



To: All Energy Star Builders

RE: HVAC Requirements for Certification of an ENERGY STAR Home

To earn the ENERGY STAR label, projects with central air conditioning must provide CET with the HVAC contractor's report for sizing the cooling system for each unit. This cooling load calculation requirement for ENERGY STAR is also part of the Massachusetts Residential Building Code requirements (V. 7, Part IV, Ch. 61).

The lack of an AC sizing report will prevent your projects from earning ENERGY STAR labeling and will also be a barrier to earning utility incentives. Please submit your AC sizing report at the same time that you provide us your project specifications for plans analysis so that CET's Raters can verify the sizing calculations.

Heating/Cooling System Load Calculations

Requirements of the MA Residential Energy Code, 6106.4.3.1. Load Calculations. "Heating and cooling system design loads for the purpose of sizing systems and equipment shall be determined in accordance with the procedures described in the *ASHRAE Handbook of Fundamentals* or the Air Conditioning Contractors Association's Manual "J," or other procedure approved by the BBRS, using the design parameters specified in 780 CMR 6105." The general contractor or HVAC contractor must submit sizing information and load calculations to the building inspector either with their initial building permit application, or if not, before they install the system. In Hampshire, Hamden, Franklin, and Berkshire counties, the exterior design temperature to be used during the load calculations is **86° F** (Table 6105.1 of the MA Building Code, 7th Edition).

Requirements for ENERGY STAR: All cooling equipment must be sized according to the latest editions of ACCA Manuals J and S, ASHRAE 2001 Handbook of Fundamentals, or an equivalent computation procedure. Maximum over-sizing limit for air conditioners and heat pumps is 15% (with the exception of heat pumps in Climate Zones 5 - 8, where the maximum over-sizing limit is 25%). Calculations must use the proper exterior design conditions. Indoor temperature for the calculation shall be **75° F** for cooling; Infiltration rate shall be selected as "**tight**", or the equivalent term. In specifying equipment, the next available size (tonnage) may be used. In addition, indoor and outdoor coils shall be matched in accordance with ARI standards.

Why Cooling Calculations are important:

- Larger systems use much more energy during late afternoons - summer peak load times, so avoiding over-sizing is one of the best ways to reduce the need for building new power plants.
- Larger systems cost more, so right-sized systems will be more cost-effective. Proper sizing of heating systems may save only a little money on the equipment itself. However, proper sizing of the distribution system can save hundreds of dollars in a typical house.
- An oversized cooling system will result in incomplete dehumidification of a home, which can cause discomfort and health concerns. This is especially true on days that are very humid and not as hot. For this reason, right-sized air conditioners are better for comfort and health.

Duct Sealing

Nationwide, duct leakage in new homes is estimated to be about 20 to 30% on average. Properly sealed ductwork will reduce leakage to 10% and below, and will:

- Prevent heated/cooled air from leaking and therefore greatly reduce annual energy costs by hundreds of dollars
- Enable the customer to get the full benefits of high efficiency systems.
- Reduce indoor air pollution and the health problems associated with back-drafting or leakage from the basement or crawl space that might bring fumes from household and garden chemicals, insulation particles, and dust.
- Improve comfort in the home.

Requirements of the MA Residential Energy Code, 6106.4.4.1. Duct Systems. “All accessible longitudinal and transverse joints, seams, and connections of low-pressure supply and return ducts shall be securely fastened and sealed with welds, gaskets, mastics (adhesives) or mastic-plus embedded-fabric systems. Exception: Continuously welded and locking-type longitudinal joints and seams.”

Requirements for ENERGY STAR: Ducts must be sealed with mastic and have a tested leakage rate of less than 6 cfm per 100 sq. ft. of conditioned floor area. The test is performed with a duct blower and a blower door, and only measures leakage that leaves the building envelope. For this reason, the best way to meet ENERGY STAR standards is to put your entire duct system inside the insulated shell of the envelope. Even in this case, though, sealing the system with mastic is required.

Note:

Duct and foil tapes are not effective at sealing duct systems over the long term. They are useful for temporarily holding duct pieces together until mastic can be applied to make the seal permanent.

Mastic must be applied to meet the above requirements. There is one type of tape that is also an effective long-term mastic sealant - it commonly referred to as mastic tape and is different than other foil tapes. You can tell it apart from other tapes because it is much thicker and usually more expensive.