

## **Attachment B2: MHEA**

### **New Mexico Audit Procedures and Field Protocol Mobile Home**

The purpose of weatherizing single family units is to increase the energy efficiency of the individual units, reduce the occupants' expenditures, and improve their health and safety. All procedures and protocol has a goal of supporting this purpose while establishing a solid and accurate engineering model of energy saving assumptions.

For PY 2018/2019 when a unit is ready for weatherization, the procedures start with review of the specific client file information, pre-visit planning, and desk monitoring. The data at this point consists of information that is largely provided by the client and is later verified by the energy auditor.

The majority of assessment procedures that are in place for site built homes are also applied to mobile homes. For software selection, there are some instances where a mobile home as a number of additions and/or modifications that causes it to behave from the energy transfer standpoint like a site built home. In these cases, the assessor will have the discretion to use NEAT in place of MEAH. When this is the case, the reasons must be clearly documented in the client file with ample photos to support the use of NEAT in place of MHEA.

1. **Pre-Visit Planning and Desk Monitoring** - The energy audit prepares for a visit with the following information:
  - Location of the home
  - Age of the home
  - Type of home (site built or mobile home)
  - Primary fuel used for heating and secondary fuel if available
  - Average annual energy costs
  - Previous weatherization date if applicable
  - Names and ages of occupants
  - Noteworthy issues that may have been communicated from client to intake
  - Directions to the home
  - Utility bills and monthly usage if available

The energy auditor then prepares with the proper field intake sheets specific to the home, views internet maps, and compares client statements with known historical information.

The information gathered during this process is used to help determine if the standard field procedures are appropriate for the particular project. The site visits will either confirm these assumptions or reveal the need to change plans for that particular unit. Energy auditors use Data Collection Forms as *Attachment C* that are arranged in a particular order and designed to collect pertinent information efficiently. These forms include:

- General project information
- Structure design and layout

- Site climatic information
- All necessary envelope, baseload, and diagnostic testing MHEA input data
- Advanced diagnostic and zonal tests
- Other data collection or tests needed to solve unusual problems
- Health and safety considerations and tests
- SWS requirements
- Client education
- Lead based paint documents

The energy auditors then start the process of assessment:

- a. Eligibility is confirmed or denied.
- b. Client communication is initiated.
  - i. Client agrees to be present for assessment.
  - ii. Directions to home are obtained if necessary.
  - iii. Client advised to the energy audit procedures, client education begins.
    1. Client notified about not having solid fuel burning for visit.
  - iv. Unusual circumstances are noted.
  - v. Existing health and safety conditions and concerns are discussed.
- c. Internet maps viewed when needed.
- d. General location of unit is scheduled along with other units in the same area.
- e. Names of other contacts are verified in the event the client is not home.
- f. Additional assessors scheduled as team when needed.
- g. Proper tools are assembled for the particular home.
- h. Lead based paint test kits are gathered if necessary.

## 2. **Arrival and Initial Client Meeting**

- a. The vehicle is parked at the site in a non-threatening position and also in a manner the driver can easily vacate the premises quickly.
- b. As soon as the assessor arrives at the site, the observations begin. Street view obvious problems are noted such as bent flues, broken doors, windows, etc.
- c. If dogs are present, it is noted on the hazard assessment form and the client is advised to contain the dogs prior to anyone exiting the vehicle.
- d. The assessor(s) enter the home with the client's permission and their personal CO detector running. If ambient levels are 9ppm or more, the source will be found and corrected.
- e. The client is engaged in detailed education based on conditions already known of the home and also standard client education involving different topics. Client is asked to fill out necessary paperwork verifying client education.
- f. Refrigerator meter is placed in operation and explained to the client.
- g. Camera is prepared for photos and videos, client consent is obtained.

3. **Exterior Inspection** - The exterior of the building is inspected for SWS requirements, MHEA entry, BPI standards, and Health and Safety.

- a. The assessor performs a general walk around for exterior inspection where all visible health and safety issues or unusual circumstances are noted, such as moisture problems.
- b. Gas meter and outside gas line testing is completed per NM Technical Standards.
- c. Exterior building measurements and perimeter are recorded.
- d. Exterior type(s) such as sheathing are documented and outside penetrations identified; if different walls have different exterior types, the exact location of the wall is described on the sketch map sheet.
- e. Each wall square footage is derived from accurate measurements as well as long wall orientation for MHEA entry.
- f. If accurate framing, cavity depth, and existing insulation can be determined from the outside, it is noted.
- g. Structural integrity of walls is examined along with insulation possibilities.
- h. Vapor retarder location is determined appropriately.
- i. Door information is gathered including area, type, performance, condition of existing weather stripping, hardware condition, needed repairs, structural integrity, and replacement needs. Lead tests are performed where applicable.
- j. Window information is obtained for MHEA entry including type, frame, glazing, orientation, interior and exterior shading, condition, repairs, integrity, and replacement possibilities. Lead tests are performed where applicable. If replacement is suspected (mostly with electric or propane), measurements of windows will be accurate to avoid unnecessary overhead costs.

Ladder is safely set up for attic (if accessible) and roof inspection

- k. Mobile home attics may need to be inspected from drill a hole procedure from inside the building and the below procedures (l, m, n) will not apply.
- l. After confined space procedures are followed, attic is inspected
- m. Attic area is calculated or measured if different from floor footprint.
- n. Insulation levels and condition in attic are measured and photographed. The assessor(s) wear protective suits and masks to perform the entire inspection correctly.
  - i. Electrical wire is tested for live current.
  - ii. Open or unsafe wires are noted on the scope of work for repair by electrician.
  - iii. Location of items such as flues is noted for damning.
  - iv. Ventilation requirements are calculated along with the need for baffles
  - v. Thermal bypass and visible attic to house open locations are photographed. Pressure plane and boundary are examined, later verified with zonal testing.
  - vi. Existing insulation is downgraded per BPI standards.
  - vii. Necessary repairs based on many factors including structural integrity are photographed and noted for work order with estimated cost.
  - viii. Appropriate location and cost of possible vapor retarder is assessed.

Roof inspection

- o. Flue conditions are documented and photographed.
- p. General roof condition is recorded.

- q. Pitch (bowstring, flat, pitched), types of materials used, joist size, coloring, and penetrations are identified.
- r. Exposure and orientation if applicable is noted.
- s. Cathedral ceiling percentage is determined
- t. Drainage, flashing, and any parapet walls are examined if present.

#### Crawl/Foundation inspection

- u. Signs of moisture are inspected.
- v. Electrical incidental repair needs.
- w. Foundation type exposure.
- x. Plumbing to be insulated and number of penetrations for infiltration are recorded.
- y. Rim joist insulation is documented.
- z. Perimeter to be insulated is recorded and photographed.
- aa. Existing insulation type and amount.
- bb. Location for MHEA entry for wing and belly (below joist, in between joist etc).
- cc. Need for vapor barrier is noted if warranted.
- dd. Cross over duct if present is examined for proper connection and other ducts if accessible.
- ee. Floor joist direction (widthwise or lengthwise) is noted.
- ff. Floor joist size is noted for both wing and belly center.
- gg. Cavity configuration is determined (square, rounded, flat).
- hh. Dense packing of wings and insulation of belly possibilities are assessed.
- ii. Maximum depth of belly from bottom of floor is carefully determined.
- jj. Allowable room to insulate is determined along with notations about mobile home such as axles, wheels, and debris under home being noted.

#### Remainder of exterior inspection

- kk. Envelope and SWS checklist portions of Data Collection Forms are filled out.
- ll. Water heater if located in an exterior closet is examined.
  - i. Water heater door condition is assessed.
  - ii. Water heater is inspected for problems including weak flooring, leaning, improper install, improper type (site built) flue conditions, leaks, etc.
  - iii. Diagnostic testing is performed.
  - iv. Data from nameplate is gathered along with insulation type and thickness.
- mm. Client education is constant if the client accompanies assessor or notes are taken for a later consultation.
- nn. Prior to audit being run, scope of work is estimated so material list can be generated. This reduces the need to go back a second time.
- oo. The assessor looks for additional problems related to weatherization needing to be solved that are not previously covered.

#### 4. **Interior Inspection**

- a. Data Collection Sheet for interior is filled out.
- b. Personal CO detector is constantly running describing proper levels of action to client.
- c. Existing CO and smoke detectors are examined and assessed for replacement.
- d. Location and power needs of existing CO and smoke detectors are documented.
- e. Client continues to be engaged in client education including clearing of areas that will receive work.
- f. All appliances burning combustion fuel are identified and necessary information is obtained from the nameplate.
- g. Photographs are taken of necessary items(with occupant permission).
- h. Lighting information is gathered including quantity, number of hours per day used, type and wattage of existing lights, and location.
- i. Water flow rates are measured for MHEA entry, number of occupants and shower time is confirmed and talked with client about water saving opportunities.
- j. Interior condition of windows are documented, with tightness guess.
- k. Door condition and tightness are documented.
- l. Infra-Red camera is used on each of the outside walls to look for insulation voids.
- m. Wall insulation level is verified with drill and patch method where possible.
- n. Any anomalies or inconsistencies are noted.
- o. Unusually high electrical usage on the client's electric bill is considered with appliances that may contribute to the high use.
- p. Health and Safety concerns are continuously monitored, and client education delivered.
- q. Existing ventilation fan information is documented, flow measured, area and volume are assessed for replacement to comply with ASHRAE 62.2 2016.
- r. The assessors search for mold growth which includes client dialogue; the mold sheet is completed, photos are taken and the presence or absence of mold is documented.
- s. Clothes dryer vent is inspected; dryer running for worse case is noted.
- t. The assessors set up for all diagnostic testing.
- u. Estimated scope of work and material list continues to develop.
- v. The assessors look for additional problems related to weatherization needing to be solved that are not previously covered.
- w. Duct plenum, boot, and branch condition and location is documented.

#### 5. **Diagnostic Tests Appliances**

The goals of the tests are to determine the efficiency, safety, and general operating condition of the systems. The assessors are trained to recognize when additional tests beyond the minimum are needed to support these goals and will perform the testing as necessary.

- a. Testing procedures outlined in the NM Energy Smart Technical Standards are followed for the gas leaks, kitchen range, water heating, and heating systems.
- b. Data Collection Forms are completed.
- c. The need for additional testing is determined.
- d. Client education is continued with clients.
  - i. Results of testing are delivered with explanations where needed.
- e. Appliance size/capacity in relation to usage is documented.

- f. Appliance room/closet is assessed for combustion air, safety, how it can be separated from the unit if individual (CAZ).
- g. Possible tune-up needs are assessed.
- h. Possible replacements are assessed.
  - i. Coding issues are identified.
  - ii. Space requirements are documented.
  - iii. SWS requirements are included.
- i. SWS compliance is assessed.
- j. Material list and scope of work is continued.
- k. Videos and photos are recorded at each stage where documentation is needed.
- l. The client is interviewed about all the water leaks the home may have had and when. The team uses their senses to determine more about any damage caused by water.
- m. The team looks for additional problems related to weatherization needing to be solved that are not previously covered. They determine if additional testing is needed.
- n. The current Health and Safety Plan is followed.

**6. Diagnostic Testing Blower Door, Ducts, Zonal Tests, Connectivity**

- a. At this point a very close assumption has been made as to whether or not the living space is connected to other spaces, a general guess on what the blower door reading will be, and what the duct pressure pan readings will be.
- b. The diagnostic testing is conducted in accordance to NM Energy Smart Standards.
- c. During the testing, the scope of work and material lists are updated with the new air leakage information.
- d. Infra-Red is used with blower door running when inside-outside delta T allows
- e. The house is thoroughly inspected with the blower door running.
- f. Client “hints” of where problems may be are investigated.
- g. High and low leaks are carefully noted with comments on how to correct them
- h. Zonal tests to attic, belly, addition, soffits, water heater closet, or other areas are conducted.
- i. Addition if present is specifically explored for leaks where the addition connects with the home. Notes are made of the discoveries.
- j. If the mobile home is a double wide the marriage is carefully examined for air sealing opportunities.
- k. Duct testing using pressure pan or subtraction is measured and recorded.
- l. For double wide mobile homes, particular attention is paid to both halves with the ducts and whether one side is significantly stronger than the other. Crossover duct will have already been examined during the assessment process and notes can be compared with the blower door readings.
- m. Photos and videos are taken.
- n. Client education is communicated.
- o. The need for additional testing is determined and the assessors ensure there are not additional problems related to these tests that need to be solved. They determine if additional testing is needed.

## **7. Site Visit Final Walk Through**

- a. Prior to leaving site, all field notes are viewed.
- b. Data Collection Sheets are reviewed for completion.
- c. Additional samples, tests, or photos may be needed to deliver a completed package and completed at this point.
- d. Refrigerator meter is viewed for kW usage, recorded, and removed. The refrigerator is verified to be plugged in again and working.
- e. Final property walk through is done to look for anything that was missed
- f. Summary of client education is delivered to appropriate parties including:
  - i. The next steps and what to expect,
  - ii. Health and safety concerns with action plan.
- g. The team verifies there are not additional problems related to weatherization that were missed.
- h. Appliances that have been turned to pilot during testing are put back into operation.
- i. Anything moved during assessment such as attic entries, crawl entries, AC covers etc. are put back into place exactly as they were before the crew arrived unless it is a health and safety correction.

## **8. MHEA Modeling Entry**

- a. When timing allows, data entry into the software happens as close to the collection time as possible. Entry at the site with a laptop is preferable but not always practical.
- b. Libraries are updated regularly or when needed.
- c. Client information is verified.
- d. Utility data is viewed but not required for entry.
- e. Field notes are questioned and compared with photos and diagrams.
- f. Audit information is entered or verified against field notes with weather file being the closest in heating degree days and location to the actual site.
- g. Wall stud size, ventilation, orientation of long wall, and insulation of each wall is verified against field notes and photos. If there are differences in walls, then that will be properly entered into MHEA. Scope of work will reflect that.
- h. Window type, frame, glazing, condition, interior and exterior shading, leakiness, size, and quantity are verified and entered into MHEA with appropriate replacement/weatherization options.
- i. Door type, area, orientation, storm door presence, door leakiness, size, and replacement options are verified against notes and photos before MHEA entry.
- j. Attic type, joist spacing, area, roof color, effective insulation levels are entered after note and photo verification. Added insulation costs are evaluated.
- k. Floor joist direction, skirting presence, joist size, insulation levels, location, type, maximum depth of belly, condition of belly, configuration of belly, and any notable comments are verified and entered.
- l. Addition shell information is verified and entered.
- m. Heating information for primary and secondary units are verified against diagnostic testing and data plate notes. Entries are made with for type, fuel, location, kBtuh input,

output, efficiency, percent of heat supplied, duct location, duct insulation location, and replacement options.

- n. Cooling information is entered after verifying notes and photos including type, cooled floor area, capacity, SEER, and year manufactured. Replacement options are considered as an energy saving item.
- o. Duct and infiltration information is entered with assessors best estimation on what the post blower door and duct numbers will be after all of the air sealing items on the scope of work have been addressed in their entirety. Cost of air sealing is entered for both labor and materials.
- p. Water heating information is entered and verified against notes and photos including that of the outdoor closet. This includes location, fuel, manufacturer, input, size, pipe and tank insulation and R Value, showerhead flow rate, and usage minutes. Replacement is run as energy saving measure prior to health and safety consideration.
- q. Refrigerator metered information is entered with replacement options and appropriate library cost considered. Measurements of refrigerator are checked against notes.
- r. All lighting information is checked against field notes and entered.
- s. Itemized costs are incidental repairs or health and safety and added from the scope of work notes. This includes items that are not energy saving such as CO detectors, mechanical ventilation, glass replacement, venting correction, or other essential items as a result of weatherization taking place in the home.
- t. "Run Audit" is initiated.
- u. Recommended measure report is compared with scope of work. Obvious mistakes or items that do not look right are examined and re-entered. The estimated scope of work is adjusted to match the audit recommendations.
- v. Input report is compared to field notes.
- w. SIRs and loads are examined.
- x. Communication with client is provided.
- y. Input reports, recommended measures, photos, field notes, and explanations are kept in the client file.
- z. MHEA Scope of Work is built and generated with accurate costs for all items and crossed checked with field notes, recommended measures, client notes, and health and safety concerns for completion.