50 Pascals.

Building Tightness Projections: 5+ Unit Buildings
(all measurements are CFM/square foot above grade)

		Post WX	
Building Type	**Pre-WX**	**Average**	**Very Tight**
Wood Frame		(25% Reduction)	(35% Reduction)
Average	1.00	0.75	0.66
Leaky	1.25	0.9	0.8
Very Leaky	1.5	1.1	0.9
Masonry	0.66	0.5	0.4

7.2 2-4 Unit Building Audits: Single Primary Heating System

1) Create a client record and include contact information for each customer. Run a single audit for the building.

2) If possible run a single blower door test or estimate leakage for the whole building.

3) Enter total number of occupants in the building if there is a single water heater to be modeled for replacement.

4) Enter the number of occupants for “Unit 1” if the unit has an individual water heater and/or refrigerator to be modeled for replacement.

5) After results are available from “Unit 1”, enter water heater and refrigerator replacements as itemized costs. Edit the number of occupants to reflect “Unit 2” and edit baseload screens for possible water heater and refrigerator replacements in “Unit 2”.

7.3 2-4 Unit Buildings: Separate Heating Systems

The type and efficiency of the heating systems will determine how to run audit(s) for the building. In buildings where there is no need to model for any replacements a single audit can be run whereas if multiple systems should be modeled for replacements, multiple audits are run.

7.3.1 Heating Systems NOT Modeled for Replacement

1) Follow the directions in section 7.2 to create client record and single audit.

2) Enter heating systems not being modeled for replacement as secondary heating systems. If one heating system should be modeled for replacement, enter it as the primary even if it supplies less than 50% of heat to building. Use fuel records to determine % heat supplied by each heating system. For upper/lower duplexes use 60% for lower as a default with 40% for upper.

3) Enter all electrical heat for the entire building as the primary when only electric is used.

7.3.2 Heating Systems Modeled for Replacement

1) Create a client record for each unit in the building. Run an audit for each unit and assign sections of the building shell to each unit.

2) For a 2-story duplex, assign the foundation to the lower unit of the building and the entire attic to the upper unit. Enter shared ceiling/floor as an attic for the lower unit with an effective R value of 100 and as a floor over a conditioned foundation space for the upper unit with an R value of 38. Assign walls to each unit, upper walls with upper unit.

3) For a side by side duplex, assign attic, walls, foundation to each side. Model the shared wall between the two units in both audits with an effective R value of 38.

4) Run separate blower door test for each unit to be entered in the audit

7.4 Replacing Multiple Space Heaters with a Forced Air or Boiler System

1) Pick one space heater as the primary heating system. Add the total costs of the replacement, including distribution system as the cost of the replacement with comments to explain.

2) Add the second, third, and all additional space heaters as heating system records as secondary systems assigning each a percentage of heat supplied. Check box “Replace with Primary Heating System.”

3) A secondary heating system may be left in place, if the eliminate with primary replacement box is unchecked, and Weatherization Assistant determines that the primary heating system is still an ECM. If the primary does not call up as an ECM, the primary must then be modeled as an H&S Furnace Replacement, and the cumulative SIR must be above 1.0 in order for the secondary heating system to be left in place.

The replacement selection will default to a Standard Efficiency – (80%). Add high efficiency number for the primary replacement – either forced air or boiler – and run the audit to see if the high efficiency replacement has a SIR ≥ 1.

Chapter 8 Reports

8.0 Input Reports

The Weatherization Assistant will produce a report for both NEAT and MHEA showing the input information entered into NEAT or MHEA by the auditor. This can be used as a resource for auditors and quality assurance if they want to check their entries for accuracy.

8.1 Output Reports – Recommended Measures

The Weatherization Assistant software produces an output report for both NEAT and MHEA that lists measures recommended as a result of the auditor's input. The output report can be run as many times as needed, if input needs to be updated or changed.

In the *Energy Saving Measure Economics* section, measures will be listed in the following order:

1) Health and Safety Measures > $1,000 (are to be included in SIR). This contributes to the cumulative cost, but no savings are related to the measures.

2) Repair Measures (all are to be included in SIR). Again, no savings are related to these measures.

3) Forced Energy Conservation Measures (ECMs) − For example, required water heater replacements.

4) All other ECMs in descending order of their SIR.

5) All other ECMs selected as itemized costs.

6) Health and Safety measures <$1,000 in Itemized costs. These measures do not contribute to cumulative savings or cost so have no impact on the cumulative SIR. They are listed with an SIR = 0.0 and cumulative SIR = 0.0.

Users will need to look above the Health and Safety Items < $1000 to get the real cumulative SIR for the job.

The Recommended Measures must be installed using the selected R-Value and/or materials as appropriate.

For 5-24 Unit Buildings

1) Building owner contributions may be used to the cover the cost (or portion of the cost) of any weatherization measure allowed by the State of Wisconsin that does not meet a minimum 1.0 SIR test as a part of their contribution toward the weatherization of the building, under the following conditions:
    a. The owner's contribution shall be equal to or exceed the buy-down amount needed to generate an SIR greater than or equal to 1.0.

b. The owner's contribution shall be at least 15 percent of the total cost of measures performed when the heat is master-metered.
c. The buy-down of measures shall not result in other cost-effective measures being dropped from the improvement package. All measures that were cost-effective after the initial energy audit is conducted shall remain on the list of measures to be completed at the property.
d. The cumulative SIR of the building's measures package shall be greater than or equal to 1.0.
e. There shall be documentation in the building/customer file of the energy audit, including measures that will be completed which have an initial SIR of less than 1.0.

8.2 Output Report - Energy Saving Measure Economics

Recommended measures are listed in the order selected by the Weatherization Assistant software. In Wisconsin, all measures that appear in the *Energy Saving Measure Economics* section of the output report with a cumulative Savings to Investment Ratio (SIR) equal to or greater than one (≥1) must be included on the work order. ECM measures with a Measure SIR<1 cannot be included on the work order (Infiltration Reduction is an exception to this).

The *Energy Saving Measure Economics* portion of the output report estimates the savings dollars per year of each measure selected, as well as the cumulative savings per year of all measures. Energy Saving Measure Economics (Adjusted)-Required unless exceptions met.

Energy Saving Measure Economics (Adjusted)

Index	Recommended Measure	Components	Measure Savings ($/yr)	Measure Cost ($)	Measure SIR	Cumulative Cost ($)	Cumulative SIR
1	Infiltration Redctn		74	1000	0.7	1000	0.7
2	DWH Replacement		412	1300	3.9	2300	2.5
3	Fill Ceiling Cavity	FA4	32	165	3.3	2465	2.6
4	High Eff Furnace	HS1	156	1385	1.9	3850	2.3
5	Attic Ins. R-38	FA2	16	221	1.3	4072	2.3
6	Attic Ins. R-30	FA1	73	1034	1.2	5105	2.1

Use this section (page 2 of the Output Report) if billing/ utility data is entered. It will appear on the *Recommended Measures* report only when utility costs are entered into the audit. In most audits, entering the utility usage will alter the recommended measures list as shown above.

Appendix A: Glossary

AFUE (Annual Fuel Utilization Efficiency) − A measurement of the seasonal energy efficiency of fossil fuel heating equipment. It is the annual output energy of the equipment divided by its annual input energy, expressed in consistent units (i.e. Btu-out per Btu-in) as a percentage. AFUE includes input energy required by the pilot light but does not include electrical energy for fans or pumps.

Audit − The process of identifying energy conservation opportunities in houses. As used here, NEAT/MHEA audit means a computer selection technique which optimizes the Saving-to-Investment Ratio of selected energy conservation measures.

Auditor − A person who performs an energy audit.

Balance point − For heating, the balance point is the outside temperature above which no heating is needed. For cooling, the balance point is the outside temperature below which no cooling is needed.

Band joist − A horizontal framing member resting on top of a framed wall that separates stories in a building.

Baseload − The energy required to operate the domestic hot water heater, lights, cooking, clothes washing, and other household appliances that are used throughout the year.

Base temperature − Base temperature is the outdoor temperature below which heating or above which cooling systems are used. Assume a base temperature of 65°F for heating degree-days (HDD's) and 78°F for cooling degree-days (CDD's), unless a different base temperature is listed on the utility bill.

Belly − The underside of a manufactured home consisting of a rodent barrier, floor trusses, and insulation.

Bowstring − Wood roof trusses in the shape of a bow which support the weight of the roof in a mobile home.

British thermal unit (Btu) − The quantity of heat required to raise one pound of water one degree Fahrenheit.

Buffered − A wall which is protected by an unconditioned, attached enclosure − like a garage or an enclosed porch.

Building description − Information used to describe the house to NEAT.

CCF − One hundred cubic feet (usually natural gas)

CCM − Cubic centimeter per minute. Refers to fluid flow.

Ceiling joist − The horizontal wood framing member that holds up the ceiling (see outer ceiling joist).

CFM − Cubic feet per minute.

Collar beam − A horizontal piece of lumber that ties the rafters together near the peak of the roof, and forms the ceiling for a section of finished attic.

Combustion tester − A device used to analyze the steady − state efficiency of combustion heating units.

Component − A segment of a building normally described by a single line within the NEAT building description data input, having sufficiently uniform construction and orientation to be considered as a single unit (for example, a portion of a house's exterior walls facing the same direction with similar construction and retrofit potential).

Conditioned − Intentionally heated or cooled areas of the home.

Cooling degree day (CDD) − During a 24 hour period, each degree that the average daily temperature is above the base temperature (usually 78°F) constitutes one cooling degree day unit.

COP (Coefficient of Performance) − A measurement of the instantaneous efficiency of heating or cooling equipment. It represents the steady-state rate of energy output of the equipment divided by the steady-state rate of energy input to the equipment.

Cost effective − Having an acceptable Savings−to−Investment Ratio

Crawl space- A type of basement in which one cannot stand up: the height may be as little as a foot, and the surface is often soil. Crawl spaces often provide access to pipes, substructures and other areas that may be difficult to access otherwise. A crawlspace cannot be used as living space, but can be used as storage

Datasheet view − A format of data entry similar to a spreadsheet. All field for a given item of required information from all records of a given component type are in the same column in the spreadsheet. Horizontal scrolling may be necessary to view all data items associated with a given record.

Draft diverter − A device located in exhaust pipes, used to prevent outside air from flowing into the pipe.

Electric Damper − See "vent damper"

ECM – Energy Conservation Measure

Energy Consumption − Energy consumption is the energy used by the occupants of a home. This energy is either electricity supplied by a utility or by fuel that is burned in the home (i.e., natural gas, wood, etc.). It includes energy consumed to heat and cool homes, cook, heat water, power lights, and other uses.

Energy cost escalation rate − The energy cost escalation rate is the federal government's best guess of how much energy costs will increase above the rate of inflation from one year to another.

Energy efficiency ratio (EER) − A measurement of energy efficiency for room air conditioners. The EER is computed by dividing cooling capacity − measured in British Thermal Units per hour (Btu/h) − by the watts of power used. This is a steady − state efficiency.

Envelope − The physical boundary of a building (i.e., wall roof) which encloses the interior space.

Exposed − In the context of NEAT/MHEA "exposed," means that a building component is in direct contact with the outside air.

Flame Retention Head Oil Burner (FRHOB) − A modern, improved efficiency oil burner that burns the oil more completely through enhanced mixing of the oil particles with air.

Floor joist − The framing members (often 2 x 8 lumber) which support the floor.

Form view − A format of data entry which allows edits to be seen and made to the information for a particular record. Data entry controls may be arranged or grouped in ways that contribute to your understanding of the information requested.

Form − In NEAT/MHEA, a computer screen containing information entered by the user describing a particular component of a house, such as a wall or furnace.

Heating Degree Day (HDD) − During a 24 hour period, each degree that the average daily temperature is below the base temperature (usually 65°F) constitutes one heating degree day unit.

HSPF (Heating Season Performance Factor) − A measurement of the seasonal efficiency of an electric heat pump using a standard heating load and outdoor climate profile over a standard heating season. It represents the total seasonal heating output in Btu's divided by the total seasonal electric power input in watt-hours (Wh). Units are Btu/Wh. Typical values range from 5.0 to 10.0.

Infiltration − Air leakage in or out of a building under natural conditions rather than under artificial pressurization by a blower door.

Input rating − A theoretical rate of a fuel's available energy a furnace, boiler or space heater is capable of receiving (kBtu/hour, gal/hour, lb. /hour, ccm).

Interior shading devices − Interior shading devices are interior window coverings that prevent sunlight from entering a manufactured home. Drapes are heavy curtains that hang in loose folds over the window. Blinds or shades are lightweight window coverings that hang flat over the window. Both venetian blinds and roller shades are in this category.

Intermittent ignition device (IID) − A device that automatically ignites the gas burner on a gas heater only when the thermostat calls for heat, thus saving the energy that a continuous pilot light consumes.

Job Identifier − A string of 50 or less typed characters entered on the *General Information* screen that uniquely identifies a building description (house) to users and the computer. It may include symbols and spaces.

Joist − A horizontal, wooden framing member supporting a floor or ceiling.

Kilowatt – hour (kWh) − A unit of energy (usually in reference to electricity).

Knee wall − A short wall that separates the unconditioned part of a finished attic from the conditioned part. The knee wall borders the floor and sloping ceiling.

Low E window − A multi−pane window with a metalized coating on one of the interior surfaces. Low E windows save energy during the winter by reflecting heat rays originating in the house back indoors. During the summer, low E windows reflect solar heat outdoors. Low E windows have a higher R-value than standard windows.

Manufactured home − A manufactured home is constructed in a factory and has a permanent chassis as part of the frame so that it can be moved. Manufactured homes are constructed either as one unit (usually less than 20 feet wide) or as two long units (each unit is usually less than 20 feet wide) that are attached at the center after the two parts have been moved separately to the site the home will occupy.

Measure number − Measure numbers group together building parts which will have the same energy treatment. Assign the same measure number to a group of components of the same type, which should be considered together when determining the SIR for retrofitting the components.

Measures − Energy conservation projects under consideration for a house.

MHEA − Acronym for Manufactured Home Energy Audit.

NEAT − Acronym for National Energy Audit Tool.

Outer ceiling joist − The portion of the ceiling joist extending from knee wall to roof rafter.

Output capacity − The rate of actual heat delivered by the heating device after flue losses and combustion inefficiencies are considered (in kBtu/h).

Pascal − A unit of pressure (kilogram−per−square meter).

Retention head − See "flame retention head oil burner" (FRHOB).

Retrofit − The process of improving the efficiency of a system, such as adding insulation to the walls of a house.

Rim joist − A horizontal framing member resting on top of the foundation

Roof rafter − A sloping wooden framing member supporting the roof.

Savings − to − investment ratio (SIR) − A ratio of the lifetime savings−to−initial investment. The SIR calculates the "present value" of dollars advised by an energy conservation measure, by adjusting the future savings to reflect energy cost escalation rates and discount rates. A SIR indicates that the investment will pay for itself over the lifetime of the measure. A SIR greater than one indicates an earlier recovery of initial investment.

SEER − Acronym for Seasonal Energy Efficiency Ratio.

Setup − Accessed by selecting "Setup" on NEAT's introduction screen. "Setup" contains material cost data, fuel prices, key parameters and weather data.

Sheathing − The rigid exterior covering over wall studs in the exterior walls of wood−frame houses. Plywood and asphalt−impregnated fiberboard are common sheathing materials.

Sill box − The area bounded on three sides by the rim joist, sill plate and sole plate.

Slab−on−grade − A concrete foundation resting on a surface even with level ground.

Steady State Efficiency − This is the instantaneous useful output of the heating system (disregarding any losses in the distribution system) divided by the input power. The value is expressed as a percentage.

Stud − A vertical framing member that is the structure of the wall of a wood frame home.

Therm − A unit of energy. One therm equals 29.3 kilowatt−hours.

Unconditioned space − An area within the house's envelope which is not intentionally heated or cooled.

Vent damper − A device that conserves energy by closing part or the entire flue when a heater is not burning fuel. Vent dampers prevent heated air from escaping up the flue while the heater is not operating.

Ventilated wall − A manufactured home wall which has space for airflow between the exterior and interior wall materials. The insulation in a ventilated wall will often be excessively dirty.

Wall code − The letter/number system used to identify each exterior wall on the floor plan. Analogous codes exist for windows, doors, attics, subspaces and air conditioners.

Window frame − The sides, tip, and sill of the window which forms a box around all the window components.

Window sash − The part of the window that surrounds and supports the glass.