

**DOCKETED**

<b>Docket Number:</b>	19-BSTD-02
<b>Project Title:</b>	Residential Alternative Calculation Method Variable Capacity Heat Pump Modeling Approach
<b>TN #:</b>	227220
<b>Document Title:</b>	AHRI Comments to February 2019 Workshop – Variable Capacity Heat Pumps
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*Comment Received From: Laura Petrillo-Groh*  
*Submitted On: 3/1/2019*  
*Docket Number: 19-BSTD-02*

**AHRI Comments to February 2019 Workshop “ Variable Capacity Heat Pumps**

This document supersedes the previous submission. Exhibit referenced in comments is now attached.

*Additional submitted attachment is included below.*



2311 Wilson Boulevard Suite 400 Arlington VA 22201 USA  
Phone 703 524 8800 | Fax 703 562 1942  
www.ahrinet.org

March 1, 2019

Larry Froess  
California Energy Commission  
Docket Unit, MS-4  
Re: Docket No. 19-BSTD-02  
1516 Ninth Street  
Sacramento, CA 95814-5512

Re: AHRI Comments to February 2019 Workshop – Variable Capacity Heat Pumps

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Dear Mr. Froess,

This letter is submitted in response to the California Energy Commission public workshop regarding a method to model variable capacity heat pump (VCHP) systems held on February 15, 2019. The method is intended for VCHP systems to be modeled for compliance in residential buildings using the performance method and algorithms to be incorporated into the Alternative Calculation Method (ACM) Reference Manual and the residential California Building Energy Code Compliance (CBECC-Res) performance compliance software for use for demonstrating compliance with the Performance Standards specified in Title 24, Part 6, Section 150.1(b)

AHRI represents over 315 air-conditioning, heating, and refrigeration equipment manufacturers. Among our members are North America's largest, most innovative, and most efficient mini and multi split variable capacity heat pumps (VCHP).

On May 13, 2014, AHRI submitted a letter to CEC (Exhibit-1) expressing concerns with the publication of a revised residential ACM reference manual that simulated ductless heat pumps as a split system equivalent to the standard design with default duct conditions (minimum efficiency). Subsequently, a Central Valley Research Homes (CVRH) project was initiated with collaboration between CEC consultants and some AHRI members. After review of the results, we support the proposal to implement an ACM option for ductless heat pumps and the provision of cooling, heating and no-duct loss credits for such systems. However, we believe that that suggested credit approach for cooling (5%) and heating (12%) is much lower than expected. We would appreciate the opportunity to continue working with CEC and its consultants prior to the next public workshop to implement a credit approach that is more representative of performance of these ductless systems. In the meantime, we are willing to support the credits proposed by CEC during the public workshop held on February 15, 2019.

If you have any questions regarding this submission, please do not hesitate to contact me.

Sincerely,

A handwritten signature in black ink, appearing to read 'LPG', with a long horizontal flourish extending to the right.

Laura Petrillo-Groh, PE  
Lead Regulatory Advisor, Cooling Technology  
Direct: (703) 600-0335  
Email: [LPetrillo-Groh@ahrinet.org](mailto:LPetrillo-Groh@ahrinet.org)

Exhibits:

1. AHRI Letter to CEC dated May 13, 2014

May 13, 2013

Martha Brook, P.E.  
Senior Mechanical Engineer  
High Performance Buildings &  
Standards Development Office  
California Energy Commission  
1516 Ninth St. MS-37  
Sacramento, CA 95814

Re: Errata for 2013 Residential Alternative Calculation Method (ACM) Reference Manual

Dear Martha:

On April 22, 2014 a revised Residential ACM Reference Manual was published. Included in that version was the addition of the following statement on page 18, "Until there is an approved compliance option for ductless heat pumps (mini-split, multi-split VRF systems) they are simulated as a split system equivalent to the standard design with default duct conditions."

We have great concern with this provision as it will essentially force all ductless heat pumps to be modeled as 13 SEER units, when in reality they are capable of producing much higher efficiency, as indicated within the AHRI Directory of Certified Performance. The proposed design provision within section 2.4 of the 2013 Residential ACM Reference Manual severely handicaps ductless systems in comparison to other systems, effectively banning them from new construction applications. Additionally, by forcing ductless systems to be modeled as 13 SEER units, this provision promotes a process that minimizes the contribution of these systems to CEC's goal of striving towards net-zero energy for residential buildings by the year 2020.

The Residential ACM errata require development of a compliance option for ductless heat pumps. However, there is insufficient time to develop such an option by July 1, 2014 (the effective date of the 2013 edition of California Title 24). In comparison, the compliance option for ducted central systems took approximately eight years and two code cycles to develop, with much, if not all of the cost funded by CEC. During this time, ducted systems were not forced to be handicapped while measures were developed to address installation issues that could negatively affect the systems' operational efficiency.

Rather than hastily implementing stop-gap new methods within the Residential ACM Reference Manual at this time, AHRI requests CEC to consider the following reasonable approach:

- For all ductless mini-splits and multi-splits, implement immediately the measure to record and verify proper minimum charge level specified in manufacturers' installation instructions.
- In the next code cycle, identify any challenges unique to ductless systems that could affect the operating efficiency, and develop practical measures that will allow for verification of proper installation.

Some additional reasons why ductless mini-splits and multi-splits should not be simulated as split systems equivalent to the standard design with default duct conditions are:

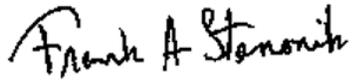
- The operation of a ductless mini-split is similar to that of a room air-conditioner or heat pump. However, ductless systems are typically more energy efficient. In addition, ductless systems have free air flow with a leak free airway and the air flow rate can vary to meet room conditions, thus negating the need for duct testing measures. The U.S. Department of Energy indicates on its website that as much as 20 percent of the air that moves through the duct system is lost due to leaks, holes, and poorly connected ducts. The result is higher utility bills and difficulty keeping the house comfortable, no matter how the thermostat is set.
- Ductless multi-split systems consist of an outdoor unit with a variable speed compressor matched with multiple evaporator fan coils, each fan coil is designed to condition a single zone. Such a system has the ability to fully shut off in zones not requiring cooling or heating, similar to a room air-conditioner or heat pump, and so it is practical to treat them as such. Unlike ducted zoning systems, these systems do not require an efficiency-reducing recirculation damper since the compressor modulates its capacity to match the load. They also have the unique feature of reducing peak energy demand with normal operation when shutting off unused zones during the day. This is one of the core goals of CEC.
- The issues caused by poorly installed ductwork (tested per the compliance option for ducted systems) are not applicable for ductless systems since there is no ductwork to change the way the system operates as compared to how it was tested. The measures on charging procedures, however, are relevant since the amount of charge needed is dependent on the length of refrigerant line installed, though many systems have a minimum length before which an additional charge level is necessary. Ductless systems are used in highly efficient buildings and are recognized by many building codes across the country as being beneficial to energy conservation. AHRI urges the CEC to continue using the published efficiency values for ductless mini-splits and multi-splits for the purposes of the 2013 Residential ACM Reference Manual. This is consistent with CEC's objectives to promote reduced energy use.

Based on the reasons stated, we request the CEC to consider adopting the aforementioned approach and allow adequate time to develop an appropriate

compliance option for ductless mini-splits and multi-splits. The industry is willing to work with CEC staff in the development of the language that adequately covers such products.

AHRI appreciates CEC's consideration on this matter. If you have any questions regarding the content of this letter, please do not hesitate to contact me.

Respectfully submitted,

A handwritten signature in black ink that reads "Frank A. Stanonik". The signature is written in a cursive, slightly slanted style.

Frank A. Stanonik  
Chief Technical Advisor