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September 4, 2018

Ms. Catherine Rivest
Office of Energy Efficiency and Renewable Energy
Building Technologies Program
Room EE-5B
U.S. Department of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585-0121

Re: AHRI Comments in Response to Department of Energy's Request for Information Regarding the Test Procedure for Single Package Vertical Air Conditioners and Single Package Vertical Heat Pumps [*Docket Number EERE-2017-BT-STD-0020*]

Dear Ms. Rivest:

These comments are submitted by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) in response to the U.S. Department of Energy's (DOE) request for information (RFI) regarding test procedures for single package vertical air conditioners (SPVAC) and single package vertical heat pumps (SPVHP), collectively referred to as single package vertical units (SPVU) appearing in the *Federal Register* on July 20, 2018.

AHRI is the trade association representing manufacturers of heating, cooling, water heating, and commercial refrigeration equipment. More than 300 members strong, AHRI is an advocate for the industry and develops standards for and certifies the performance of many of the products manufactured by our members. In North America, the annual output of the HVACR and water heating industry is worth more than \$44 billion. In the United States alone, the HVACR and water heating industry supports 1.3 million jobs and \$256 billion in economic activity annually.

This RFI raises several complex questions about the current test procedure for the equipment, but also about the applicability of certain provisions from AHRI Standard 340/360-2015, *Standard for Performance Rating of Commercial and Industrial Unitary Air-Conditioning and Heat Pump Equipment* to SPVU equipment. The RFI suggests a number of applications of AHRI Standard 340/360 to SPVU equipment, and AHRI's response is that many of these suggestions are not appropriate for SPVUs as described in detail below. As discussed in greater detail in these comments, AHRI recommends that DOE adopt a revised version of AHRI Standard 390, rather than applying AHRI Standard 340/360.

DOE also seeks comment on whether it has the authority to regulate fans embedded in other commercial equipment, such as SPVUs, and whether the regulation of supply fan energy use in field applications will constitute double regulation. AHRI believes that, under the Energy Policy and Conservation Act (EPCA), it would in this case constitute double regulation – and be outside of DOE’s authority – for the Department to regulate fans embedded in SPVUs and other commercial equipment.

Several of DOE’s suggestions for the test procedure would increase the regulatory burden by making testing unduly burdensome to conduct without appropriate benefit. AHRI encourages DOE to rely upon Executive Order 13771, “Reducing Regulation and Controlling Regulatory Costs,” which directs Executive Branch agencies to manage the costs associated with the imposition of expenditures required to comply with Federal regulations. More specific comments responding to DOE’s questions are below.

As DOE notes in the RFI, the Department is required to use industry protocol for test procedures so long as the amended test procedure is representative of use and the test is not unduly burdensome. With active DOE participation, AHRI is in the process of revising AHRI Standard 390-2003, *Performance Rating of Single Package Vertical Air-conditioners and Heat Pumps* (referred to as draft AHRI Standard 390-2018 herein). AHRI encourages DOE’s continued participation in that process and as AHRI’s SPVU Engineering Committee nears the end of its review, we recommend DOE review and adopt the revised standard as the Federal Test procedure. We expect that the Standard will undergo ANSI review this fall and be finalized by the end of the year. AHRI appreciates DOE’s involvement in the revision of this standard, and on several other AHRI standards under development.

Issues on Which DOE Seeks Comments

AHRI appreciates the opportunity to comment on issues in which the DOE has expressed interest:

Test Procedure

Test Set-up

- Issue 1: While AHRI 390-2003 provides test conditions for ducted and non-ducted SPVUs, many, if not all, products on the market allow for installation in either configuration. It is standard practice to test all SPVUs in the ducted configuration. Proposed clarifications in the 2018 draft edition of AHRI 390 standardize this industry practice by defining a non-ducted unit and adding text to identify when to test a unit as such:

Non-ducted Unit. An air conditioner or heat pump that is not designed and marketed to deliver conditioned air to the indoor space through a duct(s). A factory-installed wall sleeve(s) would not be considered as a duct.

If a duct cannot be attached and the unit is marketed as non-ducted only, then testing would be in the non-ducted configuration. All other units would be tested as ducted, with tested minimum static pressure determined by the unit's capacity.

The only equipment characteristic that can be used to determine whether SPVU models would be installed (and hence should be tested) as ducted or non-ducted models is the ability to attach a duct to the product. Marketing literature should help identify this feature.

- Issue 2: Options for different outdoor air-side attachments (e.g., grills, louvers, wall sleeve) do exist and could impact the performance during testing. To mitigate this issue, the appurtenances to be used for testing are specified in test notes of DOE's current certification reporting template (version 5.0) in the Supplemental Testing Instruction PDF. The Supplemental Testing Instruction PDF is intended to mitigate any confusion that could arise during a DOE enforcement test by allowing manufacturers the opportunity to specify the outdoor air-side attachments, which should be used during such a test.

For testing conducted as part of the AHRI certification program, a punch list is required where the manufacturer inputs test notes. This includes information on the installation of the plenum and outdoor grille or other air-side attachments. Manufacturers specify the connection of the air discharge duct in the test cell. Test cell installation can also include information on break-in time, leveling required for the unit, directions on filling the indoor side coil, water requirements for the condensate pan, sealing requirement for outlet duct connections, and any other relevant instructions for proper set up.

- Issue 3: It would not be appropriate to adopt an approach for charging requirements for SPVUs similar or identical to the approach adopted in the June 2016 Commercial Air Conditioner Test Procedure final rule. Single package vertical units, as packaged equipment, ship charged and for this equipment, no charging should be required. Many units do not have service ports, so one could not add refrigerant in the field. For units that do have service ports, units are charged by weight to the specification on the nameplate. While DOE requested data that demonstrate the performance of a SPVU relative to changes in the various charge indicators used for different charging methods, specifically the method based on sub-cooling, packaged equipment does not require external refrigerant lines therefore there is no need to account for superheat or sub-cooling. No data can be provided in response to this question.
- Issue 4: As noted in the RFI, Section 5.2.1 of ANSI/AHRI 390-2003 requires that, for units rated with 208/230 dual nameplate voltages, the test be

performed at 230 V. For all other dual nameplate voltage units, the test standard requires that the test be performed at both voltages or at the lower voltage if only a single rating is to be published. AHRI acknowledges that voltage can affect the measured efficiency of air conditioners; however, these variations tend to be insignificant and do not correlate to a specific voltage. The majority of SPVUs are applied at 230 V and therefore, the current procedure, which aligns with AHRI 210/240, is appropriate.

- Issue 5: All SPVUs on the market are designed to be installed with a filter, are shipped with a filter, and should be tested with the supplied filter. The effectiveness of the filter can vary based on application. As noted in Issue 1, all SPVUs on the market have the ability to connect a duct, and are tested in the ducted configuration, with a filter.

Airflow and External Static Pressure

- Issue 6: After conversations with company application engineers, there is agreement that the minimum ESP requirements in Table 4 of ANSI/AHRI 390–2003 are representative of field operation for ducted SPVUs when installed with 10 feet of ductwork or less.
- Issue 7: SPVUs use PSC motors with discrete speed settings or ECM motors with variable speed setting. In either case, the product leaves the factory with the fan and motor set at a specific speed to give rated 100% performance. Speed changes can be made in the field to overcome installation issues. High-pressure drop ductwork would require the fan to be set to the higher speed tap. Noise reductions would require a lower speed than the factory setting.

New sections are proposed to AHRI 390 to clarify that one should “use the manufacturer-specified fan control settings for all tests for which they are provided. Use the full-load cooling fan control settings specified by the manufacturer for all tests for which fan control settings are not specified. If there are no specified fan control settings for any tests, use the as-shipped fan control settings for all tests.”

- Issue 8: For laboratory testing of SPVUs, the priority is to set the airflow to the correct speed. The external static pressure is adjusted to match the required airflow. New sections are proposed to AHRI 390 to clarify that the airflow-measuring apparatus should be adjusted to maintain ESP within $-0/+0.05$ in H₂O of the requirement specified in the table outlining the minimum ESP for each capacity range and to maintain the airflow within ± 3 percent of the manufacturer-specified full-load cooling airflow.
- Issue 9: The normal practice is that SPVHP airflow rates for heating and cooling are the same; however, at DOE’s suggestion, a procedure has been included in draft AHRI 390 to provide for a difference in the manufacturer-

specified heating airflow and full-load cooling airflow. While the numbering in the excerpt does not match the draft standard, the text is as follows:

1.1.1.1.1 Heating Test and Part-Load Cooling Tests¹

1.1.1.1.1.1 If the manufacturer-specified part-load cooling airflow or the manufacturer-specified heating airflow is the same as the manufacturer-specified full-load cooling airflow (and for heating tests and part-load cooling tests for which an airflow is not specified and the manufacturer-specified full-load cooling airflow is used as the airflow for the test), use the fan control settings used for the full-load cooling test. Adjust the airflow-measuring apparatus to maintain the airflow within ± 3 percent of the measured full-load cooling airflow without regard to the resulting ESP. No changes are to be made to the fan control settings for the test.

1.1.1.1.1.2 If the manufacturer-specified part-load cooling airflow or the manufacturer-specified heating airflow differs from the manufacturer-specified full-load cooling airflow, use the following provisions.

1.1.1.1.1.2.1 Operate the system under conditions specified for the heating test or part-load cooling test using the manufacturer-specified fan control settings for that test condition. If there are no manufacturer-specified fan control settings for the heating test or part-load cooling test, use the manufacturer-specified fan control settings for the full-load cooling test. If there are no manufacturer-specified fan control settings for any tests, use the as-shipped fan control settings.

1.1.1.1.1.2.2 Adjust the airflow-measuring apparatus to maintain ESP within $-0/+0.05$ in H_2O of the adjusted ESP requirement determined per section 4.6.1.3 and maintain airflow within ± 3 percent of the manufacturer-specified airflow for the heating or part-load cooling test. If ESP or airflow are higher than the tolerance range, adjust the fan control settings (e.g., lower fan speed) to maintain both ESP and airflow within tolerance, if possible. If ESP or airflow are higher than the tolerance range at the lowest fan control setting, adjust the airflow-measuring apparatus to maintain airflow within tolerance and operate with the lowest possible ESP that meets the adjusted ESP requirement. If ESP or airflow are lower than the tolerance range, adjust the fan control settings (e.g., higher fan speed) to maintain both ESP and airflow within tolerance (if possible, but without adjusting sheaves and without exceeding the final fan control settings used for the full-load cooling test). If this is not possible, adjust the airflow-measuring apparatus to maintain ESP within tolerance and operate with an airflow as close as possible to the manufacturer-specified value. After setting the airflow, no changes are to be made to the fan control settings.

1.1.1.1.1.2.3 If the ESP measured after setting airflow exceeds the adjusted ESP requirement determined per section 4.6.1.3 by more than 0.05 in H_2O (because the ESP and airflow requirements cannot be simultaneously met, see section 1.1.1.1.2.2), the average value of the ESP measured over the course of the test must be within $-0/+0.05$ in H_2O of the ESP measured after setting airflow for that test. If an airflow less than 97 percent of the manufacturer-specified airflow is used for a test (because the airflow and ESP requirements cannot be simultaneously met, see section 1.1.1.1.2.2), the average airflow rate measured over the course of the test must be within ± 3 percent of the airflow rate measured after setting airflow for that test.

For heating tests and part-load cooling tests for which an airflow is not specified by the manufacturer and the manufacturer-specified full-load

¹ Section referenced is Section 4.6.3.3.2 in the draft AHRI Standard 390 with DOE markup from April 27, 2018

cooling airflow is not used as the airflow for the test (because the manufacturer provides fan control settings or instructions to obtain steady-state operation for the test), draft AHRI 390 proposes to use the manufacturer-specified fan control setting for that test condition or adjust the system control input to obtain the heating or part-load cooling operation specified by the manufacturer. The airflow-measuring apparatus will then be adjusted to meet the adjusted ESP requirement with a condition tolerance of $-0/+0.05$ in H_2O , using the measured heating or part-load cooling airflow in the ESP calculation. After setting the airflow, no changes are to be made to the fan control settings.

Outdoor Air Enthalpy Method

- Issue 10: The four ASHRAE 37 secondary outdoor air enthalpy methods for testing SPVUs (similar to those made for CAC/HPs) are under review by the AHRI SPVU Engineering Committee. After the evaluation is complete, we will make a recommendation to conduct the official test without the outdoor air-side test apparatus connected.

Air Temperature Measurements

- Issue 11: As DOE correctly noted in the RFI, outdoor air temperature and humidity are key parameters that affect SPVU performance, and for this reason, AHRI 390-2003 requires accurate outdoor air condition measurements. As such, the suggestion to add measurement requirements for indoor air entering and leaving temperatures, as well as outdoor air entering and leaving temperatures, similar to those in Appendix C of AHRI Standard 340/360-2015 would be appropriate for water slinger systems.

Energy Efficiency Descriptor

- Issue 12: DOE should not consider adopting for SPVUs a cooling-mode metric that integrates part-load performance at this time. Doing so will significantly increase testing burden for a specialized product sold in a comparatively small market. A part-load metric such as IEER or the current IPLV may be appropriate for some products, such as two-stage or variable capacity SPVUs, but only on an application basis. During the ongoing revision of Draft AHRI Standard 390, in which DOE is taking part, industry is assessing whether IEER or IPLV would better represent part-load performance for units other than single-stage products.
- Issue 13: Changes to the test procedure are not required to more accurately represent fan energy use in field applications. The full-load energy efficiency metric EER already accounts for the fan watts. A requirement to add fan efficiency during economizer or electric heating would increase testing burden. There is no need to double count fan contribution, as EER minimums will likely dictate the need for improved fan efficient motors. The fans in SPVUs are built only for the product and cannot be purchased on

the open market and applied as “stand alone fans.” Replacement parts are only available from the manufacturer of the SPVU.

- Issue 14: As noted in the RFI, DOE is required to adopt a test method that reasonably reflects energy use of a covered product during a representative average use cycle. And in doing so, there are statutory constraints on the agency’s ability to require more than one metric per covered product and to regulate components. While we estimate approximately 80-percent of SPVUs use some form of economizer or make up air, the duty cycle depends on the location and application of the product. A product installed in Houston, Texas, will have fewer economizer days annually than one in Boston, Massachusetts. Likewise, SPVUs have widely varying applications, from schools to telecom. For the portion of the product that includes no economizer hours, a fan metric would be onerous and contravene legal authority. Indeed, as DOE has acknowledged,² it may only require manufacturers to comply with one metric per covered product or covered equipment, in the case of SPVUs.³

While SPVUs can all provide some level of ventilation from time to time, an SPVU’s primary function is cooling and heating. AHRI is not aware of any field applications where an SPVU is used primarily for ventilation. Put more simply, an SPVU is not a fan. Given that DOE is limited to one metric per product, the “representative average use cycle” for SPVUs should concentrate on the bulk of energy used during heating or cooling rather than the occasional and ancillary fan-only ventilation utility.

Accordingly, AHRI supports DOE’s renewal of the EER metric for SPVUs during the agency’s seven-year review. The EER metric takes into account the fan watts of the blower-motor packages used in each product. And this metric is already driving energy savings by serving as an overall minimum for the equipment’s energy use, while allowing the manufacturer to determine how best to meet that minimum. A key goal of the prohibition on setting separate standards for components is to allow the manufacturer to innovate in meeting energy use standards for a product – and that goal is being met here. Moreover, imposing component standards would contravene EPCA’s one-metric per product limitation while, in effect, imposing impermissible design standards on the final product. In sum, setting additional minimums for supply fans or fan energy use during a

² DOE has acknowledged it can only apply one metric per product, which may either be a minimum efficiency requirement or a design standard, but not both. 42 U.S.C. §§ 6291(6) & 6311(18).

³ AHRI acknowledges certain legacy exceptions to this requirement that have been codified by statute, such as SEER and HSPF for central air conditioners and heat pumps 42 USC § 6295 (d) (1)-(2).

ventilation cycle or other field applications would undermine good policy and exceed DOE's authority.

AHRI acknowledges that DOE has the authority to include certain fans and blowers, by rule, as "covered equipment" if such products meet all the requirements of 42 U.S.C. § 6311(2). However, DOE has not taken any procedural steps to do so.⁴ Further, even if DOE developed a standard for stand-alone industrial fans, it would not be appropriate to apply that standard to fans embedded in regulated equipment for three reasons.

First, section 6312 limits DOE's authority to regulate as covered industrial equipment certain articles that are also components of consumer products. The blower-motor combination used by SPVUs and other commercial AC and HP equipment is precisely the kind of component that is protected from double-regulation by section 6312. This provision is intended to restrict DOE's authority to regulate articles that are principally sold as component parts of consumer equipment. Certain large and very large industrial fans may qualify as covered equipment under this definition, but the blower-motor combinations in SPVUs, water-source heat pumps, and commercial air conditioners are identical to the components of central air conditioners. Moreover, these products are not independently available on the open market and do not serve an independent energy-using function apart from as a component of air conditioners.

Second, DOE's authority to regulate components is based on *necessity*. Sections 6312(b) and (c) state, in relevant part, that DOE may, by rule, include as industrial equipment articles which are component parts of consumer products, only if it concludes that doing so "is *necessary* to carry out the purposes of this part." (Emphasis supplied). Adding a fan metric to the current EER requirement is not *necessary*, because SPVUs already have an overall energy efficiency requirement. If DOE seeks to improve the energy efficiency of SPVUs, then it has a viable existing mechanism: the overall product minimum standards. The addition of a ventilation or fan requirement is classic double regulation and is not "necessary" within the meaning of EPCA.

Finally, unlike the specific provision applicable exclusively to consumer furnace fans, DOE has no alternative authority to impose additional ventilation metrics or requirements on top of the product efficiency metric and standard. The fact that Congress was compelled to grant a specific provision of authority for a consumer furnace ventilation metric affirms DOE

⁴ AHRI notes that an ASRAC working group negotiated the potential terms of a fans and blowers rulemaking in 2015, and AHRI voted against the terms eventually reached by the working group. AHRI maintains several reservations about the proposed terms of that agreement, chiefly the notion that DOE has the authority to regulate fans embedded in covered equipment.

is without general authority to create overlapping ventilation requirements for any other regulated products.⁵

- Issue 15: We estimate fewer than 30-percent of SPVUs are heat pumps. DOE’s proposal to include a test procedure similar to CAC/HP that would measure the average delivered heat and total energy use, including for defrost cycles, during operation in outdoor conditions for which frost forms on the outdoor coil is not necessary on this subset of products. Electric heat during defrost is small in comparison to electric heat use when the heat pump cannot keep up.

AHRI appreciates the opportunity to provide these comments. If you have any questions regarding this submission, please do not hesitate to contact me.

Sincerely,

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⁵ See, e.g. *Morales v. Trans World Airlines, Inc.*, 504 U.S. 374, 384 (1992) (“[I]t is a commonplace of statutory construction that the specific governs the general....”).