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Energy Ageney Department of Energy, Planning, and Development

Adopted Rules Governing the Home Energy Disclosure Program

Rules as Adopted

6 MCAR S 2.2501 Authority and purpose.

A. Authority. The agency's authority to adopt these rules is contained in Minnesota Statutes, section 116H.129, as well as 116H.08, clause (a) and 116H.07, clause (i).

B. Purpose. The purpose of these rules is to establish a program requiring an energy audit to be performed upon the sale of residential structures. The three major components of this program are the establishment of: minimum energy efficiency standards for the evaluation of existing residences, mandatory minimum energy efficiency standards for rental buildings and procedures for the energy evaluation disclosure program and the certification of evaluators.

NOV 12, 1982

6 MCAR S 2.2502 Definitions.

A. Scope. For the purposes of 6 MCAR SS 2.2501-2.2510, the following terms have the meanings given them.

~~A.~~ B. Accessible. "Accessible" means:

1. For purposes of inspection, any area of the residence which can be evaluated with only the removal of temporary components of the structure. Temporary components include, but are not limited to, electrical plate covers, attic hatch covers, and obstructions in closets which provide access to the area of the residence to be evaluated.

2. For purposes of compliance with 6 MCAR S 2.2503, any area that can be made more energy efficient with the installation of program measures that are not determined to be economically infeasible and which area is exposed, without the removal of permanent parts of the structure.

~~B.~~ C. Agency. "Agency" means the ~~Minnesota Energy Agency~~ Energy Division of the Department of Energy, Planning, and Development.

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~~C.~~ D. Apartment building. "Apartment building" means any structure containing two or more residential dwelling units which are rented.

~~D.~~ E. Community based organization. "Community based organization" means an organization which has a demonstrated community involvement such that the organization has a history of energy or related community service in a specific service area.

~~E.~~ F. Conditioned space. "Conditioned space" means space within a building that is heated or cooled by an energy using system.

~~F.~~ G. Cooling degree day. "Cooling degree day" means a unit, based upon temperature difference and time, used in estimating fuel consumption and specifying nominal cooling load in summer. For any one day when the mean temperature is more than 65 degrees Fahrenheit, there exist as many cooling degree days as there are Fahrenheit degrees difference in temperature between the mean temperature for the day and 65 degrees Fahrenheit.

~~G.~~ H. Economic feasibility. For the purpose of these rules, the test of economic feasibility is met when the savings in energy procurement costs, based on residential energy costs as certified by the commissioner ~~or the director~~ in the State Register, or on local fuel costs, exceed the cost of acquiring and installing each individual program measure, as amortized over the subsequent ten-year period.

~~H.~~ I. Energy conservation measure. "Energy conservation measure" means any of the following measures in a residential building:

1. caulking consisting of pliable materials used to reduce the passage of air and moisture by filling small gaps located at fixed joints on a building, underneath baseboards inside a building, in exterior walls at electric outlets, around pipes and wires entering a building, and around dryer vents and exhaust fans in exterior walls. Caulking includes, but is not limited to, materials commonly known as "sealants," "putty," and

"glazing compounds."

2. weatherstripping consisting of narrow strips of material placed over or in movable joints of windows and doors to reduce the passage of air and moisture when the windows and doors are closed.

3. furnace efficiency modifications consisting of:

a. a furnace or boiler, including a heat pump, which replaces an existing furnace or boiler of the same fuel type and which reduces the amount of fuel consumed due to an increase in combustion efficiency, improved heat generation, or reduced heat losses.

b. a furnace replacement burner (oil) which atomizes the fuel oil, mixes it with air, and ignites the fuel-air mixture, and is an integral part of an oil-fired furnace or boiler including the combustion chamber, and uses less oil than the device it replaces.

c. an automatically operated damper installed in a gas-fired furnace (often called a vent damper) which is installed downstream from the drafthood and conserves energy by substantially reducing the flow of heated air through the chimney when the furnace is not in operation.

d. an electrical or mechanical ignition device which, when installed in a gas-fired furnace or boiler, automatically ignites the gas burner and replaces a gas pilot light.

4. a central air conditioner which replaces an existing central air conditioner of the same fuel type and which reduces the amount of fuel consumed due to an increase in efficiency.

5. ceiling insulation consisting of a material primarily designed to resist heat flow which is installed between the conditioned area of a building and an unconditioned attic. Where the conditioned area of a building extends to the roof, the term "ceiling insulation" also applies to such material used between the underside and upperside of the roof.

6. wall and foundation insulation consisting of a material primarily designed to resist heat flow which is installed within or on the walls between conditioned areas of a

building and unconditioned areas of a building or the outside.

7. floor insulation consisting of a material primarily designed to resist heat flow which is installed between the first level conditioned area of a building and an unconditioned basement, a crawl space, or the ground beneath it. Where the first level conditioned area of a building is on a ground level concrete slab, the term "floor insulation" also means such material installed around the perimeter of or on the slab. In the case of mobile homes, the term "floor insulation" also means skirting to enclose the space between the building and the ground.

8. duct insulation consisting of a material primarily designed to resist heat flow which is installed on a heating or cooling duct in an unconditioned area of a building.

9. pipe insulation consisting of a material primarily designed to resist heat flow which is installed on a heating, cooling or hot water pipe in an unconditioned area of a building.

10. water heater insulation consisting of a material primarily designed to resist heat flow which is suitable for wrapping around the exterior surface of the water heater casing.

11. storm or thermal window consisting of:

a. a window or glazing material placed outside or inside an ordinary or prime window, creating an insulating air space, to provide greater resistance to heat flow than the prime window alone; or

b. a window unit with improved thermal performance through the use of two or more sheets of glazing material affixed to a window frame to create one or more insulated air spaces. It may also have an insulating frame and sash.

12. storm or thermal door consisting of:

a. a second door, installed outside or inside a prime door, creating an insulating air space;

b. a door with enhanced resistance to heat flow through the glass area created by affixing two or more sheets of glazing materials; or

c. a primary exterior door with an R-value of at least

two.

13. heat reflective and heat absorbing window or door material consisting of a window or door glazing material with exceptional heat-absorbing or heat-reflecting properties or of reflective or absorptive films and coatings applied to an existing window or door which thereby result in exceptional heat-absorbing or heat-reflecting properties.

14. devices associated with electric load management techniques consisting of customer-owned or leased devices that control the maximum kilowatt demand of the residence on an electric utility and which are any of the following:

a. part of a radio, ripple or other utility controlled load switching system located on the customer's premises;

b. clock-controlled load switching devices;

c. interlocks and other load-actuated, load-limiting devices; or

d. energy storage devices with control systems.

15. clock thermostat consisting of a device which is designed to reduce energy consumption by regulating the demand on the heating or cooling system in which it is installed and which uses:

a. a temperature control device for interior spaces incorporating more than one temperature control level, and

b. a clock or other automatic mechanism for switching from one control level to another.

16. rim joist insulation consisting of a material primarily designed to resist heat flow which is installed along either side of the rim joist.

~~I.~~ J. Energy conserving practice. "Energy conserving practice" means any of the following measures in a residential building:

1. furnace efficiency maintenance and adjustments consisting of cleaning and combustion efficiency adjustment of gas or oil furnaces, periodic cleaning or replacement of air filters on forced-air heating or cooling systems, lowering the bonnet or plenum thermostats to 80 degrees Fahrenheit on a gas

or oil forced-air furnace, and turning off the pilot light on a gas furnace during the summer.

2. nighttime temperature setback by manually lowering the thermostat control setting for the furnace during the heating season to a maximum of 55 degrees Fahrenheit during sleeping hours.

3. reducing thermostat settings in winter by limiting the maximum thermostat control setting for the furnace to 68 degrees Fahrenheit during the heating season.

4. raising thermostat setting in summer by setting the thermostat control for an air conditioner to 78 degrees Fahrenheit or higher during the cooling season.

5. water flow reduction in showers and faucets accomplished by placing a device in a shower head or faucet to limit the maximum flow to three gallons per minute, or replacing existing shower heads or faucets with those having built-in provisions for limiting the maximum flow to three gallons per minute.

6. reducing hot water temperature by manually setting back the water heater thermostat setting to 120 degrees Fahrenheit; and reducing the use of heated water for clothes washing.

7. reducing energy use when a home is unoccupied by reducing the thermostat setting to 55 degrees Fahrenheit when a home is empty for four hours or longer in the heating season, turning an air conditioner off in the cooling season when no one is home, and lowering the thermostat setting of the water heater when a home is vacant for two days or longer.

8. plugging leaks in attics, basements, and fireplaces by installing scrap insulation or other pliable materials in gaps around pipes, ducts, fans, or other items which enter the attic or basement from a heated space; installing fireproof material to plug any holes around any damper in a fireplace; and adding insulation to an attic or basement door.

9. sealing leaks in pipes and ducts by installing caulking in any leak in a heating or cooling duct, tightening or

plugging any leaking joints in hot water or steam pipes, and replacement of washers in leaking water valves.

10. efficient use of shading by using shades or drapes to block sunlight from entering a building in the cooling season, to allow sunlight to enter during the heating season, and to cover windows tightly at night during the heating season.

~~J.~~ K. Fireplace stove. "Fireplace stove" means a chimney-connected, solid fuel-burning stove having part of its fire chamber open to the room.

~~K.~~ L. Heating degree day. "Heating degree day" means a unit, based upon temperature difference and time, used in estimating fuel consumption and specifying nominal heating load of a building in winter. For any one day, when the mean temperature is less than 65 degrees Fahrenheit, there exist as many heating degree days as there are Fahrenheit degrees difference in temperature between the mean temperature for the day and 65 degrees Fahrenheit.

M. HED. "HED" means home energy disclosure. FOR F 36.

~~L.~~ N. Positive shut-off. "Positive shut-off" means a manual shut-off device which can be utilized to produce a seal to inhibit the flow of air when a fireplace or fireplace stove is not operating. Examples are damper in fireplace, damper at top of flue, damper in connector pipe, or doors (glass or other) on fireplace or fireplace stove.

~~M.~~ O. Program measures. "Program measures" means all energy conservation measures and renewable resource measures included in the minimum energy efficiency standards for existing residences.

~~N.~~ P. "R" value. "R" value means the measure of resistance to heat flow through a material or the reciprocal of the heat flow through a material expressed in British thermal units per hour per square foot per degree Fahrenheit at 75 degrees Fahrenheit mean temperature.

~~O.~~ Q. Renewable resource measures. "Renewable resource measures" means the following measures installed in or connected to a residential building:

1. solar domestic hot water systems (DHW) designed to absorb the sun's energy and to use this energy to heat water for use in a residential building other than for space heating, including thermosiphon hot water heaters.

2. passive solar space heating and cooling systems that make efficient use of, or enhance the use of, natural forces - including solar insolation, winds, nighttime coolness and opportunity to lose heat by radiation to the night sky - to heat or cool living space by the use of conductive, convective or radiant energy transfer. Passive solar systems include only:

a. direct gain glazing systems consisting of south-facing panels of insulated glass, fiberglass, or other similar transparent substances that admit the sun's rays into the living space where the heat is retained. Glazing is either double-paned, or single-paned equipped with movable insulation.

b. indirect gain systems consisting of panels of insulated glass, fiberglass, or other transparent substances that direct the sun's rays into south-facing specifically constructed thermal walls, ceilings, rockbeds, or containers of water or other fluids where heat is stored and radiated.

c. solaria/sunspace systems consisting of structures of glass, fiberglass or similar transparent material which is attached to the south-facing wall of a structure which allows for air circulation to bring heat into the residence and which is able to be closed off from the residential structure during periods of low solar ~~insulation~~ insolation.

d. window heat gain or loss retardants consisting of mechanisms which significantly reduce summer heat gain or wintertime heat loss through windows by the use of devices such as awnings; insulated rollup shades, external or internal; metal or plastic solar screens; or movable rigid insulation.

3. wind energy devices that use wind energy to produce energy in any form primarily for use in the residence.

4. replacement solar swimming pool heaters which are used solely for the purposes of using the sun's energy to heat swimming pool water and which replace a swimming pool heater

using electricity, gas or another fossil fuel.

5. active solar space heating equipment designed to absorb the sun's energy and to use this energy to heat living space by use of mechanically forced energy transfer such as fans or pumps.

~~P.~~ R. Residence. "Residence" means any dwelling used for habitation during all or a portion of the months of December through March, or permanently by one or more persons. For rental buildings, "residence" means any dwelling used for habitation during all or a portion of the months November through April. A residence may be owned or rented and may be part of a multi-unit building, multi-family dwelling, or multi-purpose building, but "residence" shall not include buildings such as hotels, hospitals, motels, dormitories, sanitariums, nursing homes, schools and other buildings used for educational purposes, or correctional institutions. Each dwelling unit in a rental building shall be considered as a residence. A mobile home as defined in Minnesota Statutes, section 168.011, subdivision 8, shall be a residence for purposes of these rules.

~~Q.~~ S. Rim joist. "Rim joist" means that part of the residential structure between the top of the foundation wall and the sub-floor immediately above the perimeter of the floor joists.

~~R.~~ T. Seasonal efficiency. "Seasonal efficiency" means the calculated efficiency of a heating system based on the estimated peak (tuned up) steady state-efficiency corrected for cycling losses.

~~S.~~ U. South-facing. "South-facing" means plus or minus 45 degrees of true south.

6 MCAR S 2.2503 Minimum energy efficiency standards.

A. Compliance. The minimum energy efficiency standards listed in B. shall be applied to residences according to Exhibit 6 MCAR S 2.2503 A.-1. Pursuant to Minnesota Statutes, section 116H.129, subdivisions 5 and 7, the standards listed under "Disclosure at time of sale" shall only be used to evaluate the

energy efficiency of existing residences built prior to January 1, 1976, at the time of sale. Time of sale means the time when a written purchase agreement is executed by the buyer, or, in the absence of a purchase agreement, the time of execution of any document providing for the conveyance of a residence. Pursuant to Minnesota Statutes, section 116H.129, subdivisions 2 and 3, all residences constructed prior to January 1, 1976, which are renter occupied during all or a portion of the months of November through April shall have been in compliance with standards adopted pursuant to Minnesota Statutes, section 116H.129, subdivision 1 pertaining to caulking and weatherstripping by January 1, 1980, unless those standards are determined to be economically infeasible. Effective July 1, 1983, all residences constructed prior to January 1, 1976, which are renter occupied during all or a portion of the months of November through April shall be in compliance with all standards listed under mandatory compliance and not determined to be economically infeasible. All building owners shall initially determine the economic feasibility of these standards using the calculation procedures adopted by the agency. Those determinations are subject to review and final determination by the agency.

Exhibit 6 MCAR S 2.2503 A.-1.
Applicable Energy Efficiency Standards
from 6 MCAR S 2.2503 B.

Type of residence	Purpose: Disclosure at time of sale	Purpose: Mandatory compliance
Owner occupied		
Single family	Standards 1-4, 9-27	None
Mobile home	Standards 1-4, 9-27	None
Condominium building, 2-4 dwelling units	Standards 1-4, 9-27	None
Condominium building, 5 or more dwelling units	Standards 1-8	None
Renter occupied		
Single family	Standards 1-27	Standards 1-8
Mobile home	Standards	Standards

	1-27	1-8
Apartment building, 2-4 dwelling units	Standards 1-27	Standards 1-8
Apartment building, 5 or more dwelling units	Standards 1-8	Standards 1-8

B. Enumeration. The following shall be the minimum energy efficiency standards for existing residences constructed prior to January 1, 1976. These standards shall be used as indicated in Exhibit 6 MCAR S 2.2503 A.-1.

1. install weatherstripping between exterior operable window sash and frames and between exterior doors and frames. Weatherstripping is not required on storm doors or storm windows.

2. caulk, gasket or otherwise seal accessible exterior joints between foundation and rim joist; around window and door frames; between wall and roof; between wall panels; at penetrations for utility services through walls, floors, and roofs and all other openings in the exterior envelope.

3. install storm windows on all single glazed exterior window units enclosing conditioned space.

4. install storm doors on all exterior door openings into conditioned spaces unless a single door, enclosed porch, vestibule, or other appurtenance provides a double door effect or provides an "R" value of 2 or more.

5. install positive shut-offs for all fireplaces or fireplace stoves, unless an existing damper provides a positive shut-off.

6. install insulation in accessible attics to achieve a minimum total "R" value of the insulation of R-19. If there is insufficient space for the installation of the recommended "R" value, then the recommendation by the evaluator shall be based on installing insulation to fill the available space, providing for appropriate ventilation.

7. install insulation in all accessible rim joist areas to achieve minimum total "R" value of the insulation of R-11. If there is insufficient space for the installation of the recommended "R" value, then the recommendation by the evaluator shall be based on installing insulation to fill the available

space.

8. install insulation in accessible walls and floors enclosing conditioned spaces to achieve a minimum total "R" value of the insulation of R-11, when there is no insulation in a substantial portion of the exterior walls or floors over an unconditioned space. Accessible walls shall include above grade foundation walls of basements, cellars, or crawl spaces. If there is insufficient space for the installation of the recommended "R" value, then the recommendation by the evaluator shall be based on installing insulation to fill the available space.

9. install insulation in accessible floors over unconditioned spaces and in rim joists to achieve a minimum total "R" value of the insulation of R-19. For slab on grade construction, insulation shall be installed to achieve a minimum total "R" value of the insulation of R-11. If there is insufficient space for the installation of the recommended "R" value, then the recommendation by the evaluator shall be based on installing insulation to fill the available space.

10. install ceiling insulation to achieve a minimum total "R" value of the insulation of R-44 when the existing "R" value of the ceiling insulation, excluding construction materials, is R-30 or less. If there is insufficient space for the installation of the recommended "R" value, then the recommendation by the evaluator shall be based on installing insulation to fill the available space, providing for appropriate ventilation.

11. install wall and foundation insulation to achieve a minimum total "R" value of the insulation of R-11, when there is no insulation in a substantial portion of the exterior walls or foundation walls. If there is insufficient space for the installation of the recommended "R" value, then the recommendation by the evaluator shall be based on installing insulation to fill the available space.

12. install insulation to achieve a minimum total "R" value of the insulation of R-5 on all water heaters when the

remaining useful life of the heater appears to be three years or greater and space is available around the water heater to install insulation.

13. install insulation to achieve a minimum total "R" value of the insulation of R-11 on all accessible heating and cooling ducts in unconditioned spaces.

14. install insulation to achieve a minimum total "R" value of the insulation of R-5 on all accessible heating, cooling or hot water pipes in unconditioned spaces.

15. install a clock thermostat when the residence has a thermostat on the existing furnace or central air conditioner that is compatible with a clock thermostat.

16. install a replacement furnace or boiler with a unit of the same fuel type that has a minimum seasonal efficiency of 80 percent, when the existing unit is five years old or older and has a seasonal efficiency of less than 80 percent.

17. replace the oil burner of an existing furnace or boiler with an oil burner that uses less oil than the device it replaces.

18. install a vent damper on a gas fired boiler or furnace when the furnace combustion air is taken from a conditioned space.

19. install an electrical or mechanical ignition system on a gas fired boiler or furnace, when the furnace or boiler is located in a conditioned space.

20. replace all or part of the existing central air conditioner that is five years old or older that has an energy efficiency rating of less than 8.2 with one of the same fuel type to obtain an energy efficiency rating of 8.2 or greater.

21. install load management devices when the electric utility serving the residence offers a residential rate which reflects any difference in the utility's cost of service between peak and off-peak periods.

22. install heat reflective or heat absorbing window and door material when the affected rooms of the residence are air conditioned and the cooling degree days for the region exceed

700.

23. install a solar domestic hot water system when there is a south-facing site that exists on or near the residence that has a prime solar fraction exceeding 0.6.

24. install a passive solar space heating and cooling system when there is a south-facing site that exists on or near the residence that has a prime solar fraction exceeding 0.7.

25. install an active solar space heating system when there is a south-facing site that exists on or near the residence that has a prime solar fraction exceeding 0.8.

26. install a wind energy system when the region's average annual wind speed is equal to or greater than ten miles per hour and there is sufficient unrestricted access to the wind.

27. install a solar swimming pool heater where a swimming pool is present and it is heated with electricity, gas or another fossil fuel, and the prime solar fraction exceeds 0.8.

6 MCAR S 2.2504 Conducting the evaluation.

A. Disclosure reports. All evaluators shall use a disclosure report approved by the agency. One copy of the entire completed report shall be given to the seller of the property. Evaluators shall submit reports as required by the agency. Copies of completed disclosure reports shall be retained by evaluators for at least five years. The reports shall be available for review by the agency.

B. Recommendations. The evaluator shall determine which of the energy conserving practices should save energy in the residence, and in the written report the evaluator shall make a recommendation regarding each practice.

C. General duties of evaluators. Evaluators shall estimate energy savings and installation costs of each applicable program measure using the calculation procedures in 6 MCAR S 2.2510. An applicable program measure is any program measure which can be installed in the residence to meet the minimum energy efficiency standards in 6 MCAR S 2.2503. Evaluators shall:

1. inspect and take actual measurements of the building shell, and inspect the space heating, space cooling, and water

heating equipment;

2. base economic calculations on local fuel prices, or on those prices provided by the agency, as published in the State Register each August 1 and February 1.

3. base economic calculations for materials and installation of measures on prices provided by the agency. Prices shall be made available to evaluators by:

a. publication in the State Register by the agency of the most recent contractors and suppliers price survey; or

b. direct mailing by the agency of the most recent price survey to certified evaluators.

4. base calculation procedures for active solar domestic hot water and space heating systems on those contained in the HUD Intermediate Minimum Property Standards Supplement, Solar Heating and Domestic Hot Water Systems 4930.2, 1977 Edition; and

5. base any cost and savings estimate for any applicable furnace efficiency modification to a gas or oil furnace or boiler on an evaluation of the seasonal efficiency or the agency published default table, whichever is higher, of the furnace or boiler. Seasonal efficiency shall be calculated on an estimated peak (tuned-up) steady state efficiency corrected for cycling losses as follows:

a. for oil furnaces or boilers, the steady state efficiency shall be derived by a flue gas analysis of the measured flue gas temperature and carbon dioxide content.

b. for gas furnaces or boilers, the steady state efficiency shall be derived from manufacturer's design data. If the manufacturer's design data do not exist, then a flue gas analysis, as described in a. shall be performed.

6. the auditor shall calculate the energy index for the residence using the procedures in 6 MCAR S 2.2510.

D. Solar water and space heating systems. Every evaluator assessing solar domestic hot water and active solar space heating systems shall include:

1. an evaluation containing:

a. the square foot area of the solar collector;

b. the solar collector characteristics, including glazing materials and other solar collector materials;

c. any storage system needed, including the capacity of storage;

d. any freeze protection needed;

e. the estimated percent of the water heating load to be met by solar energy;

f. any physical connections needed with existing heating systems;

g. the annual maintenance costs;

h. any site preparation needed; or

2. fact sheets developed by the agency that provide the information in 1. for a typical residence.

E. Passive solar space heating systems. Every evaluator assessing passive solar space heating systems shall include the following information:

1. an evaluation which includes:

a. a general description and an illustration of the system;

b. the estimated percent of the maximum heating requirements of the residence that could be met by the system;

c. the approximate dimensions of the system;

d. the method employed by the system to store heat, including the heat capacity for heat storage; or

2. fact sheets developed by the agency that provide the information in 1. for a typical residence.

F. Wind energy devices. Every evaluator assessing wind energy devices shall include the following information:

1. an evaluation which includes:

a. installation cost estimates, based on the installation costs of a commercially available device with kilowatt ratings appropriate to the level of electricity consumed in the customer's residence;

b. the evaluator's estimate of the average wind speed at the residence based on data available at the nearest wind measurement station;

c. the specifications of the device under consideration;

d. estimates of energy cost savings, based on average yearly wind speeds and the specification of the selected wind device; or

2. fact sheets developed by the agency that provide the information in 1. for a typical residence.

G. Disclosure. ~~The following~~ A disclosure using the following language or similar language shall be included in any report prepared pursuant to D., E., or F.:

"The energy cost savings estimates you receive are based on systems which may be somewhat different from the ones you purchase. Also, these estimates were not determined using actual conditions but by using simulated measurements. Therefore, the cost savings we have estimated may be different from the savings which actually occur."

6 MCAR S 2.2505 Presentation of evaluation results. Upon completion of the evaluation, the evaluator shall provide the following information in writing to the seller or the seller's agent:

A. an estimate of the total cost for materials and labor of installation by a contractor expressed in a range of dollars, within a range of plus or minus 20 percent, of each applicable program measure addressed in the evaluation.

B. an estimate of the total cost of installation by the owner expressed in a range of dollars, within a range of plus or minus 20 percent, of each applicable program measure addressed in the evaluation; however, the evaluator shall not provide an estimate to an owner of the cost of installation by the owner of replacement central air conditioners, wall insulation, furnace efficiency modifications, devices associated with load management techniques, or wind energy devices.

C. an estimate of the savings in energy costs expressed in a range of dollars, within a range of plus or minus 20 percent, which would occur during the first year from the installation of each applicable program measure addressed by the evaluation.

D. an estimate of the payback period, measured in years, from the energy cost savings of each of the applicable program measures installed individually.

E. ~~the following~~ a disclosure using the following language or similar language: "The procedures used to make these estimates are consistent with the ~~Minnesota Energy Agency~~ Department of Energy, Planning, and Development criteria for residential energy audits. However, the actual installation costs you incur and energy cost savings you realize from installing these measures may be somewhat different from the estimates contained in this audit report. Although the estimates are based on measurements of your house, they are also based on assumptions which may not be appropriate for your household."

F. sample calculations of the effect of the federal and state energy tax incentives on the cost to the owner of installing one applicable energy conservation program measure and one applicable renewable resource program measure.

G. if the evaluation is of rental property, a separate list of those improvements necessary to bring the residence into compliance with Minnesota Statutes, section 116H.129, subdivision 3.

6 MCAR S 2.2506 Prohibitions.

A. Recommendations and endorsements. The evaluator shall not recommend or discuss any supplier, contractor or lender to any owner. The evaluator shall not endorse the use of specific brand names of materials or products, persons, firms, or contractors which may be used to meet any specific standard. The evaluator shall not make any statements relating to the standards which may be interpreted as an endorsement of any specific material or product.

B. Exclusion of measures. The evaluator shall not exclude any applicable program measures in the presentation of the audit to the owner.

C. Costs of certain products. The evaluator shall not include in the written evaluation costs or energy cost savings

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of installing any product which is not defined as a program measure.

D. Required disclosure. The evaluator shall provide the owner with a written statement of any interest which the evaluator or the evaluator's employer has, directly or indirectly, in the sale or installation of any program measure, or in the sale of the residence to be evaluated.

6 MCAR S 2.2507 Qualification procedures for evaluators.

A. Prohibition of discrimination. No person shall be denied the right to become an evaluator on the basis of race, religion, nationality, creed, sex, age or sexual preference.

B. Training.

1. Except as provided in 2. no person shall be eligible for certification pursuant to C. unless he or she has first participated in a training course which has been approved by the agency and which covers the subject matter tested in the evaluator certification examination.

2. The following persons shall be permitted to take an appropriate agency approved orientation session, in lieu of the requirements of 1.

a. any HED evaluator certified before July 1, 1981;

b. any person successfully completing an approved 30 hour training course for the HED program prior to July 1, 1981;

c. registered architects and registered engineers with work experience in energy auditing or the design of institutional, commercial, residential or industrial buildings;

d. any person who has six months' energy auditing experience and who has completed 25 energy audits for a non-profit organization;

e. members of the American Institute of Real Estate Appraisers, the Society of Real Estate Appraisers, the Independent Fee Appraisers or other associations determined by the agency to have applicable training requirements for their members;

f. certified evaluators for Truth in Housing Programs;

g. building officials certified by the Building Codes

Division of the Minnesota Department of Administration.

C. Certification. Only those persons who satisfy all of the following conditions shall be certified:

1. All persons must take and pass a certification examination conducted by the agency. The certification examination shall test for the following qualifications:

a. a general understanding of the three types of heat transfer and the effects of temperature and humidity on heat transfer;

b. a general understanding of residential construction terminology and components;

c. a general knowledge of the operation of the heating and cooling systems used in residential buildings, including the need and provision for combustion air;

d. a general knowledge of the different types of each applicable program measure, of the advantages and disadvantages and applications of each, and of the DOE installation standards;

e. the capability to conduct the HED energy evaluation including: a working knowledge of energy conserving practices, the ability to determine the applicability of each of the program measures, and proficiency in the auditing procedures for each applicable program measure established in 6 MCAR S 2.2504;

f. a working ability to calculate the steady state efficiency of furnaces or boilers;

g. an understanding of the nature of solar energy and its residential applications including: insolation, shading, heat capture and transport, and heat transfer for hot water;

h. an understanding of the nature of wind energy and its residential applications including: wind availability, effects of obstruction, wind capture, power generation, and interfaces with residential and utility power lines; and

i. a working knowledge of building and fire codes related to the installation and safety of wood burning appliances.

2. All persons shall submit a $50 certification fee to the ~~Minnesota Energy Agency~~ Energy Division, Department of

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Energy, Planning, and Development. However, no certification fee shall be charged for certified municipal building officials who are directly employed by a municipality as defined in Minnesota Statutes, section 16.84, subdivision 3, or for employees of private nonprofit community-based organizations, when the evaluations are performed as part of the employee's normal job responsibilities.

~~a.~~ No certification fee shall be charged for those persons upgrading their certification who were certified prior to July 1, 1981.

~~b. The Minnesota Energy Agency may charge a fee for these persons seeking to be recertified.~~

3. All persons shall provide evidence satisfactory to the agency of liability and of errors and omissions insurance. The minimum value of protection in each category shall be $50,000, and the insurance shall be of the "occurrence" variety where coverage is based on the date when the evaluation is made. A "claims made" policy with a reporting endorsement of at least five years is also acceptable. Coverage shall not be required for evaluators who are employed by municipal governments and who perform evaluations as part of their normal job responsibilities. Certified evaluators who have provided a bond to the state as required by the Building Code Division of the Department of Administration shall not be required to obtain the protection required by this paragraph until that bond expires. Bonds shall not be renewed for the purposes of the HED program. In addition, each insurance policy shall:

a. name the state of Minnesota as a coinsured party, and

b. be written by a corporate ~~surety~~ insurer licensed to do business in the state of Minnesota, or licensed in accordance with Minnesota Statutes, sections 60A.195 to 60A.209.

D. Certification examinations. Examinations shall be conducted by the agency and offered at the following times:

1. within two days after the completion of each state-sponsored training course or orientation session, or

2. once a month, until June 1982, with a minimum of two examinations per year afterward.

6 MCAR S 2.2508 Recertification of evaluators.

A. Term of certification. Certification shall be valid for one year.

B. Recertification procedure. Each year, each evaluator shall be recertified. The following procedures shall be completed in order for an evaluator to be recertified.

1. Prior to the date of certificate expiration, the evaluator shall attend a recertification course, as required by the agency. Successful completion of this course shall recertify the evaluator for the next year. Evaluators not completing the recertification course prior to the expiration date of their certification shall be recertified by completing the recertification course and successfully retaking the certification examination.

2. The recertification course requirements for evaluators shall be eliminated for any particular year if the agency determines that no changes were made in the HED Program that year. Certification shall then be automatically renewed.

3. Persons requesting recertification shall pay a $25 fee to the Energy Division of the Department of Energy, Planning, and Development.

~~3.~~ 4. This recertification shall occur annually, for the life of the program.

C. Personnel from other states. Any person who is certified to conduct residential conservation service audits in another state shall not be required to take the training course established in 6 MCAR S 2.2507 B.1., but shall be required to pass the evaluator certification examination.

6 MCAR S 2.2509 Decertification of evaluators.

A. Insurance. Certification shall be automatically revoked upon receipt of written notice by the department of cancellation or expiration of the insurance protection required in 6 MCAR S 2.2507 C.3.

B. Training. Certification shall be revoked for any HED evaluator certified before July 1, 1981, who does not successfully complete the appropriate training course required in 6 MCAR S 2.2507 B., and the certification examination required in 6 MCAR S 2.2507 C.1.

C. Recertification. Certification shall be revoked for any evaluator not meeting the recertification requirements of 6 MCAR S 2.2508.

D. Nonsufficient fund checks. Certification shall be revoked for any evaluator whose check or draft issued for payment of the certification fee is returned for non-sufficient funds.

E. Wrongful acts. Certification shall be revoked when reasonable evidence indicates an undisclosed conflict of interest, a violation of these rules, unethical practices, or negligent performance of duties as an evaluator. In any of these instances, the agency will, if requested, provide a review to determine whether the revocation was proper. Such a review shall consist of the following procedures:

1. The evaluator shall make a written request for a review to the agency.

2. The manager of the conservation division shall determine a time to review the request.

a. The evaluator may present testimony in person or in writing.

b. The evaluator may present witnesses on the evaluator's behalf.

c. Agency staff may present written or oral testimony, as well as witnesses.

3. The manager of the conservation division shall make a judgment based on the information presented in the review hearing. That judgment shall be presented in writing to the evaluator within three working days of the review.

F. Failure to report. Certification shall be revoked if the reports required in 6 MCAR S 2.2504 A. are not submitted to the agency as requested.

6 MCAR S 2.2510 Calculation procedures. The following procedures shall be the basis for calculating energy savings for program measures.

A. Energy conserving measures.

1. General energy savings equations. The following equations shall be used to calculate energy savings for the practices and measures listed below, except for those that are already termed in E.

Equation #1. $$\Delta E = \frac{\Delta H \times D \times 20.4}{N \times V}$$

Where:

ΔE = The quantity of annual energy savings in the appropriate energy units, such as hundreds of cubic feet of natural gas, gallons of fuel oil, or kilowatt hours of electricity.

ΔH = The difference in design heat loss per degree Fahrenheit between the improved condition and the existing condition for infiltration or thermal transmission or both. Equations for calculating H are listed in subsequent subsections.

D = The normalized annual degree days as published by the National Oceanic and Atmospheric Administration and found in the Home Energy Disclosure Technical Manual, published by the Minnesota Energy Agency, November, 1981.

N = The seasonal operating efficiency of the heating system.

V = The heating value of the fuel type, consistent with ΔE and ΔH.

2. Caulking.

Equation #2. $$\Delta H = .018 \times \Delta I \times Vol$$

Where:

ΔI = Change in infiltration rate in air changes per hour.

Vol = Volume of heated space in cubic feet.

3. Weatherstripping. Use Equation #2.

4. Furnace efficiency modifications.

a. Replacement furnaces or boilers.

Equation #3. $$\Delta E = E_h \left(\frac{1 - N_o}{N_1} \right)$$

b. Furnace replacement burner.

Equation #4. $$\Delta E = .14\ E_h$$

c. Flue opening modifications.

Equation #5. $$\Delta E = .08\ E_h$$

d. Install electronic ignition system.

(1) If pilot is turned off during the summer.

Equation #6. $$\Delta E = \frac{3600 F_p}{V}$$

(2) If pilot is left on in the summer.

Equation #7. $$\Delta E = \frac{7300 F_p}{V}$$

Where:

E_h = Total annual energy used for space heating, in units of fuel.

N_o = The seasonal operating efficiency of the existing heating system.

N_1 = The seasonal operating efficiency of the proposed heating system.

F_p = Rate at which pilot uses energy, in Btu per hours. It is typically 800 to 1000 Btu per hour.

V = Heating value of the fuel type in Btu per unit of fuel.

5. Replacement central air conditioner.

Equation #8. $$\Delta E = E_c \left(1 - \frac{PSE}{NSE}\right)$$

Where:

E_c = Annual energy used by existing central air conditioner, in units of fuel.

PSE = Present seasonal efficiency.

NSE = New (proposed) seasonal efficiency.

6. Ceiling insulation.

Equation #9. $$\Delta H = \left(\frac{1}{R_o} - \frac{1}{R_1}\right) A$$

Where:

R_o = Total R-value of existing insulation and existing construction materials in present condition.

R_1 = Total R-value of proposed condition to include total recommended R-value of the insulation and construction materials.

A = Area for which additional insulation is being proposed.

7. Wall insulation. Use Equation #9 for above grade walls.

8. Floor insulation. Use Equation #9.

9. Duct insulation.

Equation #10. $$\Delta E = \frac{\left(\frac{1}{R_o} - \frac{1}{R_1}\right) (T_2 - T_1) \quad A \times HRS}{NV}$$

Where:

R_o = The total R-value of the ducts before improvement.

R_1 = The total R-value of the ducts after improvement to include total recommended R-value of the insulation and construction materials.

T_2 = Average temperature of air inside ducts during an on cycle of the heating system.

T_1 = Average temperature of the unconditioned space the ducts pass through.

A = Duct area for which insulation is proposed.

HRS = Number of hours the heating system operates in a heating season.

N = Seasonal operating efficiency of the heating system.

V = Heating value of fuel in Btu per unit of fuel.

10. Pipe insulation.

Equation #11. $$\Delta E = \frac{(Q_1 - Q_o)\ L \times HRS}{NV}$$

Where:

Q_1 = Heat loss in Btu/hr. ft. before improvement.

Q_o = Heat loss in Btu/hr. ft. after improvement.

L = Length of uninsulated pipes in unconditioned space.

HRS = Number of hours per year the heating system operates in a heating season.

N = Seasonal operating efficiency of the heating system.

V = The heating value of the fuel in Btu per unit of fuel.

11. Water heater insulation.

a. If water heater is in an unconditioned space.

Equation #12. $$\Delta E = \frac{8760A\left(\frac{1}{R_o} - \frac{1}{R_1}\right)(T_w - T_a)}{N_p V}$$

$$\Delta E = \frac{8760A\left(\frac{1}{R_o} - \frac{1}{R_1}\right)(T_w - T_2)}{N V}$$

b. If water heater is in a conditioned space.

Equation #13.

$$\Delta E = \frac{H \times A \times \left(\frac{1}{R_o} - \frac{1}{R_1}\right)(T_w - T_a)}{N_r V}$$

$$\frac{\Delta E}{} = \frac{\frac{H \times A \times}{} \left(\frac{1}{R_o} - \frac{1}{R_1}\right)(T_w - T_a)}{\frac{N_r V}{}}$$

Where:

A = Area of water heater to be insulated.

R_o = Total R-value of the existing insulation and existing construction materials of the water heater before improvement.

R_1 = Total R-value of the water heater after improvement to include total recommended R-value of the insulation and construction materials.

T_w = Hot water temperature.

T_a = Average air temperature of area surrounding water heater.

N_r = Recovery efficiency of water heater.

V = Heating value of fuel type in Btu per unit of fuel.

H = Number of hours per year that the outside temperature is above 65 degrees Fahrenheit.

12. Storm and thermal windows.

Equation #14.

$$\Delta H = \left(\frac{1}{R_o} - \frac{1}{R_1}\right) \times A$$

$$\frac{\Delta H}{} = \frac{\left(\frac{1}{R_o} - \frac{1}{R_1}\right)}{} \times \frac{A}{}$$

Where:

R_o = The R-value of the existing window assembly.

R_1 = The R-value of the proposed window assembly.

A = The area of the window assembly.

13. Storm and thermal doors. Use Equation #14 where:

R_o = The R-value of the existing door

assembly.

R_1 = The R-value of the proposed door assembly.

A = The area of the door assembly.

14. Heat reflective and heat absorbing window or door material.

Equation #15.

$$\Delta E = \frac{A \times F_{ss} \times F_{es}}{N_{ac}}$$

Where:

A = Area of glazing.

F_{ss} = Summer shading factor.

F_{es} = Glazing orientation factor.

N_{ac} = Seasonal efficiency of the air conditioning system.

15. Load management.

Each utility offering such system will provide ΔE according to the particular system that the utility offers.

16. Clock thermostats.

Energy savings will be given for a single eight-hour night setback.

Equation #16a $\Delta E = .07E_h$ for 5 degrees Fahrenheit setback.

Equation #16b $\Delta E = .10E_h$ for 10 degrees Fahrenheit setback.

Equation #16c $\Delta E = .11E_h$ for 15 degrees Fahrenheit setback.

Where:

E_h = Total annual energy used for space heating, in units of fuel.

17. Solar domestic hot water.

Equation #17. $\Delta E = SSF \times E_{hw}$

Where:

SSF = Solar saving fraction = fraction of hot water supplied by the solar system. (Target SSF = .7)

E_{hw} = Annual energy used for heating domestic hot water, in millions of Btus.

18. Passive solar systems.

a. Direct gain glazing, indirect gain-water well storage, indirect gain - trombe wall storage.

Energy savings for 100 square feet of double glazing with R-8 night insulation:

Equation #18.

$$\Delta E = \frac{8 \times PSF \times F_o}{N}$$

b. Indirect gain-thermosiphon air panel.

Energy savings for 100 square feet of panels:

Equation #19.

$$\Delta E = \frac{3 \times PSF \times F_o}{N}$$

c. Sunspace systems.

Energy savings for 100 square feet of vertical double glazing:

Equation #20.

$$\Delta E = \frac{4 \times PSF \times F_o}{N}$$

Where:

ΔE is in millions of Btu.

PSF = Prime Solar Fraction, estimated by auditor.

F_o = Orientation Factor, from tables.

N = Heating system seasonal efficiency.

d. Window heat gain retardants. Same as Equation #14.

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19. Wind energy devices.

a. Systems providing utility grade power that can be sold to the electric utility when the system provides excess power. A system will be chosen with an Annual Wind System Output (AWSO) equal to one-half the current annual electric use.

Equation #21a. $\Delta E = 1.0$ AWSO

b. Systems providing variable voltage power for heating use only. A system will be chosen with an Annual Wind System Output (AWSO) equal to one-half of the annual heat supplied by the space heating system.

Equation #21b. $\Delta E = 1.0$ AWSO

Where:

AWSO = Annual Wind System Output in kwh.

20. Replacement solar swimming pool heaters.

Equation #22. $\Delta E = SSF \times E_{sp}$

Where:

SSF = Solar saving fraction = fraction of swimming pool heat supplied by the solar system. (Target SSF = .5)

E_{sp} = Energy used to heat the pool for the months of May through September.

21. Install positive shut-offs for all fireplaces or fireplace stoves.

Equation #23. ~~$\Delta H = 1.08 (Q_e = Q_1) A$~~

$$\Delta H = 1.08 (Q_o - Q_1) A$$

Where:

Q_o = The infiltration value in cubic feet per minute per square foot for the existing condition before improvement.

Q_1 = The infiltration value after improvement with a positive shut-off.

A = The cross sectional area of the flue or connector in square feet.

B. Energy Index.

Energy Index = $E \times F_w$

Where:

E is energy content of all fuel (including electricity) used during the months of November through April, in Btus.

F_w is a weather adjustment factor.

It is the ratio of the number of degree days in an average heating season (November 1 thru April 30) to the number of degree days for the heating season preceding the calculation.

Repealer. Rules 2 MCAR SS 1.16201-1.16207 and 1.6220-1.6230 are repealed.

SSF = Solar saving fraction = fraction of swimming pool heat supplied by the solar system. (Target SSF = .5)

E = Energy used to heat the pool for the months of May through September.

21. Install positive shut-offs for all fireplaces or fireplace stoves.

Equation #23. ~~H = 1.08 (Q - Q) A~~ o 1

$$H = 1.08 (Q - Q_o) A$$

Where:

Q = The infiltration value in cubic feet per minute per square foot for the existing condition before improvement.

Q = The infiltration value after improvement with a positive shut-off.

A = The cross sectional area of the flue or connector in square feet.

B. Energy Index.

Energy Index = E x F

Where:

E is energy content of all fuel (including electricity) used during the months of November through April, in Btus.

F is a weather adjustment factor.

It is the ratio of the number of degree days in an average heating season (November 1 thru April 30) to the number of degree days for the heating season preceding the calculation.

Repealer. Rules 2 MCAR SS 1.16201-1.16208 and 1.16220-1.16230 are repealed.