



## New ENERGY STAR Specification for Residential HVAC: Comments from Colorado Springs Utilities

In view of the new Federal standard, the marginal benefit of selecting higher SEER will be less than the in past, especially for new construction. However, we think there is still a big margin for energy savings in the retrofit market. Future rebates could potentially be decoupled from the Energy Star specification. We may just encourage customers to replace old central air-conditioners (CAC) with new Federal standard CAC. (We do not anticipate offering rebates for ASHP, which we classify as a low priority).

As the marginal benefit for new construction is low, the proposal for inclusion of installation-criteria is laudable, but verification costs could potentially be very high, and reduce the cost-effectiveness of some DSM programs. Verification Option 1 (Verification by Energy Efficiency Program Sponsors) will impose unwelcome and burdensome verification costs on utilities. As such, we strongly suggest Options 4 (Verification through the Home Energy Rating System), 5 (Verification by EPA) or 6 (Self Certification) be adopted, if the installation criteria move forward.

### **Equipment Criteria**

1. Table 1 is excellent, and the equipment is available (split systems and packaged systems SEER-14, and air source heat pumps in excess of HSPF 8). The added benefit to this upgrade in EER is reduced demand. Peak usage in summer usually requires peaking generators which are costly to run.
2. Heat pumps should have an outdoor air thermostat to prohibit electric heat use above the median HSPF rating temperature, which is 35 degF.
3. All of the air systems should have better filters to help sustain their energy performance between cleanings. They should be able to overcome at least a 20% pleated filter. The usual 'see through' stock filters are around 5-7% efficient and the washable ones are worse.

### ***Evaporator Access/Maintainability***

4. Item I.A.i) What is needed for sustainable performance is to be able to clean the coil periodically. To accomplish this, there needs to be an access opening both upstream and downstream of the coil. Cleaning operation is usually reverse of the air flow (hence the downstream opening) and uses a lot of water that is best controlled with a wet vac (hence the upstream opening). The SIZE of the opening should be specified since, for example, an 8x8 plate is just about useless. We think it would work to say the access doors/plates should be square and be within 2 inches of the widest rectangular duct dimension.
5. Item I.A. ii) Recommend omit item ii, which allows instruments in lieu of access.

### ***Evaporator Measurement Access***

6. Item I.B.i) An access port upstream of the coil is a very good idea, and there should also be one on the leaving side of the coil to allow the start-up measurements to be made.

7. Item I.B.ii) Suggest omit this option. The mark allowing a field drilled hole may accommodate existing in-stock equipment manufacturers, and can be drilled OK, but each of these represents a potential leak because it will likely get a piece of gray duct tape on the hole when done, which will then come off very soon.

### ***Automated Refrigerant Flow Metering Device***

8. Item I.C) Very important that ratings should be required to be accepted only for MATCHED condensing unit and evaporator unit. A SEER-14 condensing unit applied to an existing evaporator coil will not yield the savings it would if matched to the proper indoor unit.

9. Item I.C) We say 'no' to requiring a TXV, even though that is a good idea. The requirements for equipment should be performance based (SEER-14), how the manufacturers achieve that should be their business.

### **Installation Criteria**

10. Item II.2) Air flow of at least 400 cfm/ton is an excellent criteria, since it raises the suction temperature and reduces compressor lift (and kW).

11. II.4) Assuring the filter installed is the 20% pleated type, that it fits snugly in the channel to prevent air bypassing it, and that the subsequent air flow tests are with the good filter in place, not the stock filter.

12. II.4). Besides volts and amps and temperatures, a bottom line calculation of kW/ton and EER, and the manufacturer's target values at actual conditions, would provide a quick way to check if performance is reasonable and in line with the people who built it.

13. II.4) The report and results should be hard bound and provided to the owner (preferably attached to the unit), since the 'new' condition is the benchmark for servicing that equipment over its life. The information should somehow stay with the equipment to assist in sustainable operation.

14. II.5) Commissioning and compliance certification by the installer is like the fox guarding the henhouse. Third part certification is the textbook answer, but would add cost, so maybe a compromise is to use the NATE certified installers and let it go at that.

### **Options for Field Verification of Proper Installation**

15. III) We strongly discourage Option 1 due to the impact of additional verification costs on the overall cost-effectiveness of some DSM programs.

16. III) Our preference would be for Options 4, 5 or 6. While Option 6 presents the problem of "the fox guarding the henhouse," at the very least, this provides an opportunity to educate installers and raise awareness, which may eventually lead to better installation practices. If nothing else, the new equipment criteria will provide some benefit—proper installation would simply be an "extra bonus" where it does occur.

## Other Items to Consider

### 17. Item VI

- High efficiency fan motors? YES, since the motor losses represent parasitic losses in cooling mode, they should be reduced where practical. ECM motors are readily available that will help here.
- Built-in sensors? NO. For residential systems, simple is always better.
- On-board diagnostics? NO. For residential systems, simple is always better.
- NATE certified installer? YES. In refrigeration work, a pound of prevention is worth a ton of cure.
- Air-flow analysis prior to retrofit? YES. This is especially important for the usual heating-only furnace with a proposal to add A/C years later. The amount of air flow necessary is higher and the ducts usually can't accommodate. High output fans are used to bridge the gap, but these systems still are choked for air and fall short of optimum. Maintaining the 400 cfm per ton rule for ALL (new and retrofit) will naturally do the job of weeding these out.
- Specify duct leakage? YES PLEASE. 10% leakage is terrible, and since it is not checked, most are much higher than that. Following ASHRAE 90.1 may be too strict. One benchmark may be 5 cfm per 100 SF at 1 inch w.c. which is attainable. Using typical residential duct sizing methods (0.1 in/100 ft, and 2000 cfm in a 24x12 duct), this would equate to 1% leakage which is an order of magnitude better than the current 10%. There would be push back on this from the industry that traditionally not cared about leakage, so third party field testing would be suggested for QC, before they are forever covered in sheetrock, is a very good idea to assure performance. The test should be a complete test, not a sampling. e.g. blank off all the register boots before putting on the grills, and then apply the duct test apparatus with a temporary 6-inch opening in the main duct, measuring the air flow into the blower as equal to air leaking out.
- All components by same mfg? NO. It's a good idea to have the evaporator and condensing unit match, but using performance criteria, if the assembly of the two is ARI certified SEER-14, everybody wins.

18. Another item not mentioned is air transport ratios. What is typical for residential construction is skinny ducts, high velocity ducts, and make it up with a bigger fan. This creates systemic parasitic losses in the cooling mode, increasing the span between created and delivered cooling energy, the difference being soaked up in fan brake horsepower. My suggestion is to limit fan horsepower as a function of total cooling BTU output. Using a 30:1 ratio between Cooling energy output (Btu) and transport fan energy input (Btu) would limit fan motor size by design. For example, a 3-ton system would allow no more than 1200 Btu of fan heat which would be about 0.35 kW of indoor fan motor input, which is about a 1/3 hp motor. Having this as a requirement WITH the better filters AND the 400 cfm/ton will cause the designers to face an energy budget, and compensate with increased duct sizes, or oversized A-coils, and furnace/filter housings.