WaWeb User's Manual for KY Weatherization

KHC Kentucky Housing Corporation

Investing in quality housing solutions.

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CONTENTS

1.1 HARDWARE AND SOFTWARE REQUIREMENTS

The Weatherization Assistant needs web browser, as it is a web-based application. The currently supported browsers, listed in preferential order, are Firefox, Chrome, and Microsoft Edge. The latest version of each browser is recommended. Current browser requirements are for Windows operating systems a Pentium 4 or higher CPU, 200 MB of free disk space, Windows 7 or higher/Mac OS X 10.5.6 or higher, and 512MB of RAM for 32-bit machines, or 2Gb of RAM for 64-bit machines.

The graphic card and monitor should be able to produce a full display with a minimum resolution of 1680 x 1050 to allow the Weatherization Assistant to be seen without scrolling. Smaller resolutions will work if the browser full screen mode is used, or if the display is scaled, but there are known issues with these approaches. Scaling or zooming in the browser, anything other than 100% either direction, will also present minor issues that will only affect the appearance, and not the functionality of the Weatherization Assistant.

Reports for the Weatherization Assistant are all generated as PDF documents.

1.2 LOGGING INTO THE WEB-BASED WEATHERIZATION ASSISTANT

Log into the web-based Weatherization Assistant (Figure 1.1) using a link and login information (username and password) KHC, or the agency for which you work. The link will often be in the form of "wa-ky.ornl.gov". The left side of the login window provides updates made to the latest release of the software.

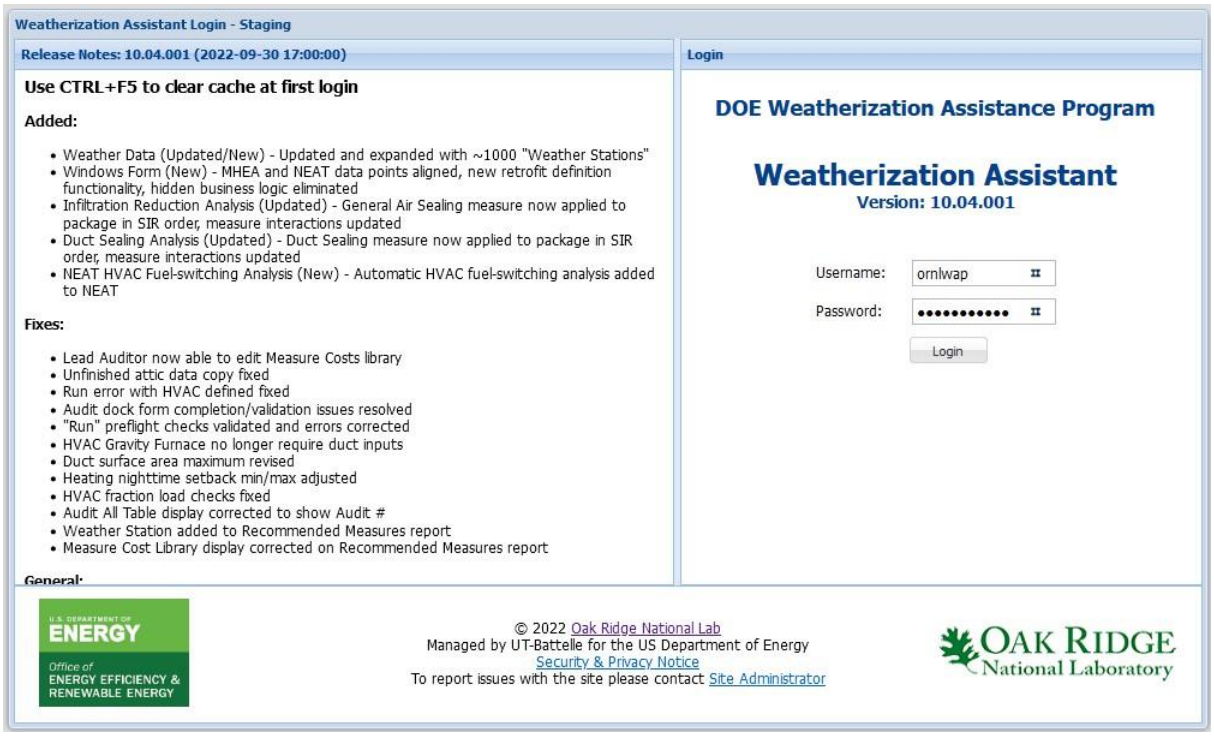


Figure 1.1. Web-based Weatherization Assistant login web page.

The Account form will open upon login, and the menu bar is located at the top of the user interface (Figure 1.2). The menu bar provides access to the administrative forms (agency, contacts, cost centers, account, and user), audits (NEAT & MHEA), work orders, and libraries needed to run NEAT & MHEA (Economic Parameter Set, Fuel Cost, Measure Cost Set, Key Parameter Set, Supply, and Defined Measure Set). The menu bar also provides a link to obtain more information about the Weatherization Assistant, access release notes, and log out. In the future, it may also provide access to Options and Help

menus.

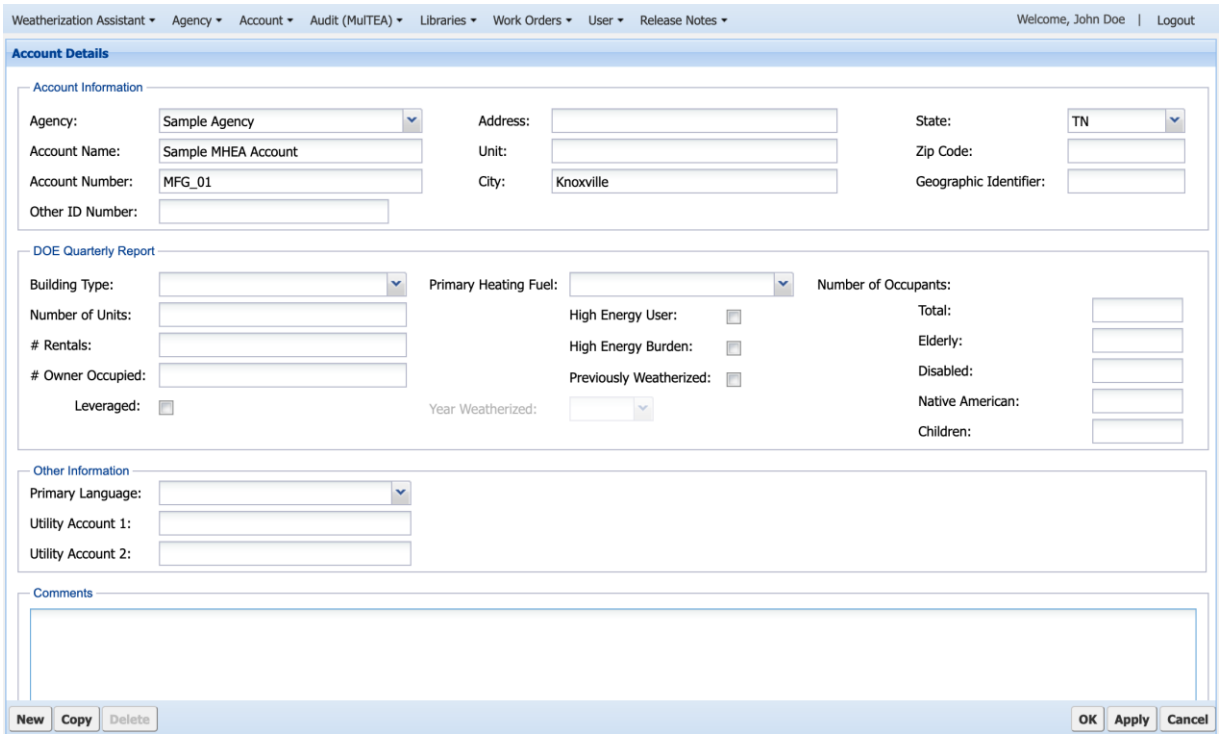


Figure 1.2. Account form with the menu bar at the top.

1.3 GENERAL LAYOUT AND NAVIGATION

A typical form has two sections: the main form at the top for data input and an All table at the bottom that lists the existing records that can be displayed on the main form (see Figure 1.3).

The main form has a title bar at the top, data input fields, and a task bar at the bottom. The title bar shows the name of the form. Data input fields are frequently grouped within a boundary that is called a *field set* (e.g., Building Information in Figure 1.3). The task bar contains New, Copy, and Delete options to create or delete a record. Selecting OK saves the record and closes the form. Selecting Apply saves the record but leaves the form open. Selecting Cancel closes the form without saving the entries made.

Data input fields are typically ghosted if not relevant in certain contexts or grayed if read-only. Some data input fields display a tooltip when you hover over the field, which describes the field, the acceptable format, and/or the acceptable range of the input. Data input in individual fields may be required or optional. The form cannot be saved if a required field is left blank or the input is out of range or in an incorrect format. If these issues occur, a red border will appear around the required field and a validation failure message will appear when OK or Apply are selected.

The All table at the bottom of the form shows all the records that you can select to be shown on the main form. Select a record in the All table to display it in the main form. The All table has a title bar and header row at the top. In addition, the All table of Audit forms also has a pagination bar at the bottom. The column headers show key field names of the form. When you hover over a column header, a drop-down button will appear on the right. Selecting this button will allow you to sort the records in ascending or descending order. In addition, it provides a means to hide or unhide columns of the table (Figure 1.4). The All table can further be customized by changing the order and width of the columns. To change the width of a column, drag the boundary of the column heading left or right. To change the width of a column to fit the contents, double-click the boundary to the right of the column header. To change the order of the columns, drag the column heading to a new location.

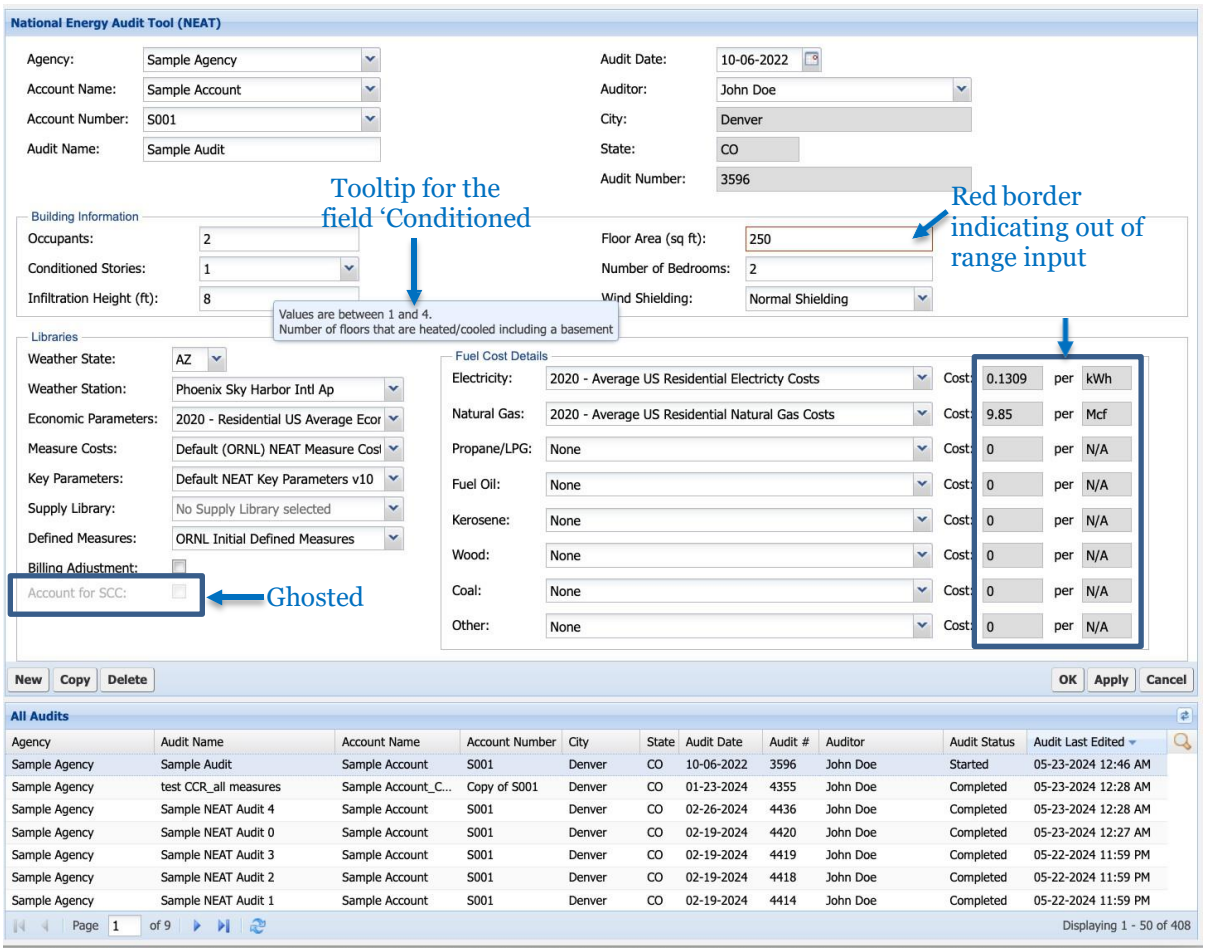


Figure 1.3. NEAT Audit form consisting of the main form and All table.

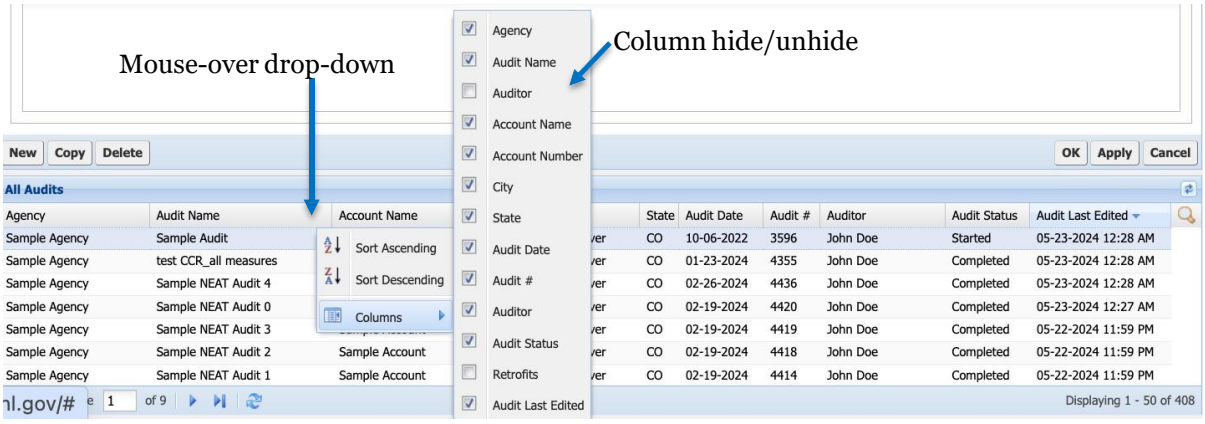


Figure 1.4. The All table displaying sorting and column hide/unhide checkbox options.

In the All table, the magnifying glass on the right of the header row, which is available on some forms, is the filter toggle to show or hide a filter bar below the header row. To filter the records, select the filter toggle and enter the filtering criteria for one or more columns (Figure 1.5). To clear all the filters, select the cross below the filter toggle. In addition, in the All table of the Audit form, you may select the buttons on the pagination bar at the bottom to navigate between pages. Fifty audits are displayed per page.

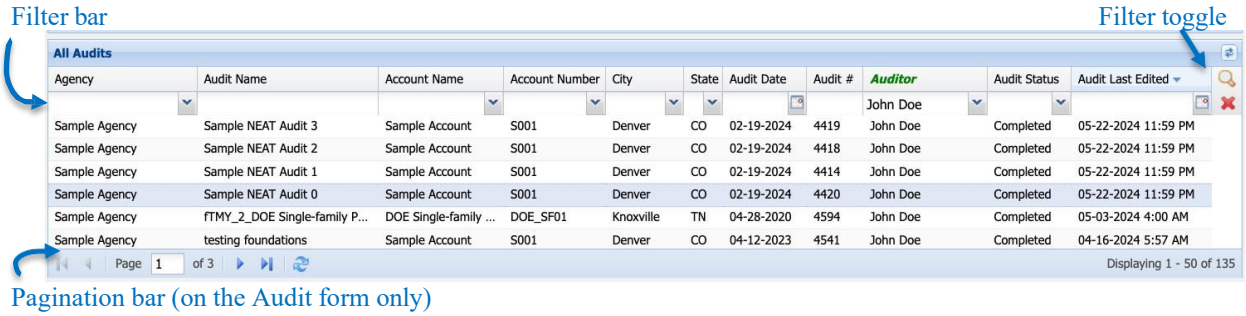


Figure 1.5. All Audits table showing filter bar after selecting the filter toggle.

1.4 USER FORM

Figure 1.6 shows the option to select the User form (Figure 1.7; guests are not allowed access to the User form). Select User → View User on the menu bar to see the user records created by the entity that provided you with your login information. The Privilege Level field lists the privilege level that was assigned to you. Your privilege level determines your access to different forms and records. You may have one of six privilege levels. The User Privilege levels and their responsibilities and levels of access are summarized in Table 1.1.

Figure 1.6 Accessing the User form from the menu bar.

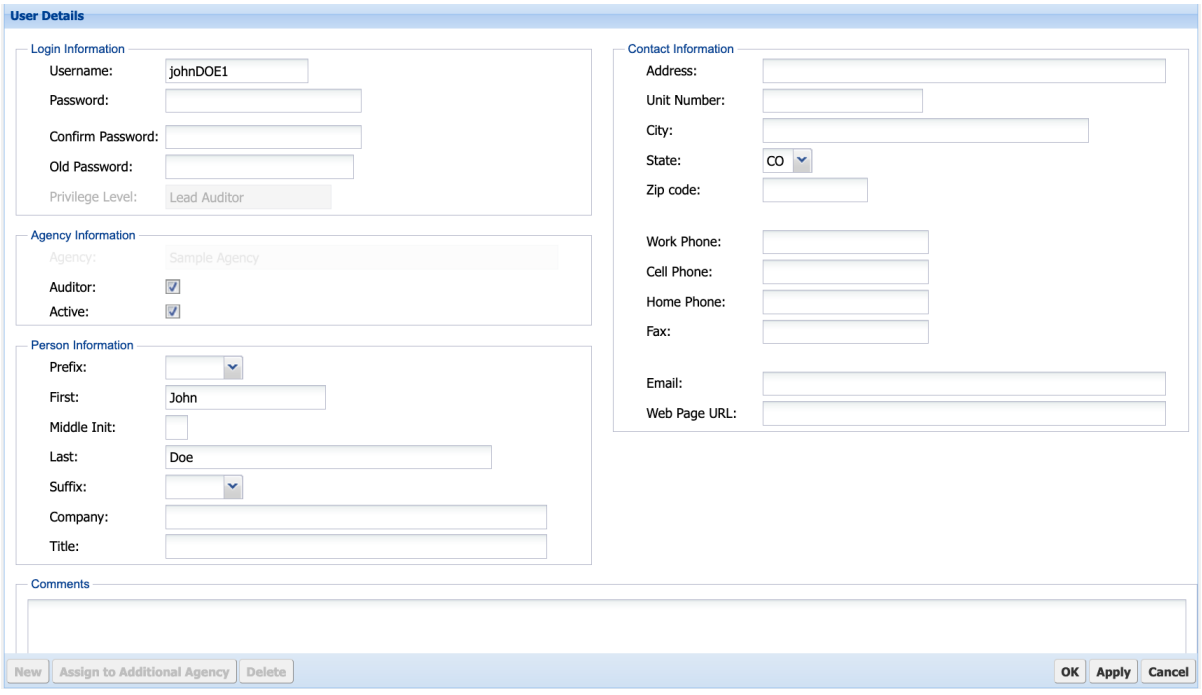


Figure 1.7. User form.

Table 1.1. User privilege

<table>
<tr><th rowspan="2">Entity</th><th rowspan="2">User privilege level</th><th rowspan="2">Scope of access</th><th colspan="6">Responsibilities (in bold) and level of access to records</th></tr>
<tr><th>User records</th><th>Agency records</th><th>Library records</th><th>Account records</th><th>Audit records</th><th>Work orders</th></tr>
<tr><td>ORNL/ developer</td><td>Site Administrator</td><td>All state-specific databases</td><td>- Must create at least one State Administrator per state
- Can edit own user record
- Can create or edit other user records</td><td colspan="5">- Have no restriction to create and edit records (for troubleshooting)</td></tr>
<tr><td>Grantee</td><td>State Administrator</td><td>State database</td><td>- Can edit own user record except privilege level
- Can create or edit other State Administrators
- Must create at least one Agency Administrator per agency
- Can view users for all agencies</td><td>Must create all agencies in the state</td><td colspan="4">Can view libraries, accounts, audits, and work orders</td></tr>
<tr><td rowspan="4">Agency personnel and associates</td><td>Agency Administrator</td><td rowspan="4">Agency records</td><td>- Can edit own user record except privilege level and agency information
- Must create all other users in their agency</td><td>Can edit their agency record</td><td colspan="4">Can create or edit all libraries, accounts, audits, and work orders</td></tr>
<tr><td>Lead Auditor</td><td rowspan="2">- Can edit own user record except privilege level and agency information
- Can view other user records in their agency</td><td rowspan="2">Can view their agency record</td><td>Can create and edit all libraries</td><td colspan="3" rowspan="2">Can create and edit all accounts, audits, and work orders</td></tr>
<tr><td>Auditor</td><td>Can view libraries</td></tr>
<tr><td>Guest</td><td colspan="4">No access</td><td>Can view all audits and work orders</td></tr>
</table>

The information that can be entered on the User form relates to login information, agency information, person information, and contact information. The only required fields on this form are Username, Password (conditionally hidden for other user accounts based on privilege level), Privilege Level, Agency, Last Name, and State. You can edit own user record except privilege level and agency information. You may want to add, edit, or update the information presented in other fields as needed. When creating a user record, make sure the Active checkbox is selected. Unchecking the Active checkbox will disallow the user to log in, which may be desired for individuals who no longer require access to Weatherization Assistant. Also make sure the Auditor checkbox is selected if the user might create audits in the future. This will list the name of the user on the Auditor drop-down field on the Audit form for NEAT & MHEA. If these checkboxes need to be updated for your user account and you are an Auditor or Lead Auditor, then your Agency Administrator may need to make the change.

1.5 AGENCY FORMS

The agency forms—Agency Details, Agency Contact, and Agency Cost Center—can be accessed by selecting Agency on the menu bar (Figure 1.8; guests are not allowed access to the agency forms). Select Agency → Agency Details to see the agency record (Figure 1.9) to which you have been assigned. The agency may have been created by ORNL or your state. If you are an Agency Administrator, you may want to add, edit, or update the information as needed. The only required fields on this form are Agency Name, Agency Type, and State. Make sure the Active checkbox is selected to have the agency name listed on the Agency drop-down field on the Audit form for NEAT & MHEA.

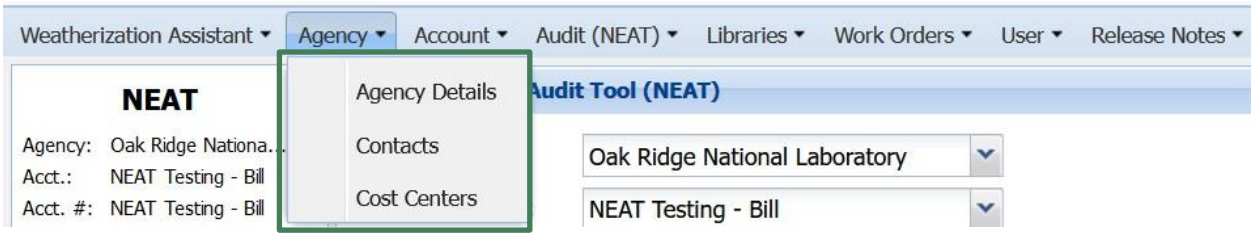


Figure 1.8. Accessing the Agency forms from the menu bar.

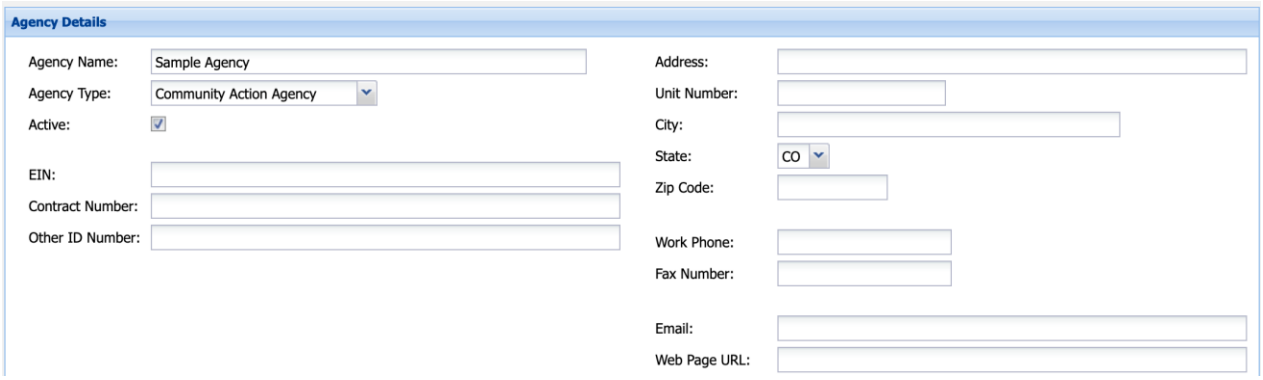


Figure 1.9. Agency Details form.

The Agency Contact form (relevant to NEAT and MHEA only) is used to enter information on certain individuals associated with the agency, specifically Contractors, Suppliers, and In-house crew members. The information on the Agency Details form is used to assign recommended measures to contractors and suppliers in the Supply Library and Work Order.

The Agency Cost Center form (relevant to NEAT and MHEA only) is used to set up cost centers or funding sources, to which the cost for individual recommended measures can be assigned.

1.6 LIBRARY FORMS (RELEVANT TO NEAT & MHEA)

Six libraries can be accessed from the menu bar by selecting Libraries → [Library Name], as shown in Figure 1.10 (guests are not allowed access to the library forms). The described libraries are used only by NEAT & MHEA.

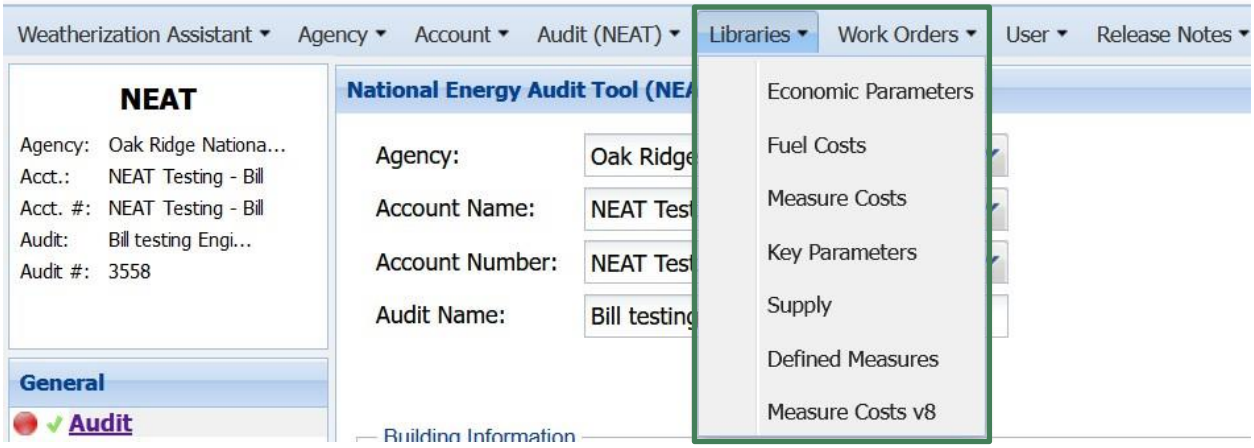


Figure 1.10. Accessing the library forms from the menu bar.

- **Economic Parameter Set** – These libraries (Figure 1.11) provide the fuel price indices and modified uniform present value factors required to perform economic calculations in NEAT & MHEA. These are provided for 8 fuels for 30 years: electricity, natural gas, propane, fuel oil, kerosene, wood, coal, and other.

- **Fuel Cost** – These libraries (Figure 1.12) provide the costs for eight fuels used in NEAT & MHEA: electricity, natural gas, propane, fuel oil, kerosene, wood, coal, and other.

- **Measure Cost Set** – These libraries (Figure 1.13) collect overall measure cost information. They provide access to Retrofit Measure Cost Details forms (Figure 1.14), which collect material and installation cost details for individual retrofit measures programmed into NEAT & MHEA for use in making economic calculations. These are provided separately for NEAT & MHEA. For NEAT and MHEA measures that have site- or system-specific costs, including air sealing, duct sealing, and replacement of HVAC equipment, water heaters, refrigerators, and lighting, costs are directly entered on the audit forms and not in the Measure Cost Set Library. The NEAT Measure Cost Set Library also provides access to a form to enter NEAT insulation types.

- **Key Parameter Set (NEAT and MHEA only)** – These libraries (Figure 1.15) provide flexibility to modify some of NEAT's and MHEA's inputs and assumptions. The existing values on these forms may be replaced with information for your agency. These forms are provided separately for NEAT and MHEA.

- **Supply (NEAT and MHEA only)** – These libraries (Figure 1.16) provide the ability to identify materials used within your program and their cost. Although primarily used in creating work orders, information entered for refrigerators, water heaters, and lighting can be accessed from within an audit. For each material, you can enter material properties, costs, and energy-related information.

- **Defined Measure Set (NEAT and MHEA only)** – These libraries (Figure 1.17) provide the ability to predefine weatherization activities, including 50 predefined health and safety measures, that are not addressed within the NEAT and MHEA library measures but are commonly encountered during an audit. Defining the measures on this form enables copying them to any audit as an itemized cost.

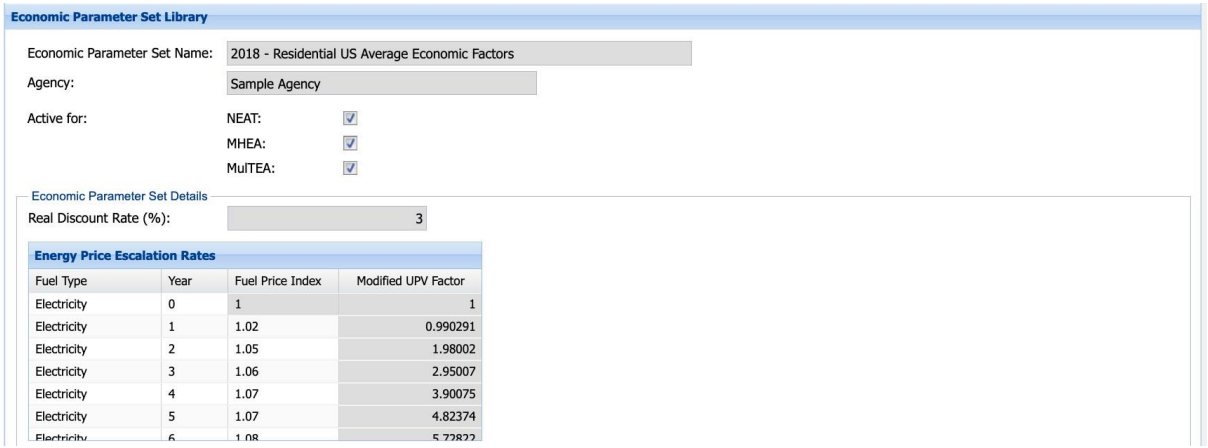


Figure 1.11. Economic Parameter Set Library form.

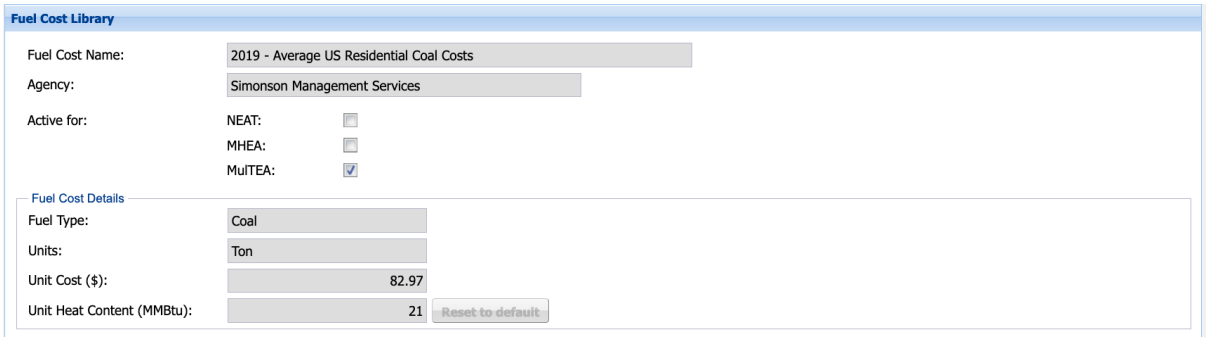


Figure 1.12. Fuel Cost Library form.

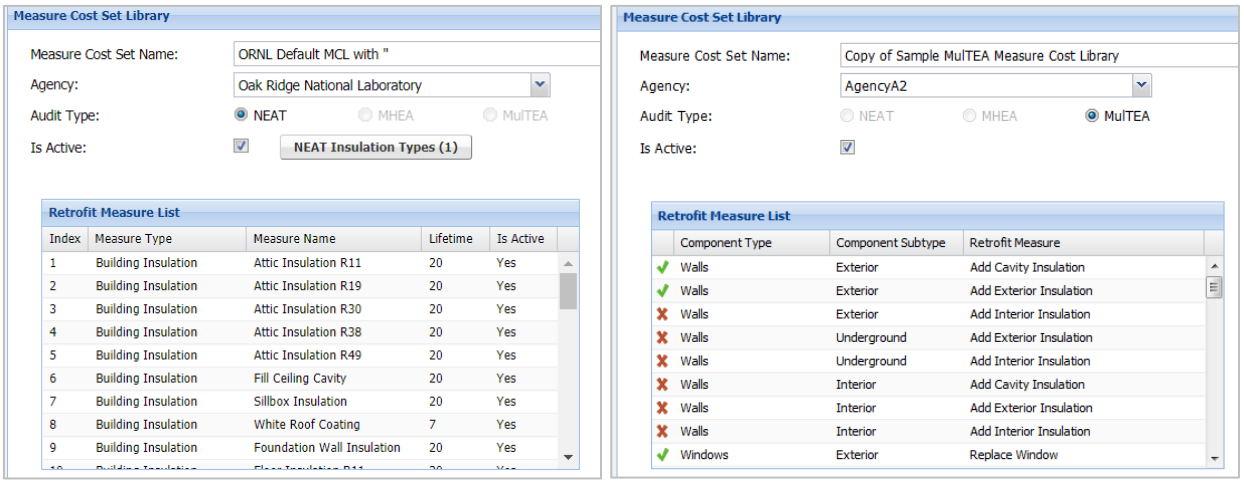


Figure 1.13. NEAT

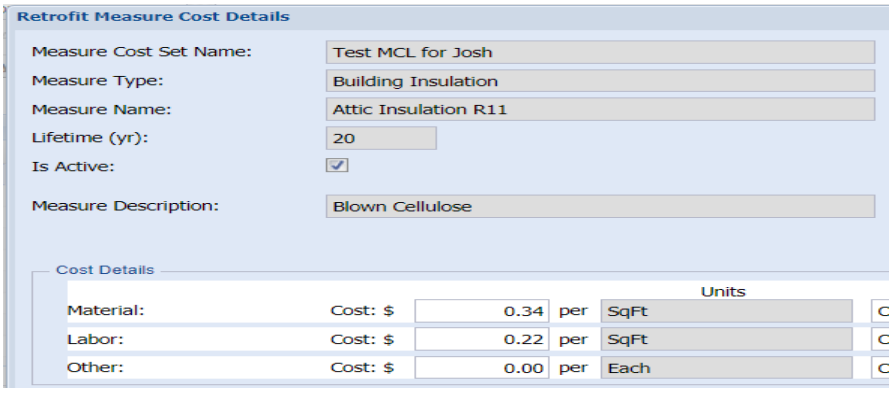


Figure 1.14. NEAT

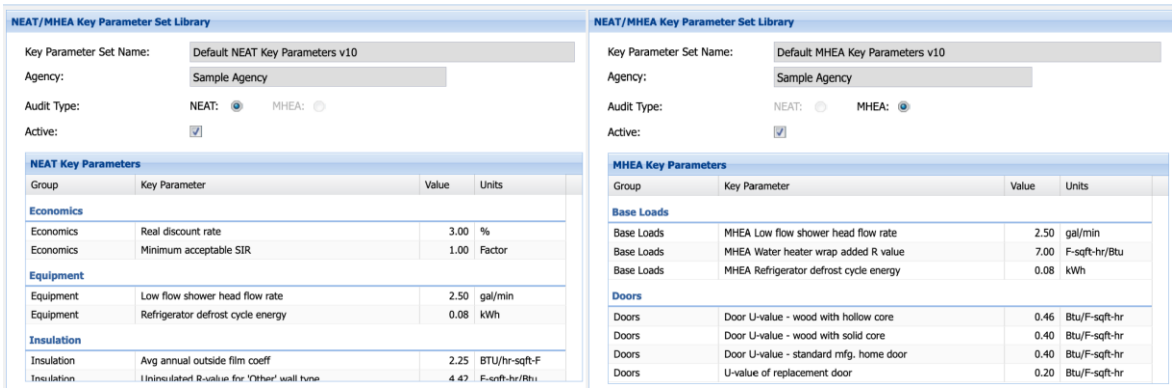


Figure 1.15. (left) NEAT and (right) MHEA Key Parameter Set Library forms.

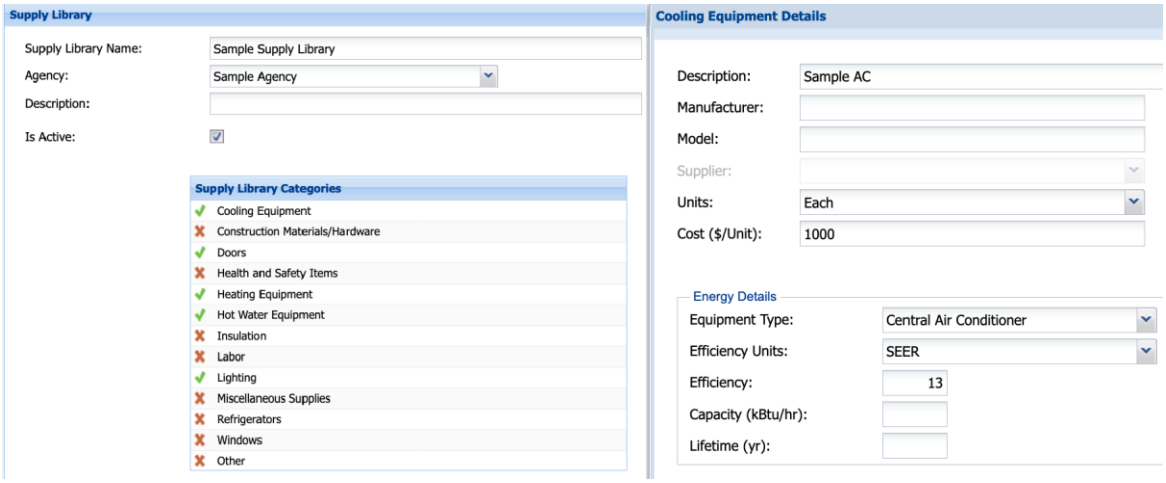


Figure 1.16. (left) Supply Library form and (right) Example Supply Library Category Details form.

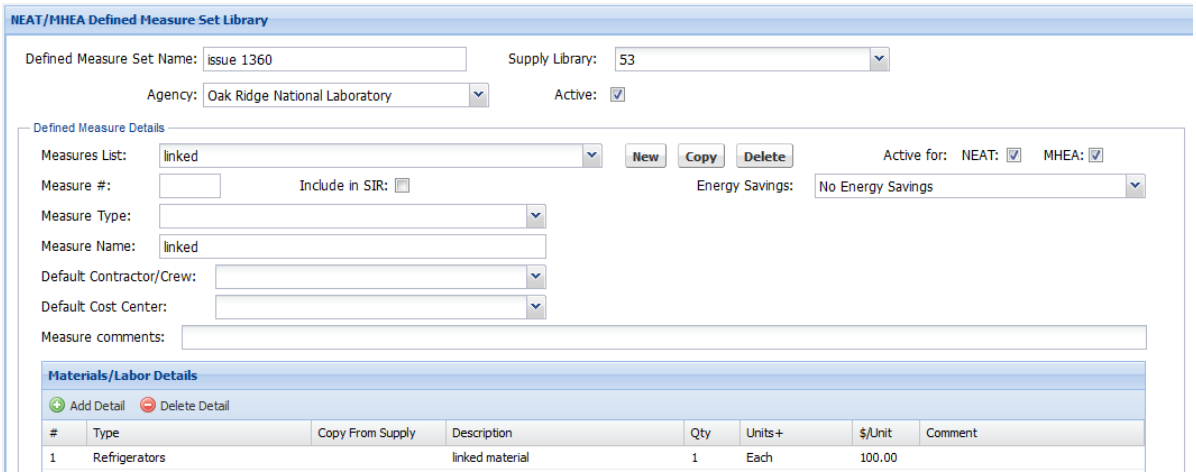


Figure 1.17. NEAT/MHEA Defined Measure Set Library form.

During initial setup, ORNL creates a new, read-only economic parameter set applicable to the United States and four census regions (Northeast, Midwest, South, and West) each year when new parameters are issued by the National Institute of Standards and Technology, usually in May.

Kentucky Housing Corporation (KHC) will update the Fuel Cost once a year in the audit software. Subgrantees are responsible for updating and/or checking the prices on the other audit libraries every six (6) months.

Likewise, for full compliance with Weatherization Assistance Program requirements, you will need to create your own NEAT and MHEA Measure Cost Set Libraries to reflect actual costs for your location and agency. ORNL has created example read-only Measure Cost Set Libraries for NEAT & MHEA that you can use as you become familiar with these audits.

Creating and Editing Libraries – The libraries can be created or edited only by Site Administrators, Agency Administrators, and Lead Auditors. To create a new library, access the library form and either (a) select New on the task bar and complete the form or (b) select an existing library record from the All [library type] table, select Copy on the task bar, and edit the input information as needed. It is recommended that new Economic Parameter Set and Key Parameter Set libraries be created using the latter approach. Be sure that the Active for NEAT or MHEA checkbox is selected for new Economic Parameter Set and Fuel Cost libraries that you create, and that the Active checkbox is selected for new Measure Cost Set, Key Parameter Set, Supply, and Defined Measure Set libraries to make the library available to select on the Audit form. Libraries created by ORNL during initial setup and those created on behalf of your state for access by all agencies in your state are read-only and designated as "Is Shared." Furthermore, libraries in use for an existing audit become read-only. The Is Shared status of a library and the total number of existing NEAT and MHEA audits using that library can be viewed in the All table, as highlighted by the orange box in Figure 1.18. You cannot modify or delete an existing library that is shared or in use for an existing audit. You can only edit a copy of a shared or in-use library to use it for future audits. Further, you can only uncheck the Active checkbox for a shared or in- use library to make it unavailable for future audits.

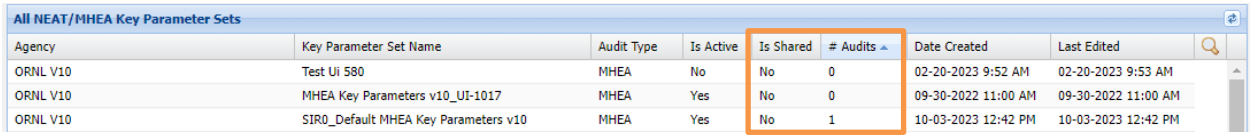


Figure 1.18. All table showing the Is Shared status and # Audits for library records.

1.7 ACCOUNT FORM

You must access and fill in a new Account form (i.e., set up an account for a house, building, or project) before you run NEAT or MHEA Audit or create a work order. The Account form can be accessed by selecting Account → View Account on the menu bar (Figure 1.19) (guests are not allowed access to the Account form). To create a new account, select the New button on the task bar of the Account form (Figure 1.20). The Copy button on the task bar can also be used to create a new account. In the Account form, you can enter account information about the house, building, or project such as its name, number (e.g., job number), and address. The only required fields are Agency, Account Name, Account Number, and State. The information in the DOE Quarterly Report field set is data used by Weatherization Assistance Program Grantees in reporting results to DOE and is optional within Weatherization Assistant, as are the Primary Language and Utility Account fields.

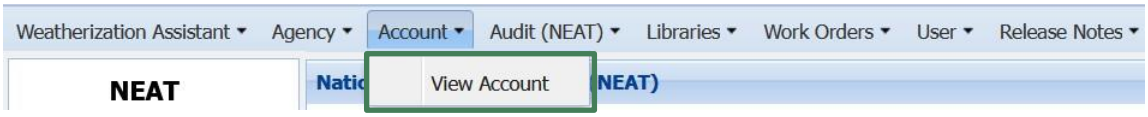


Figure 1.19. Accessing the Account form from the menu bar.

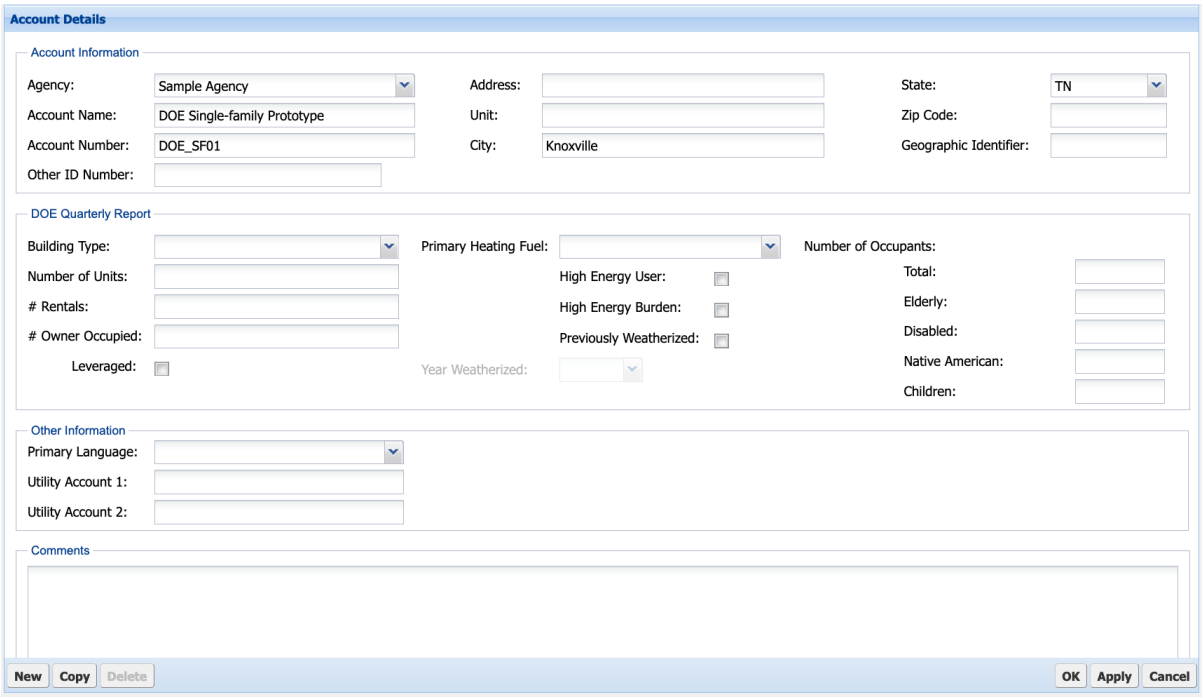


Figure 1.20. Account form.

1.8 WORK ORDER FORMS

The work order forms are used to create, manage, and track the progress of weatherization measures to be completed (state administrators and guests are not allowed to create a work order). The work order includes materials and labor, quantities, and cost details. A work order may be created from scratch or from NEAT or MHEA Audit Recommendations.

To access work orders, select Work Orders → View Work Orders on the menu bar (Figure 1.21). The Work Order Details form (Figure 1.22) is used to enter general information about the work order and to set and track its status. To create a new work order, select the New button on the task bar. You must provide a Work Order name and select either the Account Name or Account Number; this will autofill the Agency and State fields. You may also select an Audit Name, if previously created for the selected account that you intend to link with this work order. You may select a Supply Library containing inventory items from which any materials used by the work order may be taken. You may also select a Contractor/Crew to perform the work described by the work order. Finally, you may select the Work Order Type that best describes the work order. The choices are Weatherization, Re-Weatherization, Emergency Repair or Replacement, Response to Client Request, or Other.

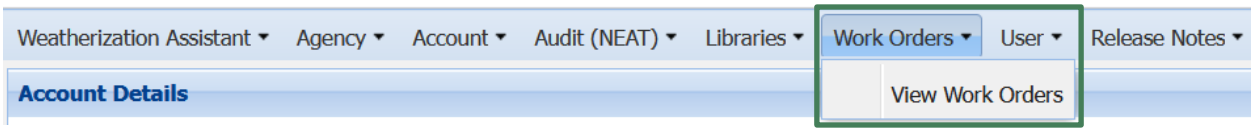


Figure 1.21. Accessing the Work Order forms from the menu bar.

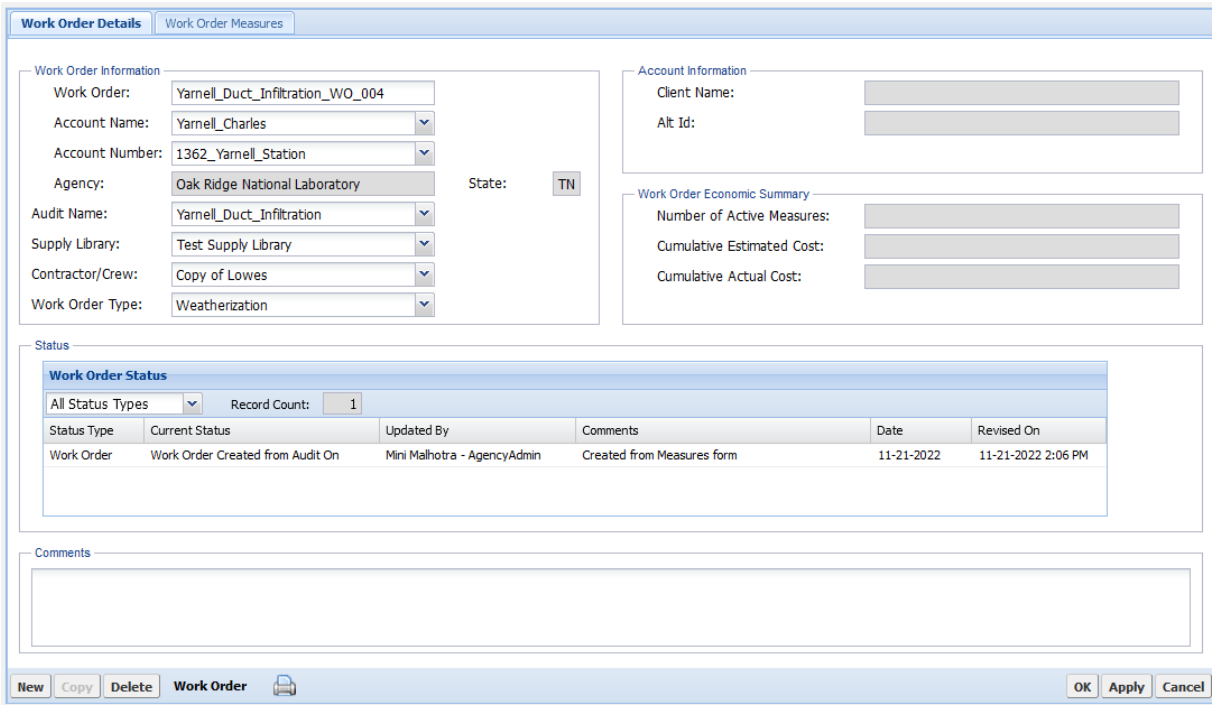


Figure 1.22. Work Order Details form.

The Work Order Status field set allows you to set and track the status of a work order for three work order status types: Work Order, Inspection, and Payment. The status categories and the available settings for these status types are listed in Table 1.2. Three specific work order status values ("Work Completed On," "Work Refused by Client On," and/or "Rework Complete On") indicate the work as complete and ready for summarized reporting (e.g., the DOE Quarterly Report).

Table 1.2. Work Order Status Type and settings

Status Type	Work Order Status	Inspection Status	Payment Status
Settings[1]	Work Order Created from Audit On Work Order Details Completed On Work Order Approved On Work Order Issued On Work Scheduled to Start On Work Started On Work Completed On* Client Signed Off On* Work Refused by Client On* Work Order Canceled On* Work Order Modified On Rework Completed On* Delayed On Other	Scheduled For Passed On* Failed On Not Required* Delayed On Other	Invoice Received On Invoice Approved On Invoice Paid On* Not Required* Delayed On Other

[1]Statuses tagged with an asterisk (*) are considered to represent completion.

Select the Work Order Measures tab, to develop detailed task descriptions for weatherization measures for a selected work order. The Work Order Measures form (Figure 1.23) allows you to enter a general description of measures at the top of the form and material and labor components in the Materials/Labor Details sub-form. You must enter a Measure Name to identify it in the work order. You may select the Measure Type from the drop-down list. The choices are Baseloads, Building Insulation, Client Education, Doors and Windows, General Heat Waste and Air Infiltration, General Repairs, Health and Safety, HVAC Systems, and Other. You may enter the Order # to identify the work order by a unique code. You may enter Components identifying the name or code of all the building components to which the measure will be applied. You may select a Cost Center, which is a funding source to which the actual cost of the measure will be charged. Be sure to select the Active checkbox to include the measure in the work order.

The Materials/Labor Details sub-form allows you to describe the actual quantities and unit price for different cost components of a measure. You may enter the details of cost components manually or by choosing from the Supply Library in the drop-down under the Copy From Supply column if a Supply Library was selected on the Work Order Details form.

For a work order, multiple Work Order Measures may be created by selecting the New button on the task bar. Select the Print icon to view a PDF of the work order for the measure, which will open in new tab on the browser.

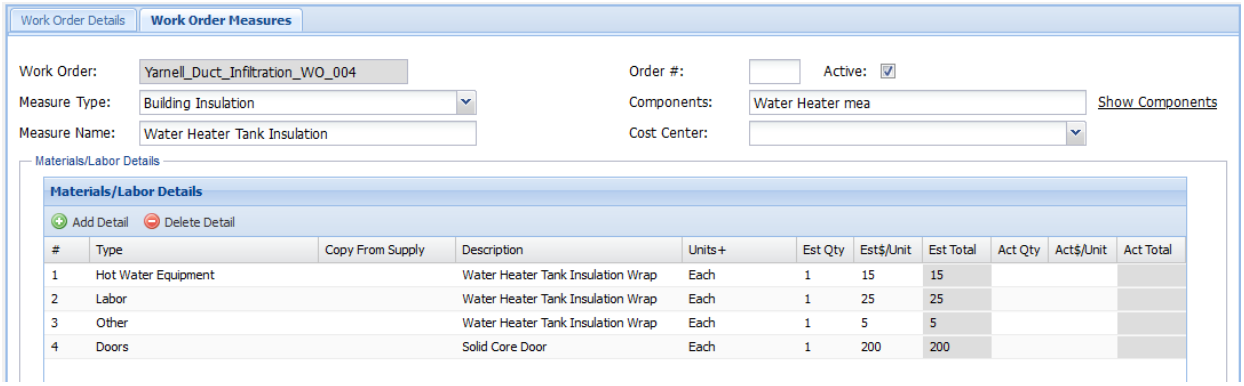


Figure 1.23 Work Order Measures form.

2. NEAT

Once you have set up an account for a house, you can create and run NEAT on that house. NEAT has multiple forms used to describe a house; each has a main form for data input and possibly an All table for record navigation (Section 1.3). NEAT also has an Audit Dock that is a static feature anchored on the left of each NEAT input form (Figure 2.1) and provides the means of accessing NEAT's various forms and running the audit. The Audit Dock may not be displayed when creating a new audit until after the Audit form has been saved.

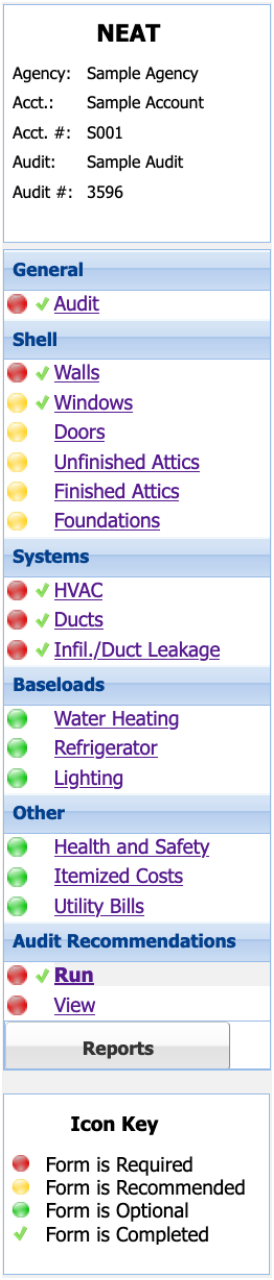


Figure 2.1. NEAT Audit Dock.

At the top of the Audit Dock is an information block that shows key audit information entered on the Audit form for the audit that is currently active (i.e., being viewed). Links to each of NEAT's 16 data input forms used to describe the house are provided below the information block. These links are organized into five groups: General, Shell, Systems, Baseloads, and Other. Colored icons are presented beside these links to indicate if the form is required, recommended, or optional, and if the form has been completed. A legend for the icons is shown in the Icon Key at the bottom of the Audit Dock. Links are provided in an Audit Recommendations group to run NEAT or view results of the last run for that audit. Finally, Reports can be selected to access various reports available within NEAT for the audit being viewed.

Many of the data input forms in NEAT allow multiple records to be described for a building component. For example, in Figure 2.2, multiple walls are entered on the Wall form. These forms have New and Copy options to create multiple records. For each record, a tab named by the user-entered code is created at the top of the form. The All table presented at the bottom of each of these forms lists these records (i.e., the tabs) (Figure 2.3).

To complete 1 of the 16 NEAT data input forms, select the form in the Audit Dock, input appropriate data in the main form, and select Apply to save the form or OK to save and exit the form. Select Cancel to exit the form without saving the entries that you just made. Select New or Copy (if applicable) to create additional records. The completed records will be listed in the All table. To view or edit an existing record, select the tab or the record in the All table.

On most of the Shell, Systems, and Baseloads forms, field sets on the left of the main form describe a selected component of the existing building. A field set on the right of the main form describes retrofit measure technical details for the component. For cases in which the cost of a measure is site- or system-specific (including air sealing, duct sealing, replacement of HVAC equipment, water heaters, refrigerators, and lighting), the retrofit measure field sets can be used to directly enter the total costs associated with the measure because they cannot be described in the Measure Cost Set Library. In other cases, such as on the Shell forms, the retrofit measure field sets can be used to enter an additional cost associated with installing the measure that will be added to the cost calculated from the Measure Cost Set Library.

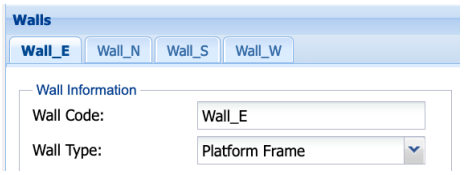
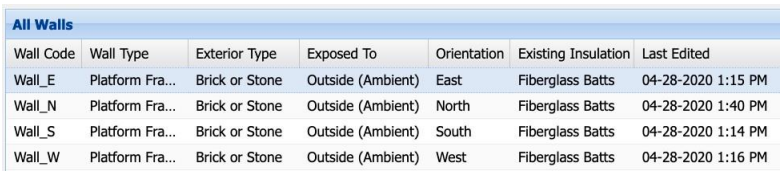


Figure 2.2. Tabs on NEAT's Walls form.



Wall Code	Wall Type	Exterior Type	Exposed To	Orientation	Existing Insulation	Last Edited
Wall_E	Platform Fra...	Brick or Stone	Outside (Ambient)	East	Fiberglass Batts	04-28-2020 1:15 PM
Wall_N	Platform Fra...	Brick or Stone	Outside (Ambient)	North	Fiberglass Batts	04-28-2020 1:40 PM
Wall_S	Platform Fra...	Brick or Stone	Outside (Ambient)	South	Fiberglass Batts	04-28-2020 1:14 PM
Wall_W	Platform Fra...	Brick or Stone	Outside (Ambient)	West	Fiberglass Batts	04-28-2020 1:16 PM

Figure 2.3. All Walls table on NEAT's Walls form.

NEAT evaluates all retrofit measures that are indicated as being active in the Measure Cost Set Library and applicable to the house. However, many of the data input forms in NEAT provide the option to evaluate only certain measures for a component, which will exclude evaluation of other active measures for that component. In that case, NEAT also provides an option to include the energy savings and cost of the measure in calculating the package SIR. Measures for which "Required" is selected but that are not included in the package SIR are normally related to health and safety or are measures funded by a source other than the Weatherization Assistance Program. Measures with both "Required" and "Include in SIR" selected will be included in the package SIR and will always be recommended regardless of their SIR (this option is generally used for incidental repair measures). Check the guidance for your program in deciding if and how these features can be used.

2.1 DESCRIBING A HOUSE IN NEAT

All data entered into the NEAT software shall be provided using the Data Collection Form provided by KHC to all sub-grantees. Only the DCF provided by KHC has been approved for use of data collection. All ECM's must be considered for retrofit. To create a new NEAT audit, select Audit → NEAT on the menu bar and then select New on the Audit form (State Administrators and Guests are not allowed to create an audit). Select Copy to create a new audit from an existing audit. You may want to create a new audit using Copy to make multiple audit runs for a house (e.g., to evaluate different retrofit options or replacement equipment for a given house) but still see the results of previous runs.

When creating a new audit using New, fill in the Audit form first before entering information on the other forms. Also, you will need to fill in the Wall form before completing the Window and Door forms. In general, completing forms in top to bottom order from the Audit Dock is the best practice for Audit input.

Each of NEAT's input forms are described briefly here. Section 2.2 describes how to run NEAT.

Audit form (required) – The Audit form is used to enter general audit information and select weather files and libraries needed to run the audit (Figure 2.4). All the fields on this form that are not disabled or read-only are required. At the top of the form, select your Agency and then select the account using either the Account Name or Account Number field (the other data field will be auto-filled using information from the Account form). Enter an Audit Name and the Audit Date, and then select the Auditor Name (auditor names provided in the drop-down list will include all users for the Agency that are marked as Active and Auditor on the User form). The City and State fields will be auto-filled using information from the Account form. The Audit Number will be automatically assigned by NEAT.

Next, enter the building information: Occupants, Conditioned Stories (number of floors that are heated/ cooled including a basement), Infiltration Height, Floor Area (length x width of all levels that are intended to be a conditioned space), Number of Bedrooms, and Wind Shielding. Then, select the Weather State, Weather Station, and the following libraries: Economic Parameter Set, Measure Cost Set, Key Parameter Set, Supply (optional), Defined Measure Set, and Fuel Cost. NEAT has 1,000+ US weather stations that are filtered by weather state. You may also consider cities near you in states that border your own. The libraries listed in the drop-down lists are restricted to those that have been created in the respective libraries for this agency and marked Active for NEAT. For the Fuel Cost, you can select None for fuel types that will not be used in the audit except for electricity. The fuel costs associated with the selected Fuel Cost names will be auto-filled. Finally, for NEAT to adjust energy savings estimates and recommend measures based on the actual pre-weatherization energy consumption of the home, select the Billing Adjustment checkbox.

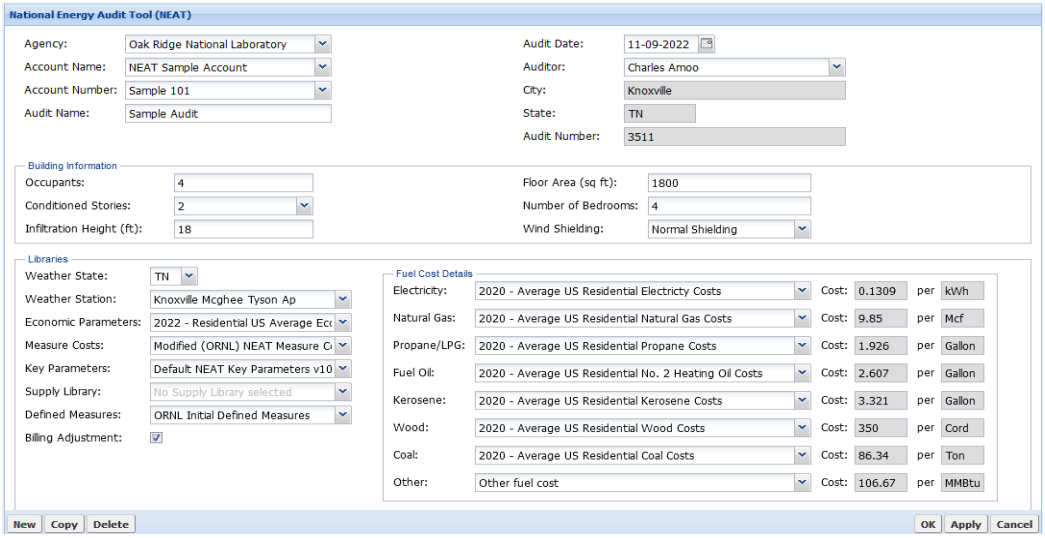


Figure 2.4. NEAT Audit form.

Shell forms – Shell forms are used to describe the walls, windows, doors, attics, and foundations of a house. The forms are used to describe all the shell components in the house that define the thermal boundary, select retrofit options, and describe any additional costs associated with the installation of the retrofit unique to the house being audited that are not described in the Measure Cost Set Library. You must enter one wall description on the Wall form to meet the minimum requirements of NEAT; the remaining shell forms are optional. These forms are used to describe a horizontally or vertically attached house, where no heat is lost to the outside through some of the envelope components. In most buildings, though, multiple wall descriptions will be entered on the Wall form and entries will be made on the Window, Door, Attics, and Foundation forms. On the Wall, Attics, and Foundation forms, a Measure # field is provided to specify if multiple segments of a shell component should be combined into groups when evaluating retrofit measures. Select different measure numbers for segments that you want to evaluate as separate measures.

The **Wall form** (required) is used to describe all the walls of the house that define the thermal boundary. Walls that differ by orientation, exposure (i.e., to the ambient conditions, buffered space (not directly exposed to ambient conditions but are adjacent to areas that are such as a garage, attic knee-wall, CAZ, or stairwell), construction, or insulation level should be described separately because the cost of insulating the walls and the energy savings from insulating the walls will differ. To describe all the exterior walls of a house most efficiently, you may combine multistoried walls or separate wall segments that have the same orientation and construction. Wall insulation is a major measure. All exterior and buffered walls that are exposed to an unconditioned space must be evaluated and considered for added insulation. Additional cost may be needed and will vary depending on job and method of insulating such as dense packing from interior or exterior.

The **Window and Door forms** are used to describe all the windows and doors on the walls that are exposed to the outside. The number of each type of window or door is entered by their parent wall, or attic assembly in the case of skylights. Notably, a skylight cannot be defined and saved until after the associated attic assembly has been defined on the appropriate attic form. All replacement windows must be energy star rated with a minimum rated U-value of .32 and a SHGC of .40. Evaluate window replacement and storm windows must be check for all jobs to allow auditing software to determine most energy efficient measure. .

The **Unfinished and Finished Attic forms** are used to describe the attics in the house. Auditor can use deration calculation for attic insulation R-values to determine what R-value shall be entered into the audit. The Unfinished Attic form is used to describe typical attic areas such as those built using ceiling joists and roof rafters or trusses and cathedral or flat ceilings. If an attic built from joists or trusses has flooring installed over the joists (e.g., plywood so that items may be stored in the attic), then it is Floored. Cathedral and flat ceilings are attic areas where the roof and interior ceiling are parallel. Max depth of insulation should be used when there is a physical limitation to the depth, as with floored or cathedral attics. The Finished Attic form is used to describe attic areas that result when a portion of the attic is included in the conditioned space of the home: outer ceiling joist, collar beam, knee wall, and roof rafter (Figure 2.5). Attic areas should generally be entered separately and have separate attic numbers. Added R-values should not be suggested therefore allowing the audit software to determine what is to be installed. The audit only generates funds for insulation and labor according to set up library cost. Verify that all libraries are up to date and accurate on a continual basis. Any additional cost must be entered as the exact amount to be used in the selected measure.

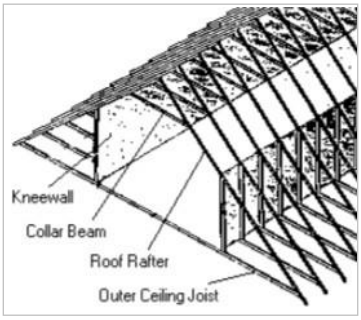


Figure 2.5. Components of a finished attic.

The **Foundation form** is used to model the foundations of the house, including basements, crawlspaces, slab-on-grade floors, and floors exposed directly to the outside air. Foundations can be insulated by insulating the floor, sill box(or band board that runs around the perimeter of the home where the floor joist attach to)(perimeter can be measured by adding each walls length together), and/or wall of the foundation depending on what type of foundation it is, the intended use of the foundation space, and what areas of the foundation are currently insulated. Percentage of height exposed shall be based on how much of the foundation wall is exposed to ambient air. For basements and crawlspaces, NEAT will never recommend both floor insulation and sill and/or wall insulation for the same foundation. Multiple foundations may need to be entered if some areas are insulated and some are uninsulated. Both areas square footage would need to be entered separately as two (or more) different foundations. To describe a foundation, you must first select the Foundation Type from the following options: conditioned, non-conditioned, vented non-conditioned, unintentionally conditioned, uninsulated slab, insulated slab, and exposed floor.

Crawlspaces are typically vented non-conditioned, and basements are conditioned, non-conditioned, or unintentionally conditioned. Conditioned foundations are those that are purposefully heated and/or cooled with at least one supply and return duct to the area. Conditioned foundations will have the pressure/thermal boundary at the foundation walls and sills. Unconditioned foundations will have the pressure/thermal boundary at the floor. All relevant uninsulated areas must be evaluated for insulation. Unintentionally conditioned foundations are those areas that are un-purposefully heated and/or cooled by things such as, but not limited to, faulty duct work, door openings left open, and/or large bypasses. If issues causing the foundation to be unintentionally conditioned are to be remedied with WX work then post-WX status may be entered. For conditioned foundations, sill and foundation wall insulation MUST be evaluated. Auditors should add Additional Costs when there may be a significant additional cost, such as to remove and replace drywall in order to install insulation. The audit only generates funds for insulation and labor according to set up library cost. Verify that all libraries are up to date and accurate on a continual basis. Any additional cost must be entered as the exact amount to be used in the selected measure.

Systems forms – Systems forms are used to describe the HVAC equipment, ducts, and infiltration and duct leakage associated with a house. You must enter one heating system and enter infiltration data on the Infiltration/Duct Leakage form to meet the minimum requirements of NEAT. The remaining forms are optional unless deemed required based on other inputs. For example, the Duct form may be required depending on HVAC entries. The selections made in the HVAC form, especially regarding heating, will determine whether the Duct form remains optional or becomes required.

The **HVAC form** is used to describe the heating and cooling equipment installed in the house and select retrofit options. In NEAT, you can describe as many equipment as are required to describe the heating and cooling sources in the house. All equipment that provides heating must be described in this form. The selected equipment may provide either heating or cooling or both. To describe the equipment, first enter the equipment type (and fuel if heating-only equipment) and then enter the data collected through proper manual testing for each appliance depending on fuel source in the applicable fields. SSE shall be used when manually testing in the field for gas fired appliances if different from AFUE ratings. If SSE readings cannot be obtained, then AFUE ratings are acceptable to use, at original rated efficiency. Inputs related to equipment type and fuel will filter out other necessary inputs, as well as the retrofit options that will be available for evaluation. For example, selecting a space heater will disable tune up as a retrofit option. The Replace the Equipment retrofit option is always enabled for possible selection and is used to specify if the measure replaces one or more existing equipment described in other HVAC sub-forms. Selecting a measure as required will disable other measures that are mutually exclusive to the required measure. Replacement required shall only be selected if a unit is non-operational or has major faulty H&S issues to where it is unsafe to operate the equipment for manual testing. When using replacement required if SIR is checked the audit will generate the potential allowable ECM SIR for the measure. If SIR is not checked it will be considered a H&S measure. H&S HVAC replacement should not have SIR checked. If there is no existing unit applicable one shall be installed as a H&S measure, if no DOE funds are used for the replacement system it can be modeled as existing.
Unlike in Weatherization Assistant Version 8, heating/cooling equipment inputs are not limited to primary and secondary systems. All existing heating and cooling equipment in the home may be entered as separate records. Weatherization Assistant Version 10 determines the primary system based on the Fraction of Load Served value that is either input or estimated by the software. Inputs made on any optional forms (e.g., other field measurements or health and safety observations) are informational only and are not used in running the audit analysis.

The **Duct form** (conditionally required) is used to describe the supply and return ducts for ducted HVAC equipment. A duct system with varying characteristics (e.g., location, insulation) must be described as multiple segments. All ducted HVAC equipment must be selected as served by at least one supply duct. All supply and return dusts shall be considered for modeling and properly entered in the software as is. Default methods can be used for surface area or manual entry is allowable with proper measurements of width height and length or diameter. To evaluate a duct insulation measure, you must enter the measured duct surface area and insulation R-value. If sufficient details relating to duct size and/or surface area and insulation R-value are unknown, then Weatherization Assistant Version 10 can estimate the values by selecting Use Defaults (Figure 2.6). To calculate these estimates and view the results, select the Use Defaults checkbox. To edit the values, clear the Use Defaults checkbox and input other values. Select Apply or OK to save the inputs.

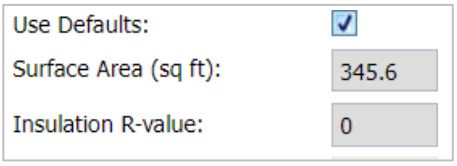


Figure 2.6. Use Defaults checkbox selected.

The **Ducts/Infiltration form** (required) is used to enter air and duct leakage data to evaluate the effectiveness of infiltration reduction work and duct sealing. The data input fields on the Ducts/Infiltration form change depending on whether duct sealing will be evaluated and, if so, which method—whole house blower door or duct blower measurements—will be used. Duct blower measurements should always be selected. Pre duct operating pressure shall be obtained by switching on the air handler and using a pressure pan to obtain readings from both supply and return ducts. When only one (1) central return exists, DO NOT COVER WITH PRESSURE PAN. Place 2-3 inches of the hose in the return at the filter grill. Target ductoperating pressures shall be 5pa greater than measured operating pressure. To evaluate infiltration reduction as a retrofit measure, you must, at a minimum, enter the pre-weatherization whole-house air leakage rate (usually measured), an estimated or target rate after weatherization, house pressure differences for these rates, and the cost of the infiltration reduction work. A set of optional forms (Blower Doors, Zonal Pressures, Pressure Pans, and Room Pressure Balances) can be used to enter measurements made during the infiltration and duct leakage measurements or health and safety observations related to the HVAC systems. Information entered on these optional forms is not used in running an audit. Duct Blaster Measurements must be obtained through testing and entered into the auditing software to evaluate for duct sealing. Duct sealing and whole house infiltration targets are based on IECC 2009 guidance for duct leakage and infiltration rates. 25pa shall be entered in all 6 inputs for 'at Duct Pressure' and 'House Pressure WRT Outside'.

Baseloads forms – Baseloads forms are used to describe water heating retrofits, refrigerator replacement, and lighting retrofits. These forms are used to evaluate specific retrofit measures.

The **Water Heating form** is used to enter information necessary to evaluate for water heating retrofit measures: tank insulation, pipe insulation, low-flow showerheads, and water heater replacement. You may describe the existing water heater by selecting from the list of manufacturer and model number, which will autofill the energy use characteristics of the water heater, or by directly entering the data on the form collected from the manufactures data plate. To evaluate a water heater replacement, you may either select a water heater you have already described in the Supply Library, which will autofill the data, or directly enter the data on the form from the manufacturers data plate. All water heater replacements must be submitted to KHC for approval.

The **Refrigerator form** is used to enter information necessary to evaluate a refrigerator replacement. Here, you may specify the energy use characteristics of the existing and replacement refrigerators. For the existing refrigerator, you may either select from the list of manufacturers and model numbers in the

library, which will autofill the data, or directly enter the data on the form. All refrigerators being considered for replacement must be metered a minimum of 2 hours with an approved metering device or model number entered from the audit database and the results logged on the Base Load Record.

The **Lighting form** is used to describe lighting replacement retrofits. You may specify the quantity, usage, and energy use characteristics of the existing and replacement lighting and cost of the replacement lighting. For the existing and/or replacement lighting system, you may either select lighting you have already described in the Supply Library, which will autofill the energy and cost data, or directly enter the data on the form. All lighting retrofits are required by KHC to be energy star rated.

The **Health and Safety form** can be used to enter health and safety measurements and observations that you have made of the house. Items on this form help identify potential health and safety hazards related to the whole house, equipment, and shell; record worst-case draft measurements for space heating equipment and the water heater; and determine ventilation requirements to comply with ASHRAE Standard 62.2. Auditors must use Red Calc Tool (https://basc.pnnl.gov/redcalc) when determining ventilation requirements for pre, target and post inspections.

The **Itemized Costs form** (optional) can be used to enter necessary repair and health and safety measures associated with recommended energy measures and their costs.

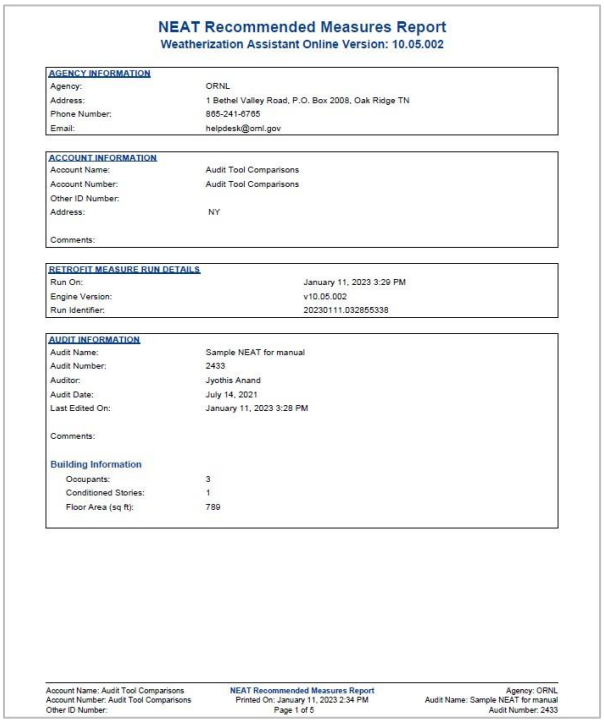
- **Incidental Repair Measure (IRM):** An IRM must be first attached to an ECM (for example gutters can be attached to attic, walls, or floor to solve moisture issues). That ECM must hold an allowable SIR. If the IRM materials and labor drop the ECM SIR below acceptable then you can enter it as an itemized cost with an SIR included, that way it adds that measure to your cumulative SIR. An IRM according to DOE is "A repair necessary for the effective performance or preservation of newly installed weatherization materials, but not part of a standard installation. IRM installations must be associated with a specific ECM or group of ECMs. IRMs must be justified by written and photo documentation in the client file. IRM costs must be included the SIR calculation of the total package of weatherization measures.". Ancillary items are materials needed to properly perform that measure and are an allowable cost under the measure (for example insulation rods, baffles, junction markers, depth markers, etc. are all ancillary items.) For example IRM's could be things such as attic or crawl space access door repairs or replacement, wall ceiling or floor repairs, gutters, sump pumps, waterline insulation, are all incidental repairs and need to be listed that way in the work order as IRM materials and IRM labor.

The **Utility Bills form** (optional) can be used to enter pre-retrofit utility bills associated with heating and cooling if you want NEAT to compare them with NEAT's heating and cooling energy consumption estimates as part of an audit calibration process and adjust energy savings estimates for the recommended measures. For NEAT to adjust its energy savings estimates and develop a second set of recommended weatherization measures based on the actual pre-weatherization energy consumption of the house, select the Billing Adjustment checkbox. Comparison of the predicted base case energy use against utility bills is more appropriate for metered fuels, such as natural gas and electricity. Bulk fuels such as propane, fuel oil, and kerosene, which are delivered in bulk and stored in tanks at the house, are less appropriate. 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.

2.2 RUNNING NEAT AND VIEWING RESULTS

Audit recommendations – You can run NEAT after you have entered all the information for the house on the data input forms. The Run on the Audit Dock link will be activated as soon as all the required data input forms have been completed. When you select Run, the status of the run will be displayed, and the Recommended Measures Report will be opened in a separate window. Once an audit has been run, the link to View will be activated. You can select View to see a NEAT Recommended Measures Report that has already been created and saved from a previous run.

Figure 2.7 shows the title page of the NEAT Recommended Measures Report. The title page identifies your Agency, Account, Audit, and Audit Run; provides key information you have entered on the Agency, Account, and Audit forms; and provides additional information about the audit run to track the audit results.



NEAT Recommended Measures Report
Weatherization Assistant Online Version: 10.05.002

AGENCY INFORMATION
Agency: ORNL
Address: 1 Bethel Valley Road, P.O. Box 2008, Oak Ridge TN
Phone Number: 865-241-6765
Email: helpdesk@ornl.gov

ACCOUNT INFORMATION
Account Name: Audit Tool Comparisons
Account Number: Audit Tool Comparisons
Other ID Number:
Address: NY
Comments:

RETROFIT MEASURE RUN DETAILS
Run On: January 11, 2023 3:29 PM
Engine Version: v10.05.002
Run Identifier: 20230111.032855338

AUDIT INFORMATION
Audit Name: Sample NEAT for manual
Audit Number: 2433
Auditor: Jyothis Anand
Audit Date: July 14, 2021
Last Edited On: January 11, 2023 3:28 PM
Comments:

Building Information
Occupants: 3
Conditioned Stories: 1
Floor Area (sq ft): 789

Account Name: Audit Tool Comparisons
Account Number: Audit Tool Comparisons
Other ID Number:
NEAT Recommended Measures Report
Printed On: January 11, 2023 2:34 PM
Page 1 of 5
Agency: ORNL
Audit Name: Sample NEAT for manual
Audit Number: 2433

Figure 2.7. NEAT Recommended Measures Report: title page.

After the title page, the report lists all the recommended measures along with their estimated energy and cost savings, measure costs and SIRs, and primary material quantities needed to perform them (Figure 2.8).

Annual Energy and Cost Savings

Index	Recommended Measure	Components	Heating		Cooling		BaseLoad		Total	
			(MMBtu)	($)	(kWh)	($)	(kWh)	($)	(MMBtu)	($)
1	Lighting Retrofits	LT1	0.0	$0	0	$0	206	$30	0.7	$30
2	Lighting Retrofits	LT2	0.0	$0	0	$0	263	$38	0.9	$38
3	Low Flow Showerheads	Water Heating	0.0	$0	0	$0	421	$18	1.4	$18
4	Water Heater Tank Insulation	Water Heating	0.0	$0	0	$0	476	$21	1.6	$21
5	Insulate and Seal Attic Acess	Itemized Cost	0.0	$0	0	$0	0	$0	0.7	$0
6	Refrigerator Replacement	Refrigerator	0.0	$0	0	$0	1,915	$277	6.5	$277
7	Water Heater Pipe Insulation	Water Heating	0.0	$0	0	$0	260	$11	0.9	$11
8	Weatherize Window	WD3,WD1,WD2	6.0	$77	-46	-$7	0	$0	5.9	$70
9	General Air Sealing	Ducts/Infiltration	9.7	$123	-22	-$3	0	$0	9.7	$120
10	Water Heater Replacement	Water Heating	0.0	$0	0	$0	1,362	$59	4.7	$59

Economics

Index	Recommended Measure	Components	Measure Savings ($/yr)	Measure Cost ($)	Measure SIR *
Incidental Repairs					
1	Repair Roof	51	$0	$80	0.00
Weatherization Measures					
2	Lighting Retrofits	LT1	$30	$24	9.58
3	Lighting Retrofits	LT2	$38	$32	9.17
4	Low Flow Showerheads	Water Heating	$18	$30	6.71
5	Water Heater Tank Insulation	Water Heating	$21	$45	4.48
6	Insulate and Seal Attic Acess	Itemized Cost	$9	$30	4.17
7	Refrigerator Replacement	Refrigerator	$277	$800	4.07
8	Water Heater Pipe Insulation	Water Heating	$11	$30	3.68
9	Weatherize Window	WD3,WD1,WD2	$70	$300	1.80
10	General Air Sealing	Ducts/Infiltration	$120	$600	1.56
11	Water Heater Replacement	Water Heating	$59	$450	1.28
Total			$652	$2,421	2.67

*Total [Package] SIR excludes Health and Safety measures.

Materials

Index	Material	Type	Quantity	Units
1	Weatherize Window	Weatherize Window Materials	10	Each Window
2	Water Heater Tank Insulation	Water Heater Tank Insulation Wrap	1	Each
3	Water Heater Pipe Insulation	R-1.85 (1/2") Water Pipe Insulation	1	Each
4	Low Flow Showerheads	Low Flow Showerhead	1	Each
5	General Air Sealing	General Air Sealing	1	Each Measure
6	Replacement Lighting	CFL Lamp 13.0 watts	4	Each
7	Replacement Lighting	CFL Lamp 15.0 watts	4	Each
8	New Refrigerator		1	Each
9	New Water Heater		1	Each
10	R-30 faced batt insylation		1	Each

Figure 2.8. NEAT Recommended Measures Report: recommended measures.

If you entered utility bills on the Utility Bills form, the report will also provide a revised set of tables for the recommended measures based on adjusted estimates of energy and cost savings and SIRs, and a comparison of NEAT's estimates of the house's heating and/or cooling energy consumptions with the utility bills. Notably, NEAT's estimates are based on TMY3 (Typical Meteorological Year 3) weather data, whereas the utility bills reflect energy consumption for the actual weather that occurred during the billing period. If you also entered degree days associated with the utility bills, they will be compared with the TMY3 weather data used to make the home's energy estimates so that you can determine the degree to which differences between predicted energy consumptions and utility bills might be due to weather differences.

The report also provides other information such as the annual loads and energy consumptions (in MMBtu/yr), peak (i.e., design) loads (in kBtu/hr), and output required (in kBtu/hr for heating and tons for cooling) for the house before and after weatherization (Figure 2.9).

House Loads and Energy Consumptions

	Before Weatherization		After Weatherization	
	Heating	Cooling	Heating	Cooling
Annual Load (MMBtu/yr)	43.2	30.2	32.6	31.0
Annual Energy (MMBtu/yr)	63.9	8.8	48.1	9.1
Design Day Heat Loss/Gain (kBtu/hr)	37.9	16.1	34.5	15.0
Design Day Output Required (kBtu/hr)(ton)	45.5	1.6	39.7	1.5

Peak Heating Load

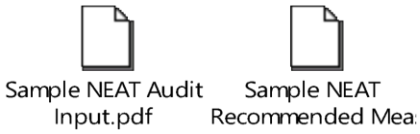
Component Type	Component Name	Area or Volume (Infiltration)	Before Weatherization Load (Btu/h)	After Weatherization Load (Btu/h)
Wall (Btu/h)	WL1-N	348	3,096.3	3,096.3
Wall (Btu/h)	WL2-S	348	3,096.3	3,096.3
Wall (Btu/h)	WL3-E	624	5,552.1	5,552.1
Wall (Btu/h)	WL4-W	640	5,694.4	5,694.4
Window (Btu/h)	WD1	32	2,091.4	2,091.4
Window (Btu/h)	WD2	32	993.1	993.1
Window (Btu/h)	WD3	16	545.0	545.0
Door (Btu/h)	DR1	20	428.2	428.2
Door (Btu/h)	DR2	20	428.2	428.2
Attic (Btu/h)	A1	1,000	3,242.1	3,242.1
Foundation (Btu/h)	Crawlspace1	1,000	3,637.3	3,637.3
Infiltration (Btu/h)	Inf	16,000	9,144.5	5,715.3
Total heat loss (Btu/h)	Tot	0	37,949.1	34,519.9
Duct loss (Btu/h)	Duct	405	7,589.8	5,178.0
Output required (Btu/h)	Output	0	45,538.9	39,697.9

Peak Cooling Load

Component Type	Component Name	Area or Volume (Infiltration)	Before Weatherization Load (Btu/h)	After Weatherization Load (Btu/h)
Wall (Btu/h)	WL1-N	348	899.8	899.8
Wall (Btu/h)	WL2-S	348	899.8	899.8
Wall (Btu/h)	WL3-E	624	1,613.4	1,613.4
Wall (Btu/h)	WL4-W	640	1,654.8	1,654.8
Window (Btu/h)	WD1	32	980.5	980.5
Window (Btu/h)	WD2	32	940.2	940.2
Window (Btu/h)	WD3	16	1,298.4	1,298.4
Door (Btu/h)	DR1	20	124.4	124.4
Door (Btu/h)	DR2	20	124.4	124.4
Attic (Btu/h)	A1	1,000	1,832.8	1,832.8
Foundation (Btu/h)	Crawlspace1	1,000	623.0	623.0
Infiltration (Btu/h)	Inf	16,000	3,340.8	2,272.8
People (Btu/h)	People	2	552.0	552.0
Appliances (Btu/h)	Appl	1	1,200.0	1,200.0
Total Sensible (Btu/h)	TotS	0	16,084.5	15,016.4
Ducts (Btu/h)	Ducts	0	2,412.7	2,252.5
Total (with ducts) (Btu/h)	TotW	0	18,497.2	17,268.9
Size (tons)	Size	0	1.5	1.4
Latent Load (inf) (Btu/h)	LatentI	0	0.0	0.0
Latent Load (occ) (Btu/h)	LatentO	0	460.0	460.0
Latent Load (tot) (Btu/h)	LatentT	0	460.0	460.0
Total Load (Btu/h)	Total	0	18,957.2	17,728.9
Size (tons)	Size	0	1.6	1.5

Figure 2.9. NEAT Recommended Measures Report: annual loads, energy consumptions, and peak load components before and after weatherization.

Reports – The Reports drop-down field on the Audit Dock is used to select two reports associated with the NEAT audit (attached below). The Audit Input report provides a printout of all the inputs made in NEAT. The Audit Recommendations report provides the NEAT Recommended Measures Report for the most recent run of the audit (equivalent to the View link).



2.3 CREATING A NEAT WORK ORDER

A work order is typically created for the measures recommended by running an audit. To create a work order for a previously run NEAT audit, select View at the bottom of the Audit Dock. This will open the Recommended Measures Report in a separate window. Switch to the Weatherization Assistant window and select the View Measures button on the task bar at the bottom of the NEAT Audit Recommendations window (Figure 2.10) to open the Audit Run Measures form. All work-orders must have a detailed explanation of work performed and reference most stringent SWS, KY-WX field guide, or ICC codes.

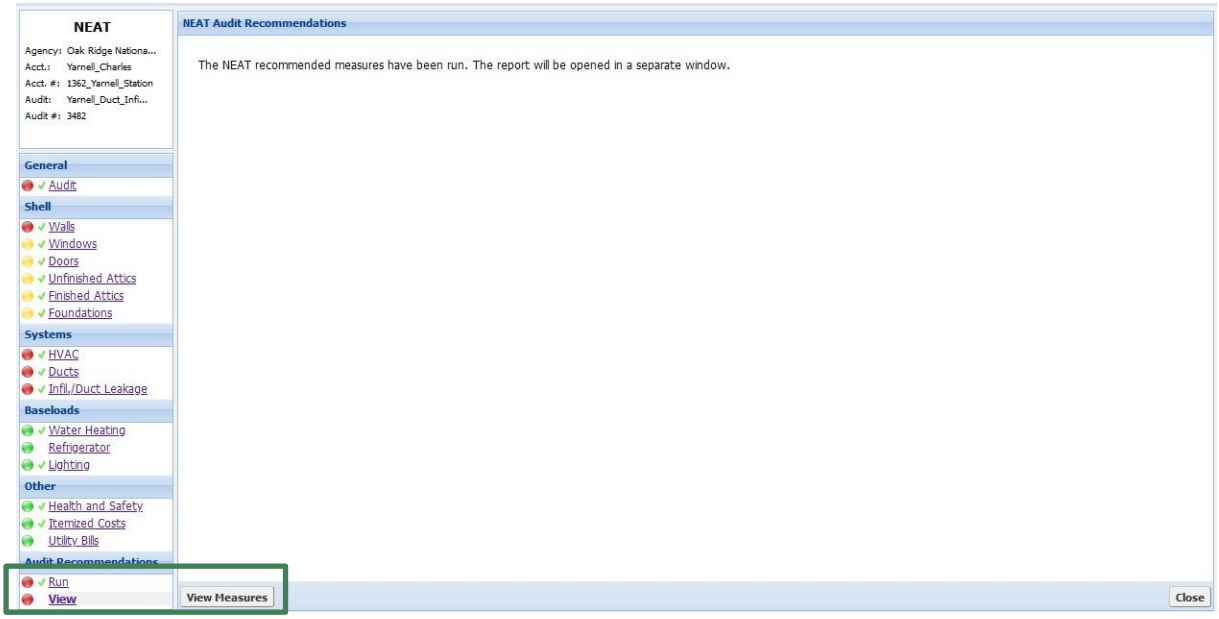


Figure 2.10. NEAT audit showing View and View Measures.

The **Audit Run Measures** form (Figure 2.11) displays seven buttons at the top, the Audit Run Measures sub-form in the middle, and the Unit Costs for Measure: [Measure Name] table at the bottom. The Select All, Unselect All, Invert Selections, Same Contractor, and Same Cost Center buttons help users complete the Audit Run Measures sub-form quickly. The Create Work Order button creates work orders based on information provided in the Audit Run Measures sub-form. The Close button exits the form.

The Audit Run Measures sub-form displays (a) un-editable fields under columns # (that reflect the order in which measures appear on the Recommended Measures Report), Measure Name, Components (that show the name of component[s] associated with the measure), and Estimated Cost and SIR (that display the measure cost and SIR used by the audits to make their initial recommendations); (b) drop-down fields under Contractor/In-House Crew and Cost Center columns, which allow you to assign each measure to a contractor and the cost of implementing each measure to a funding source or program, respectively; and (c) checkboxes under the Work Order column to indicate which measure to transfer to the work orders.

The Unit Costs for Measure: [Measure Name] table shows a breakdown of Estimated Cost for a measure selected in the Audit Run Measures sub-form. For a selected measure, the table lists as many cost types as were defined in the Retrofit Cost Details or Defined Measures library forms and in various building description forms. For each cost type, Measure Description, Quantity, Unit, Units$ (i.e., cost per unit), and Comment specifying the source form for the cost per unit are displayed.

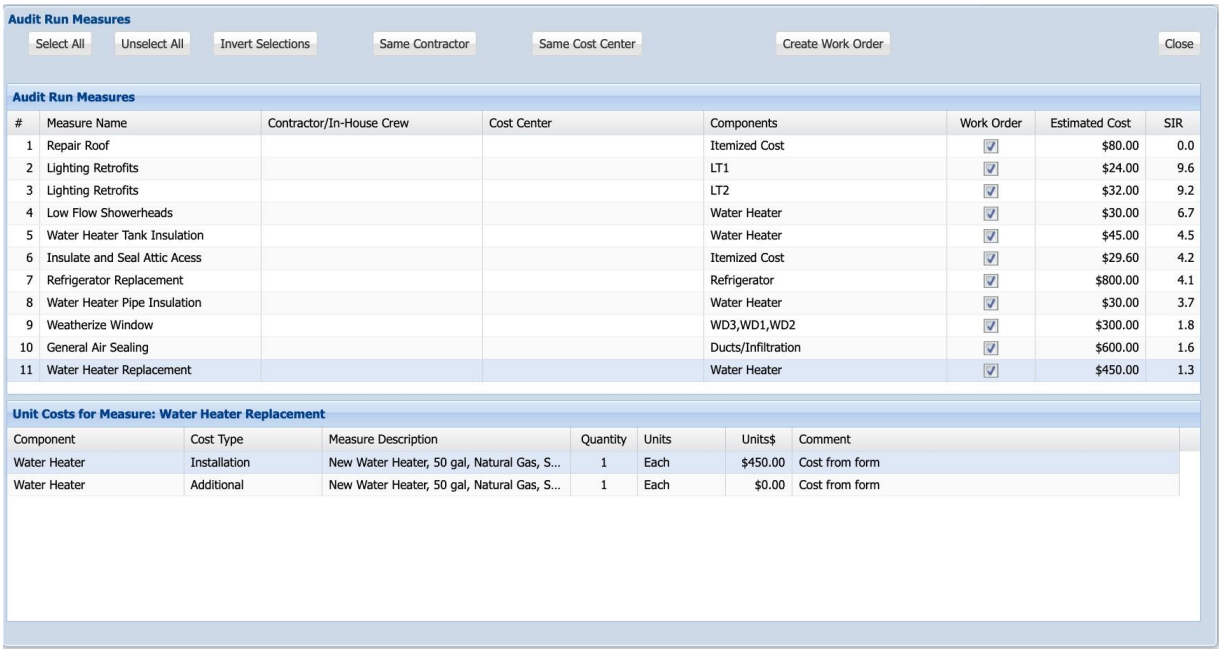


Figure 2.11. Audit Run Measures form.

To create work orders, you must select the checkbox under the Work Order column for each measure you want transferred to a work order. Measures not selected will not be sent to a work order. You may prefer to not send a specific measure to a work order if a work order already exists that includes the measure or if you do not want to consider certain recommended measures. You may use the Select All, Un-Select All, and Invert Selections buttons to select all recommended measures, unselect all, or invert the current selections.

You may select a Contractor/In-House Crew to assign each measure to a contractor. The selection will determine how many work orders are created from the measure list. All measures assigned the same contractor will be included in the same work order. The choices displayed in the drop-down list will be all agency contacts defined as Contractor or Crew on the Agency Contact form. All measures with an unassigned Contractor that are selected for transfer to a work order will be assigned to the same work order with the contractor undesignated. After assigning one measure to a contractor, you may use the Same Contractor button to assign all additional measures to that contractor.

If you are tracking costs incurred by different funding sources or programs, you may select a Cost Center to assign the cost of implementing each measure to the appropriate Cost Center. The choices available in the drop-down list will be those you have defined on the Agency Cost Center form. If the entry is left un-assigned, work orders can still be developed, but total costs over multiple audits will not be tracked. The costs assigned to the various cost centers are not the Estimated Costs. They are the actual costs declared in the work orders themselves. After assigning one measure to a cost center, you may use the Same Cost Center button to assign all measures to that cost center.

When you are ready to create the work orders based on the information provided on the Audit Run Measures sub-form, select the Create Work Order button. If you have previously created work orders from this specific audit, the Create Work Order pop-up form (Figure 2.12) will be displayed and will ask your preference among three options:

- Save the previously generated Work Order and create new ones,
- Replace the previously generated Work Order with new ones, or
- Cancel the creation of Work Orders.

Select an option and then select OK to save and close the pop-up form. Any work orders not created from this audit will be unaffected by the request to create work orders from the Audit Run Measures form of this audit. Thus, if you used the Work Orders form from the menu bar to create work orders for an account, then you ran an audit for the same account and were asked to create work orders based on the audit recommendations, the two sets of work orders would exist for the same client. This is intended to address situations where agencies may implement some measures outside an audit (such as from a priority list) but use the audit for recommendations on other measures.

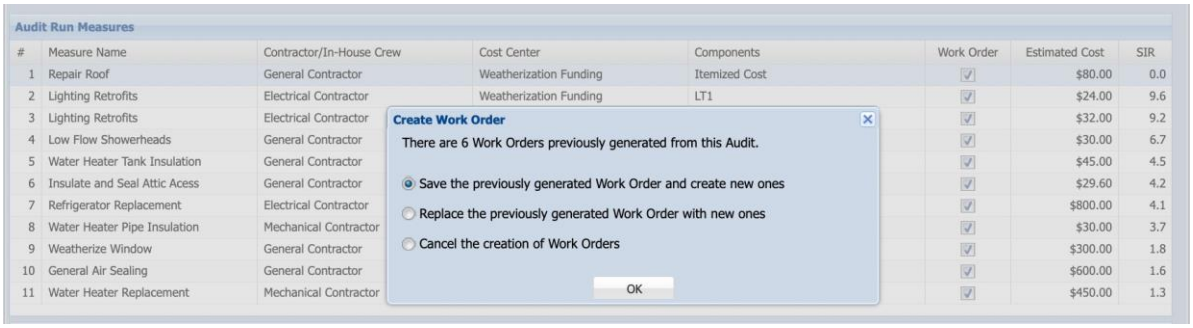


Figure 2.12. Create Work Order pop-up form.

The program will next display the Information pop-up window (Figure 2.13) indicating how many work orders were created because of your selections on the Audit Run Measures sub-form. This should correspond to the number of unique contractors (including undesignated) that you indicated on the Audit Run Measures sub-form. Select OK to acknowledge and close the pop-up window. Select Close to exit the Audit Run Measures form.

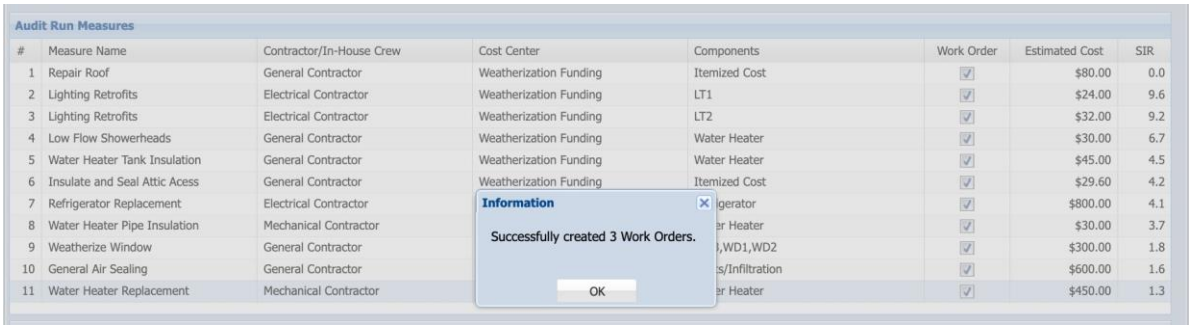


Figure 2.13. Information pop-up window for successfully created work orders.

After creating work orders from the audit recommendations, you may access them from the All table on the Work Order Details form (Figure 2.14) and view measure details on the Work Order Measures form (Figure 2.15). See Section 1.8 for information about making changes to a work order or measure details.

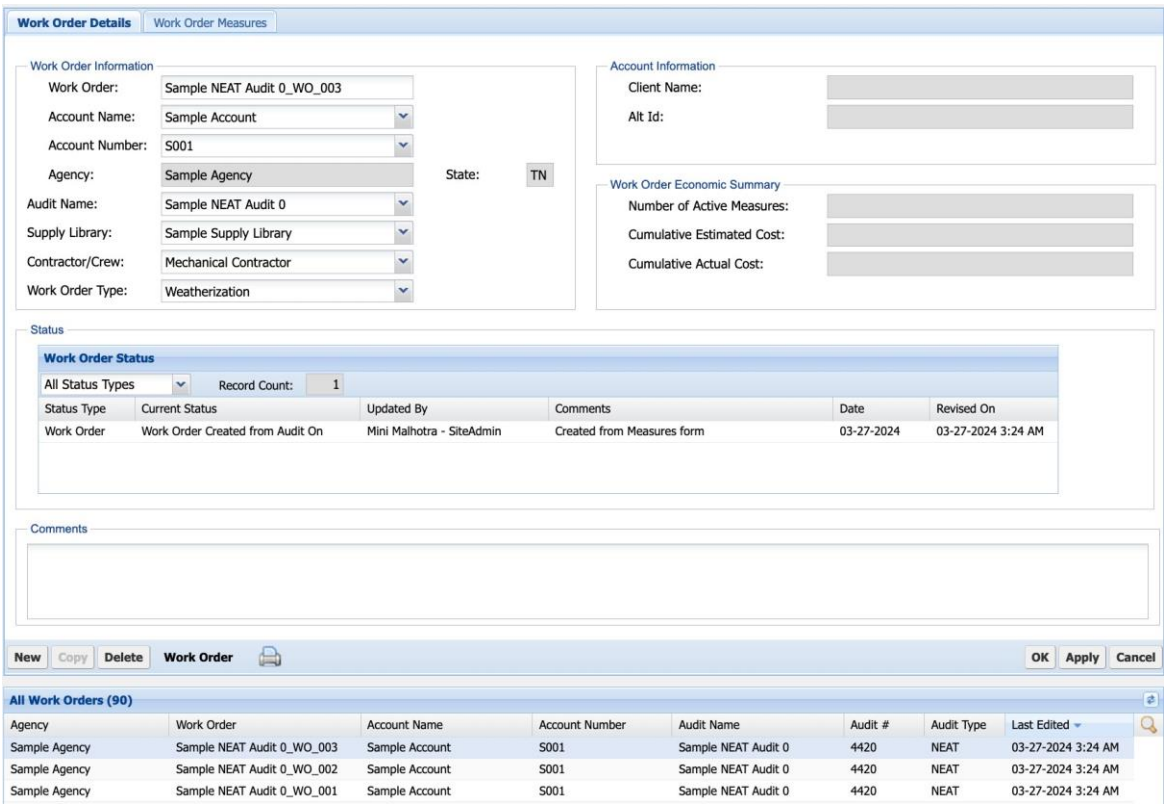


Figure 2.14. Work orders created for a NEAT audit.

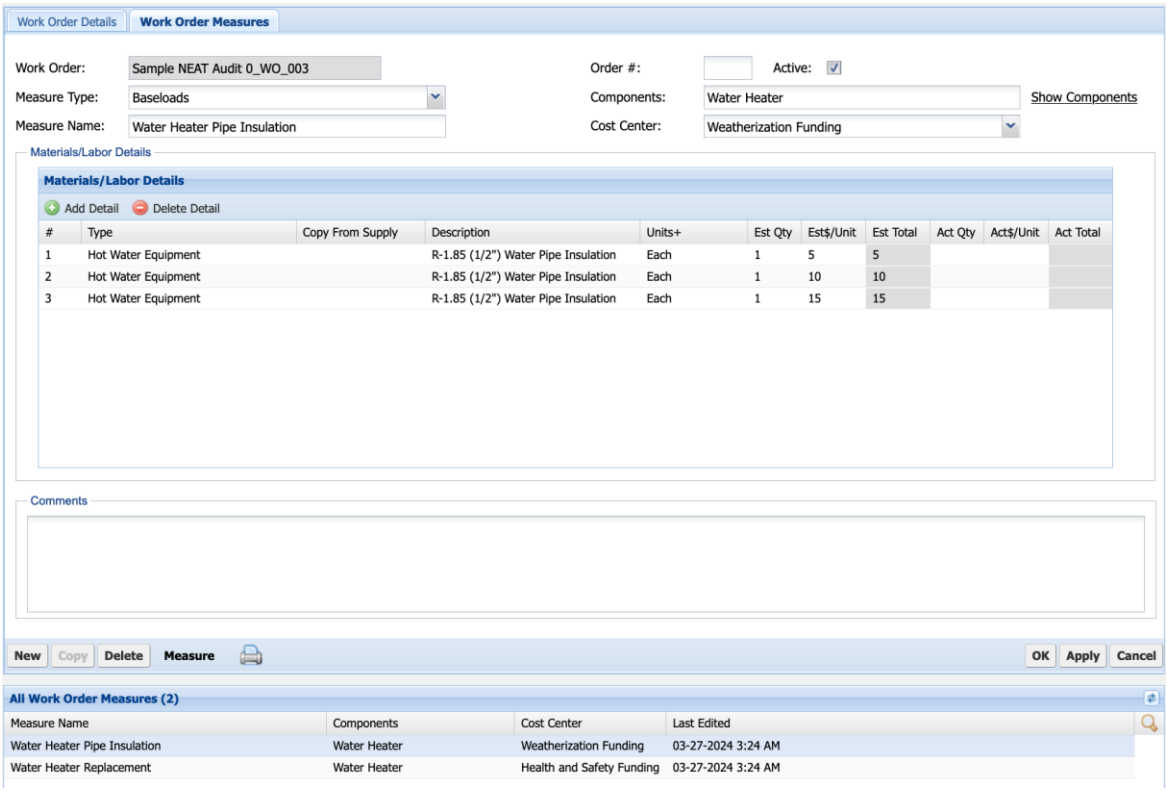


Figure 2.15. Work order measure details for a NEAT measure.

3. MHEA

Once you have set up an account for a manufactured home, you can create and run MHEA on that home. MHEA has multiple forms used to describe a manufactured home with each having a main form for data input and possibly an All table for record navigation (Section 1.3). MHEA also has an Audit Dock that is a static feature anchored on the left of each MHEA input form (Figure 3.1) and provides the means of accessing MHEA's various forms and running the audit. The Audit Dock may not be displayed when creating a new audit until after the Audit form has been saved.

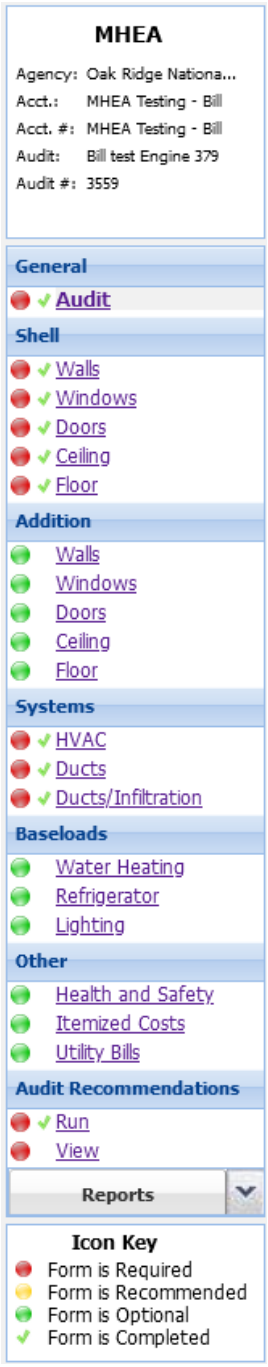


Figure 3.1. MHEA Audit Dock.

At the top of the Audit Dock is an information block that shows key audit information entered on the Audit form for the audit that is currently active (i.e., being viewed). Links to each of MHEA's 20 data input forms used to describe the house are provided below the information block. These links are organized into six groups: General, Shell, Addition, Systems, Baseloads, and Other. Colored icons are presented beside these links to indicate if the form is required, recommended, or optional, and if the form has been completed. A legend for the icons is shown in the Icon Key at the bottom of the Audit Dock. Links are provided in an Audit Recommendations group to run MHEA or view results of the last run for that audit. Finally, Reports can be selected to access various reports available within MHEA for the audit being viewed.

Some of the data input forms in MHEA allow multiple records to be described for a building component. For example, in Figure 3.2, multiple windows are entered on the Window form. These forms have New and Copy options to create multiple records. For each record, a tab named by the user-entered Code is created at the top of the form. The All table presented at the bottom of each of these forms lists these records (i.e., the tabs) (Figure 3.3).

To complete one of the 20 MHEA data input forms, simply select the form in the Audit Dock and then complete the form. Select Apply to save and remain on the form or OK to save and exit the form. Select Cancel to exit the form without saving the entries that you just made. Select New or Copy (if applicable) to create additional records. The completed records will be listed in the All table. To view or edit an existing record, select the tab or the record in the All table.

On most of the Shell, Addition, Systems, and Baseloads forms, field sets on the left part of the main form describe a selected component of the existing building. A field set on the right of the main form describes retrofit measure technical details for the component. In some cases, the retrofit measure field sets can be used to directly enter the total costs associated with the measure because it cannot be described in the Measure Cost Set Library. In other cases, the retrofit measure field sets can be used to enter an Additional Cost associated with installing the measure that will be added to the cost calculated from the Measure Cost Set Library.

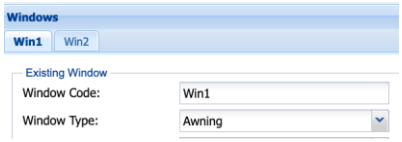


Figure 3.2. Tabs on MHEA's Window form.

Window Code	Frame Type	Glazing Type	Wall/Roof Code	Leakiness	Width (in.)	Height (in.)	Last Edited
Sliding Door	Vinyl	Double Pane	Wall	Medium	72	80	11-17-2022 12:43 PM
Sliding Door - Max	Vinyl	Double Pane	Wall	Medium	90	90	11-17-2022 12:43 PM
W01	Wood	Single Pane	Wall	Very Loose	34	45	11-17-2022 12:42 PM
W02	Wood	Single Pane	Wall	Very Loose	34	45	11-17-2022 12:42 PM
W03	Wood	Single Pane	Wall	Very Loose	34	45	11-17-2022 12:42 PM
W04	Wood	Single Pane	Wall	Very Loose	34	45	11-17-2022 12:42 PM

Figure 3.3. All Windows table on MHEA's Window form.

MHEA will evaluate all retrofit measures that are indicated as being active in the Measure Cost Set Library and applicable to the home. However, some of the data input forms in MHEA provide the option to evaluate only certain measures for a component, which will exclude evaluation of other active measures for that component. In that case, MHEA also provides an option to include the energy savings and cost of the measure in calculating the package SIR. Measures where "Required" is selected, but not included in the package SIR are normally related to health and safety or are measures funded by a source other than the Weatherization Assistance Program. A measure with both "Required" and "Include in SIR" selected will be included in the package SIR and will always be recommended regardless of its SIR (this option is generally used for Incidental Repair Measures). Check the guidance for your program in deciding if and how these features can be used.

3.1 DESCRIBING A MANUFACTURED HOME IN MHEA

All data entered into the MHEA software shall be provided using the Data Collection Form provided by KHC to all sub-grantees. Only the DCF provided by KHC has been approved for use of data collection. To create a new MHEA audit, select Audit → MHEA on the menu bar and then select New on the Audit form (State Administrators and Guests are not allowed to create an audit). Select Copy to create a new audit from an existing audit. You may want to create a new audit using Copy to make multiple audit runs for a home (e.g., to evaluate different retrofit options or replacement equipment for a given home) but still see the results of previous runs. When creating a new audit using New, fill in the Audit form first before entering information on the other forms.

Each of MHEA's input forms are described briefly here. Section 3.2 describes how to run MHEA.

Audit form (required) – The Audit form is used to enter general audit information and select weather files and libraries needed to run the audit (Figure 3.4). All the fields on this form that are not disabled or read-only are required.

At the top of the form, select your Agency and then select the account using either the Account Name or Account Number field (the other data field will be auto-filled using information from the Account form). Enter an Audit Name and the Audit Date, and then select the Auditor Name (auditor names provided in the drop-down list will include all users for the Agency that are marked as Active and Auditor on the User form). The City and State fields will be auto-filled using information from the Account form. The Audit Number will be automatically assigned by MHEA. Next, enter the building information: Occupants, Length & Width(not including additions which will be entered in the additions tab of MHEA), Exterior Wall Height (height of exterior wall), Infiltration Height (height from floor to highest peak in ceiling on the interior of the mobile home), Number of Bedrooms, Wind Shielding, and the presence of Outdoor Water Heater Closet. Then, select the Weather State, Weather Location, and the following libraries: Economic Parameter Set, Measure Cost, Key Parameter Set, Supply, Defined Measure Set, and Fuel Cost for each fuel type. MHEA has 1,000+ US weather stations, which are filtered by weather state. You may also consider cities near you in states that border your own. The libraries listed in the drop-down lists are restricted to those that have been created in the respective libraries for this agency and marked Active for MHEA. For the Fuel Cost, you can select None for fuel types that will not be used in the audit except for electricity. The fuel costs associated with the selected Fuel Cost names will be auto-filled. Finally, for MHEA to adjust energy savings estimates and recommend measures based on the actual pre-weatherization energy consumption of the home, select the Billing Adjustment checkbox.

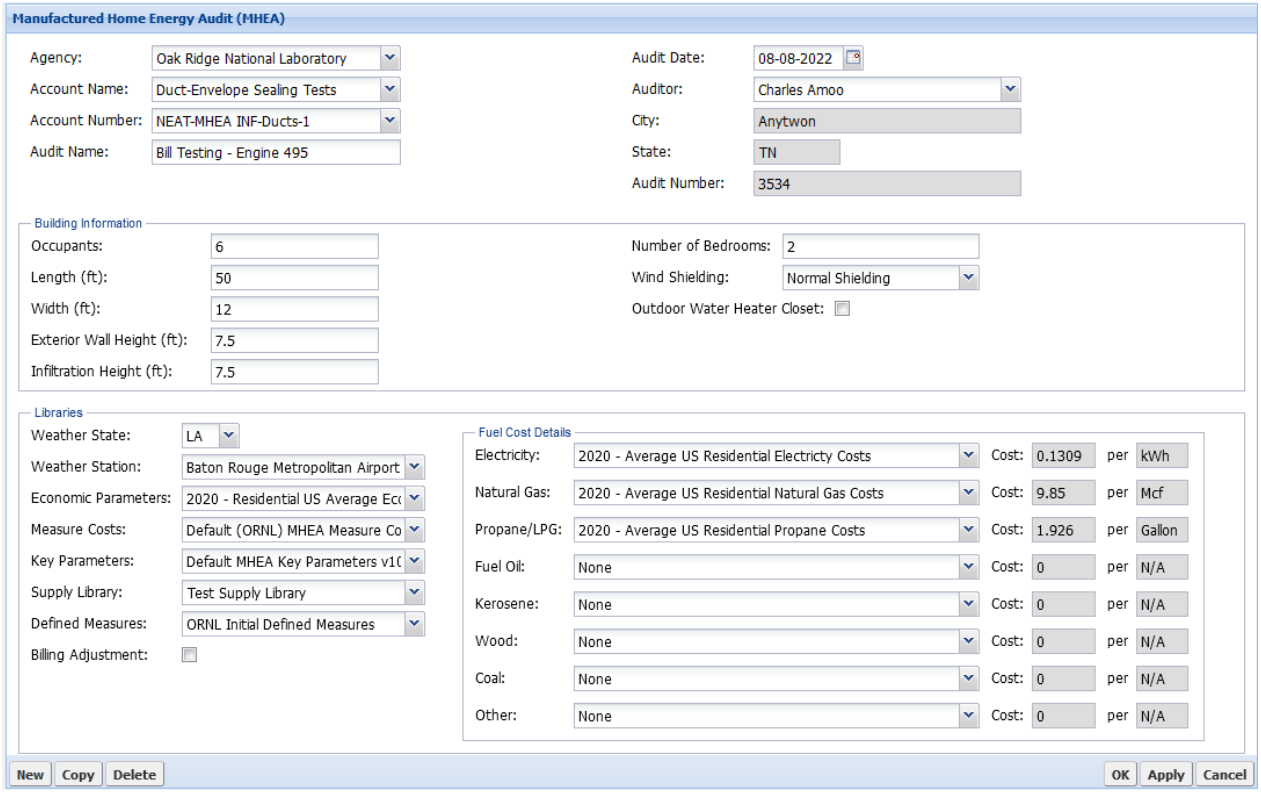


Figure 3.4. MHEA Audit form.

Shell forms – Shell forms are used to describe the walls, windows, doors, ceiling, and floor of a manufactured home. Use these forms to describe all the shell components in the home that define thermal boundary (as illustrated in Figure 3.5), select retrofit options, and describe any additional costs associated with the installation of the retrofit unique to the home being audited that is not described in the Measure Cost Set Library. Each of the shell forms is required.

1. Main beam
2. Band joist
3. Rough window opening
4. Bowstring trusses
5. Floor joists
6. Heating/AC duct
7. Top plate
8. Ceiling joist cavity
9. Wall section
10. Rough door opening
11. Vapor barrier
12. Blown-in insulation

Figure 3.5. Typical mobile home components.

The **Wall form** (required) is used to describe the four primary walls of the home that enclose the conditioned space of the home. MHEA assumes that a manufactured home is rectangular in shape, the walls are wood-frame construction, and the walls facing different orientations have identical construction characteristics; therefore, MHEA uses only one form to describe all four primary walls (not including any addition that will be described on the addition tab of MHEA).

The **Window and Door forms** (required) are used to describe all the windows and exterior doors of the home (not including any addition that will be described on the addition tab of MHEA). The number of each type of window or door entered is entered by its orientation.

The **Ceiling form** (required) is used to describe the ceiling (i.e., the roof) in the home (not including any addition that will be described on the addition tab of MHEA).To describe a roof, you must first select the roof type from the following options: Flat, Bowstring, and Pitched (Figure 3.6), enter the joist size for flat roofs, height of roof at center for bowstring roofs, or desired amount of insulation to add at center for pitched roofs (Figure 3.7); select the roof color; and describe the cathedral ceiling if one exists (see Figure 3.8 and Figure 3.9 for different cathedral ceiling configurations).

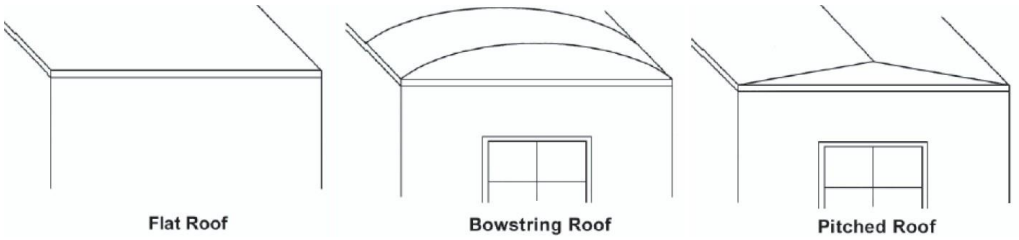


Figure 3.6. Typical manufactured home roof configurations.

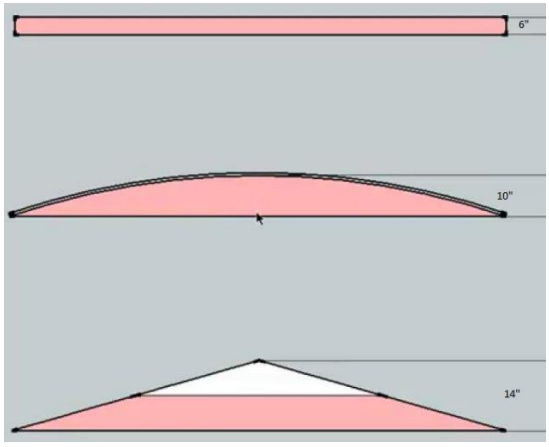


Figure 3.7. Section drawings of manufactured home roof configurations (from top to bottom: flat roof, bowstring roof, pitched roof).

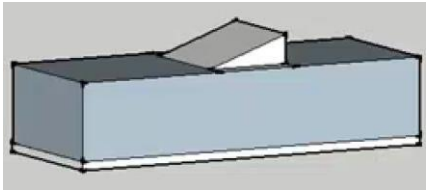


Figure 3.8. Sloped roof cathedral ceiling with step wall, typical with flat roofs.

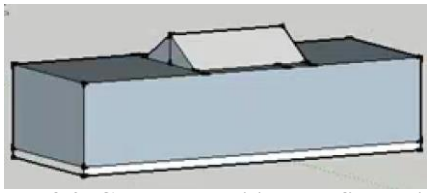


Figure 3.9. Cathedral ceiling configurations with no step wall, typical with pitched roofs.

The **Floor form** (required) is used to describe the floor of the home, defined in MHEA to comprise wing and belly sections (Figure 3.10) (not including any addition that will be described on the addition tab of MHEA). The wing and belly sections are protected from outside elements (including water, wind, and rodents) using an insulation wrap attached to the underside of the floor joists. The space available for adding insulation depends on the direction and size of the floor joists, the location and thickness of the existing insulation in the wing and belly sections, and the belly cavity configuration (Figure 3.11). The manufactured home may also have skirting installed around the perimeter. When belly is damaged with missing insulation belly shall be listed as in poor condition and insulation levels derated using deration .

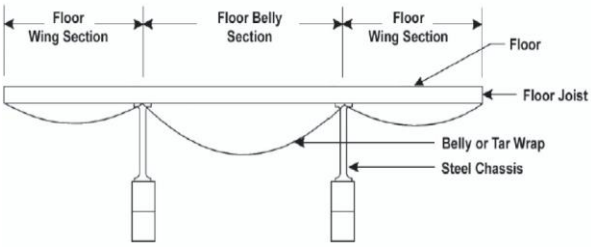


Figure 3.10. Widthwise floor joist direction.

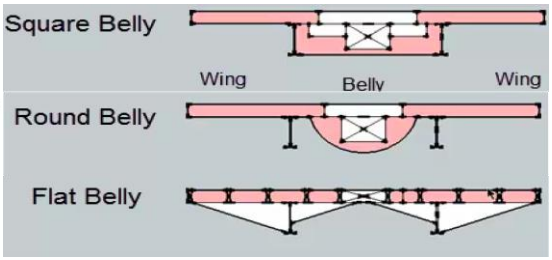


Figure 3.11. Typical manufactured home belly configurations.

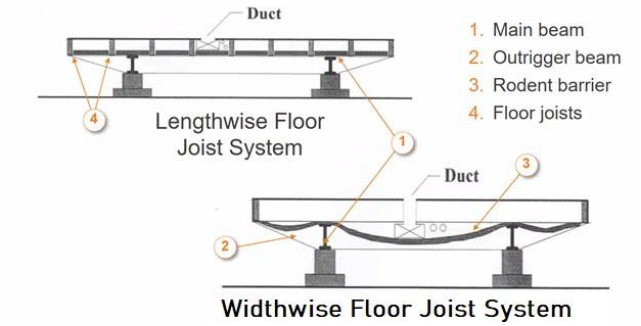


Figure 3.12. Manufactured homes joist spacing and direction.

Addition forms – Addition forms are used to describe the walls, windows, exterior doors, ceiling, and floor of a conditioned room attached to the manufactured home. MHEA assumes that the manufactured home addition is rectangular in shape with wood-frame construction and has three exposed walls, a flat, shed or gable roof, and a crawlspace, slab on grade, or exposed floor (see Figure 3.13, Figure 3.14, and Figure 3.15). Use these forms to describe all the shell components in the addition through which heat flows, select retrofit options, and describe any additional costs associated with the installation of the retrofit unique to the house being audited that are not described in the Measure Cost Set Library. If there is no addition, you do not need to access the addition forms. However, if entry is begun on any one of the addition forms, then the **Walls form**, **Ceiling form**, and **Floor form** must be completed. The **Window and Door forms** are optional.

Systems forms – Systems forms are used to describe the HVAC systems, ducts, and duct leakage and infiltration associated with a manufactured home. You must enter one heating system and enter infiltration data on the Ducts/Infiltration form to meet the minimum requirements of MHEA. The remaining forms are optional unless deemed required based on other inputs. For example, the Duct form may be required depending on HVAC entries. The selections made in the HVAC form, especially with regard to heating, will determine whether the duct form remains optional or becomes required. In most homes, though, both heating and cooling systems will be entered on the HVAC form.

The **HVAC form** (required) is used to describe the heating and cooling equipment installed in the house and select retrofit options. In MHEA, you can describe as many equipment as are required to describe the heating and cooling sources in the house. At least one equipment that provides heating must be described in this form. The selected equipment may provide either heating or cooling or both. To describe an equipment, first enter the equipment type (and fuel if heating-only equipment) and then enter the data collected through proper manual testing for each appliance depending on fuel source in the applicable fields. SSE shall be used when manually testing in the field for gas fired appliances if different from AFUE ratings. If SSE readings cannot be obtained, then AFUE ratings at original rated efficiency are acceptable to use. Inputs related to equipment type and fuel will filter out other necessary inputs, as well as retrofit options that will be available for evaluation. For example, choosing a central heat pump will disenable the retrofit option for installing a smart thermostat, and selecting a space heater will disenable tune up as a retrofit option. The Replace the Equipment retrofit option is always enabled for possible selection and is used to specify if the measure replaces one or more existing equipment described in other HVAC sub-forms. Replacement required selection procedure is the same process as outlined in the HVAC form section in NEAT.

Unlike in Weatherization Assistant Version 8, heating/cooling equipment inputs are not limited to primary and secondary systems. Each type of existing heating and/or cooling equipment in the home may be entered as separate records. Weatherization Assistant Version 10 determines the primary system based on the Fraction of Load Served value that is either input or estimated by the software. Inputs made on any optional forms (e.g., other field measurements or health and safety observations) are informational only and are not used in running the audit analysis.

The **Duct form** (conditionally required) is used to describe the supply and return ducts for ducted HVAC equipment. A duct system with varying characteristics (e.g., location, insulation) must be described as multiple segments. All ducted HVAC equipment must be selected as served by at least one supply duct. All supply and return dusts shall be considered for modeling and properly entered in the software as is. Default methods can be used for surface area or manual entry is allowable with proper measurements of width height and length or diameter. To evaluate a duct insulation measure, you must enter the measured duct surface area and insulation R-value. If sufficient details relating to duct size and/or surface area and insulation R-value are unknown, then Weatherization Assistant Version 10 can estimate the values. To calculate these estimates and view the results, select the Use Defaults checkbox (Figure 3.16). To edit the values, clear the Use Defaults checkbox and input other values. Select Apply or OK to save the inputs. Figure 3.17 shows the typical furnace and duct system layout in a mobile home.

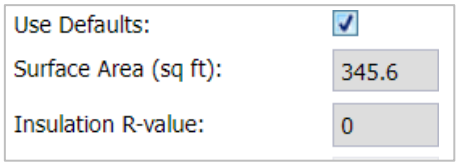


Figure 3.16. Use Defaults checkbox selected.

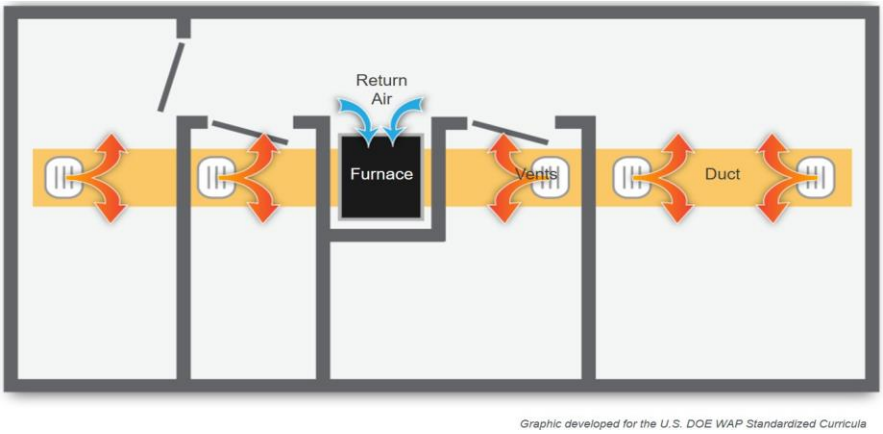


Figure 3.17. Typical furnace and duct system layout in a mobile home.

The **Ducts/Infiltration form** (required) is used to enter air and duct leakage data to evaluate the effectiveness of infiltration reduction work and duct sealing. The data input fields on the Ducts/Infiltration form change depending on whether duct sealing will be evaluated and, if so, which method—whole house blower door or duct blower measurements—will be used. Duct blower measurements should always be selected. Pre-duct operating pressure shall be obtained by switching on the air handler and using a pressure pan to obtain readings from both supply and return ducts. When only one (1) central return exists, DO NOT COVER WITH PRESSURE PAN. Place 2-3 inches of the hose in the return at the filter grill. Target duct operating pressures are 5pa greater than measured operating pressure. To evaluate infiltration reduction as a retrofit measure, you must, at a minimum, enter the pre-weatherization whole-house air leakage rate (usually measured), an estimated or target rate after weatherization, house pressure differences for these rates, and the cost of the infiltration reduction work. A set of optional forms (Blower Doors, Zonal Pressures, Pressure Pans, and Room Pressure Balances) can be used to enter measurements made during the infiltration and duct leakage measurements or health and safety observations related to the HVAC systems. Information entered on these optional forms is not used in running an audit. Duct Blaster Measurements must be obtained through testing and entered into the auditing software to evaluate for duct sealing. Duct sealing and whole house infiltration targets are based on IECC 2009 guidance for duct leakage and infiltration rates. 25pa shall be entered in all 6 inputs for 'at Duct Pressure' and 'House Pressure WRT Outside'.
Baseloads forms – Baseloads forms are used to describe water heating retrofits, refrigerator replacement, and lighting retrofits. These forms are optional and are used to evaluate specific retrofit measures.

The **Water Heating form** is used to enter information necessary to evaluate for water heating retrofit measures: tank insulation, pipe insulation, low-flow showerheads, and water heater replacement. You may describe the existing water heater by selecting from the list of manufacturer and model number, which will autofill the energy use characteristics of the water heater, or by directly entering the data on the form collected from the manufactures data plate. To evaluate a water heater replacement, you may either select a water heater you have already described in the Supply Library, which will autofill the data, or directly enter the data on the form from the manufacturers data plate. All water heater replacements must be submitted to KHC for approval.

The **Refrigerator form** is used to enter information necessary to evaluate a refrigerator replacement. Here, you may specify the energy use characteristics of the existing and replacement refrigerators. For the existing refrigerator, you may either select from the list of manufacturers and model numbers, which will autofill the energy use characteristics of the refrigerator, or directly enter the data on the form. For the replacement refrigerator, you may either select a refrigerator you have already described in the Supply Library, which will autofill the data, or directly enter the data on the form. Refrigerator replacement process is outlined in the refrigerator form in the NEAT section.

The **Lighting form** is used to describe lamp replacement retrofits. You may specify the quantity, usage, and energy use characteristics of the existing and replacement lighting and cost of the replacement lighting. For the existing and/or replacement lighting, you may either select lighting you have already described in the Supply Library, which will autofill the energy and cost data, or directly enter the data on the form. All lighting retrofits are required by KHC to be energy star rated.

Other forms – Other forms can be used to describe health and safety observations in the home; repair or health and safety measures or your own energy measure; and utility bills.

The **Health and Safety form** can be used to enter health and safety-related measurements and observations that you have made of the home. Items on this form help identify potential health and safety hazards related to the whole house, equipment, and the shell; record worst-case draft measurements for space heating equipment and the water heater; and determine ventilation requirements to comply with ASHRAE Standard 62.2.

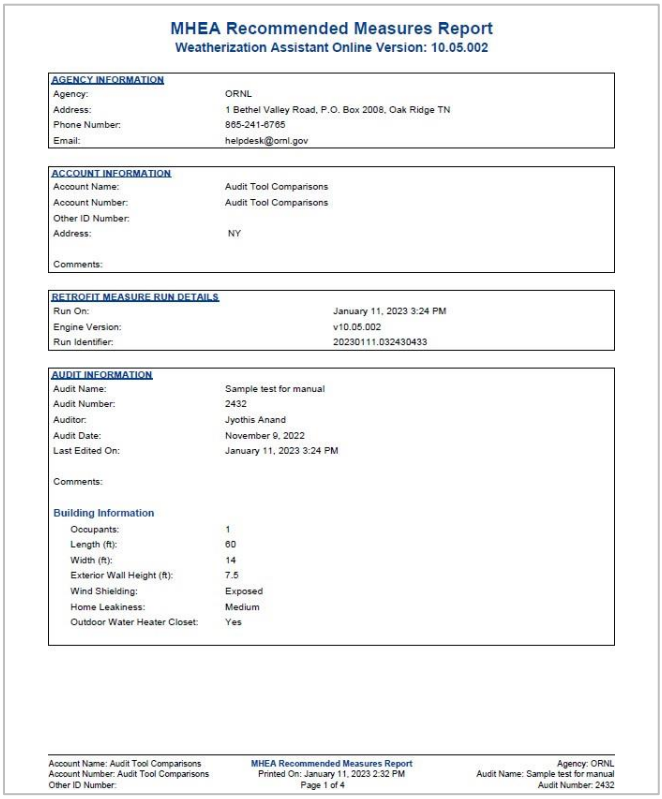
The **Itemized Costs form** can be used to enter necessary repair and health and safety measures associated with recommended energy measures and their costs. Refer to the Itemized Cost Form for NEAT to see how to enter material and labor cost for an Incidental Repair Measure (IRM).

The **Utility Bills form** (optional) can be used to enter pre-retrofit utility bills associated with heating and cooling if you want MHEA to compare them with MHEA's heating and cooling energy consumption estimates as part of an audit calibration process and adjust energy savings estimates for the recommended measures. For MHEA to adjust its energy savings estimates and develop a second set of recommended weatherization measures based on the actual pre-weatherization energy consumption of the home, select the Billing Adjustment checkbox. Comparison of the predicted base case energy use against utility bills is more appropriate for metered fuels, such as natural gas and electricity. Bulk fuels such as propane, fuel oil, and kerosene, which are delivered in bulk and stored in tanks at the home, are less appropriate. 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.

3.2 RUNNING MHEA AND VIEWING RESULTS

Audit recommendations – You can Run MHEA after you have entered all the information for the home on the data input forms. The Run on the Audit Dock link will be activated as soon as all the required data input forms have been completed. When you select Run, the status of the run will be displayed, and the Recommended Measures Report will be opened in a separate window. Once an audit has been run, the link to View will be activated. You can select View to see a MHEA Recommended Measures Report that has already been created and saved from a previous run.

Figure 3.18 shows the title page of the MHEA Recommended Measures Report. The title page identifies your Agency, Account, Audit, and Audit Run; provides key information you have entered on the Agency, Account, and Audit forms; and provides additional information about the audit run to track the audit results. After the title page, the report lists all the recommended measures along with their estimated energy and cost savings, measure costs and SIRs, and primary material quantities needed to perform them (Figure 3.19).



MHEA Recommended Measures Report
Weatherization Assistant Online Version: 10.05.002

AGENCY INFORMATION

Agency:	ORNL
Address:	1 Bethel Valley Road, P.O. Box 2008, Oak Ridge TN
Phone Number:	865-241-6765
Email:	helpdesk@ornl.gov

ACCOUNT INFORMATION

Account Name:	Audit Tool Comparisons
Account Number:	Audit Tool Comparisons
Other ID Number:	
Address:	NY
Comments:	

RETROFIT MEASURE RUN DETAILS

Run On:	January 11, 2023 3:24 PM
Engine Version:	v10.05.002
Run Identifier:	20230111.032430433

AUDIT INFORMATION

Audit Name:	Sample test for manual
Audit Number:	2432
Auditor:	Jyothis Anand
Audit Date:	November 9, 2022
Last Edited On:	January 11, 2023 3:24 PM
Comments:	

Building Information

Occupants:	1
Length (ft):	60
Width (ft):	14
Exterior Wall Height (ft):	7.5
Wind Shielding:	Exposed
Home Leakiness:	Medium
Outdoor Water Heater Closet:	Yes

Figure 3.18. MHEA Recommended Measures Report: title page.

Annual Energy and Cost Savings

Index	Recommended Measure	Components	Heating		Cooling		BaseLoad		Total	
			(MMBtu)	($)	(kWh)	($)	(kWh)	($)	(MMBtu)	($)
1	Low Flow Showerheads	Water Heating	0.0	$0	0	$0	256	$34	0.9	$34
2	Water Heater Pipe Insulation	Water Heating	0.0	$0	0	$0	159	$21	0.5	$21
3	Lighting Retrofits	L1	0.0	$0	0	$0	178	$23	0.6	$23
4	Water Heater Tank Insulation	Water Heating	0.0	$0	0	$0	230	$30	0.8	$30
5	General Air Sealing	Ducts/Infiltration	0.8	$50	16	$2	0	$0	0.8	$52
6	Roof Fiberglass Loose Insulation	Roof	1.1	$70	609	$80	0	$0	3.2	$149
7	Replace HVAC System	AC	5.7	$365	2,337	$306	0	$0	13.7	$671

Economics

Index	Recommended Measure	Components	Measure Savings ($/yr)	Measure Cost ($)	Measure SIR
Weatherization Measures					
1	Low Flow Showerheads	Water Heating	$34	$23	18.42
2	Water Heater Pipe Insulation	Water Heating	$21	$15	15.18
3	Lighting Retrofits	L1	$23	$30	11.96
4	Water Heater Tank Insulation	Water Heating	$30	$40	8.28
5	General Air Sealing	Ducts/Infiltration	$52	$101	4.47
6	Roof Fiberglass Loose Insulation	Roof	$149	$672	3.43
7	Replace HVAC System	AC	$671	$4,000	2.07
Health and Safety Measures or Other Funding Sources					
9	Smoke Detector is Needed	Itemized Cost	$0	$10	0.00
Total			$983	$5,109	2.54

Materials

Index	Material	Quantity	Units
1	Low Flow Showerheads	1	Each
2	Water Heater Pipe Insulation	1	Each
3	LED Lamp 10.0 watts	3	Each Bulb
4	Water Heater Tank Insulation Wrap	1	Each
5	General Air Sealing	1	Each
6	Roof Fiberglass Loose Insulation	16	Bag
7	Replace HVAC System	1	Each

Figure 3.19. MHEA Recommended Measures Report: recommended measures.

If you entered utility bills on the Utility Bills form, the report would also provide a revised set of tables for the recommended measures based on adjusted estimates of energy and cost savings and SIRs, and a comparison of MHEA's estimates of the home's heating and/or cooling energy consumptions with the utility bills. MHEA's estimates are based on TMY3 weather data, whereas the utility bills reflect energy consumption for the actual weather that occurred during the billing period. If you also entered degree days associated with the utility bills, they will be compared with the TMY3 weather data used to make the home's energy estimates so that you can determine the degree to which differences between predicted energy consumptions and utility bills might be due to weather differences.

The report also provides other information such as the annual energy consumptions for heating, cooling, and baseloads and peak heating load of the home before and after weatherization (Figure 3.20).

House Energy Consumptions						
	Before Weatherization			After Weatherization		
	Heating (MMBtu)	Cooling (kWh)	Baseload (kWh)	Heating (MMBtu)	Cooling (kWh)	Baseload (kWh)
Annual Energy	13.2	6,734.4	0.0	5.6	3,752.8	-2.8

Peak Heating Load		
Component Type	Before Weatherization Load (Btu/h)	After Weatherization Load (Btu/h)
Wall	3,280.8	3,280.8
Floor	3,051.1	3,051.1
Roof	2,624.2	1,090.3
Windows	2,900.0	2,900.0
Doors	410.1	311.1
Infiltration	3,134.0	2,162.6
Duct Loss	0.0	0.0
Total	15,400.1	12,795.8

Figure 3.20. MHEA Recommended Measures Report: energy consumptions and peak heating load components before and after weatherization.

Reports – The Reports drop-down field on the Audit Dock can be used to select two reports associated with the MHEA audit (attached below). The Audit Input report provides a printout of all the input made in MHEA. The Audit Recommendations report provides the MHEA Recommended Measures Report for the most recent run of the audit (equivalent to the View link).

3.3 CREATING AN MHEA WORK ORDER

The process for creating an MHEA work order is the same as for NEAT. Please refer to Section 2.3, CREATING A NEAT WORK ORDER, for details.

If you have any questions regarding the auditing software please feel free to contact KHC technical staff for further guidance.

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