



Understanding Select Fields on the Residential Plans Examiner Review Form for HVAC System Design



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SEEA
SOUTHEAST ENERGY EFFICIENCY ALLIANCE

Residential HVAC

Tips for Enforcing the 2018 Virginia Code



Residential Plans Examiner Review Form for HVAC System Design (Loads, Equipment, Ducts)

Form
RPER 1.01
8 Mar 10

County, Town, Municipality, Jurisdiction
Header Information

Contractor _____	REQUIRED ATTACHMENTS ¹	ATTACHED
Mechanical License # _____	Manual J1 Form (and supporting worksheets):	Yes <input type="checkbox"/> No <input type="checkbox"/>
Building Plan # _____	or MJ1AE Form ² (and supporting worksheets):	Yes <input type="checkbox"/> No <input type="checkbox"/>
Home Address (Street or Lot#, Block, Subdivision) _____	OEM performance data (heating, cooling, blower):	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Manual D Friction Rate Worksheet:	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Duct distribution system sketch:	Yes <input type="checkbox"/> No <input type="checkbox"/>

HVAC LOAD CALCULATION (IRC M1401.3)

Design Conditions

Winter Design Conditions

Outdoor temperature _____ °F
 Indoor temperature _____ °F
 Total heat loss _____ Btu

Summer Design Conditions

Outdoor temperature _____ °F
 Indoor temperature _____ °F
 Grains difference _____ Δ Gr @ _____ % Rh
 Sensible heat gain _____ Btu
 Latent heat gain _____ Btu
 Total heat gain _____ Btu

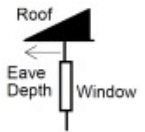
Building Construction Information

Building

Orientation (Front door faces) _____
North, East, West, South, Northeast, Northwest, Southeast, Southwest
 Number of bedrooms _____
 Conditioned floor area _____ Sq Ft

Windows

Eave overhang depth _____ Ft
 Internal shade _____
Blinds, drapes, etc
 Number of skylights _____



HVAC EQUIPMENT SELECTION (IRC M1401.3)

Heating Equipment Data

Equipment type _____
Furnace, Heat pump, Boiler, etc.
 Model _____
 Heating output capacity _____ Btu
Heat pumps - capacity at winter design outdoor conditions
 Auxiliary heat output capacity _____ Btu

Cooling Equipment Data

Equipment type _____
Air Conditioner, Heat pump, etc
 Model _____
 Sensible cooling capacity _____ Btu
 Latent cooling capacity _____ Btu
 Total cooling capacity _____ Btu

Blower Data

Heating CFM _____ CFM
 Cooling CFM _____ CFM

HVAC DUCT DISTRIBUTION SYSTEM DESIGN (IRC M1601.1)

Design airflow _____ CFM	Longest supply duct: _____ Ft	Duct Materials Used (circle)
External Static Pressure (ESP) _____ IWC	Longest return duct: _____ Ft	Trunk Duct: Duct board, Flex, Sheet metal, Lined sheet metal, Other (specify) _____
Component Pressure Losses (CPL) _____ IWC	Total Effective Length (TEL) _____ Ft	Branch Duct: Duct board, Flex, Sheet metal, Lined sheet metal, Other (specify) _____
Available Static Pressure (ASP) _____ IWC <small>ASP = ESP - CPL</small>	Friction Rate: _____ IWC <small>Friction Rate = (ASP x 100) ÷ TEL</small>	

I declare the load calculation, equipment selection, and duct system design were rigorously performed based on the building plan listed above. I understand the claims made on these forms will be subject to review and verification.

Contractor's Printed Name _____ Date _____
 Contractor's Signature _____

Reserved for use by County, Town, Municipality, or Authority having jurisdiction.

¹ The AHJ shall have the discretion to accept Required Attachments printed from approved ACCA software vendors, see list on page 2 of instructions.
² If abridged version of Manual J is used for load calculation, then verify residence meets requirements, see Abridged Edition Checklist on page 13 of instructions.

The *Residential Plans Examiner Review Form for HVAC System Design* is a standardized template provided by Air Conditioning Contractors of America (ACCA). It provides key information about the load calculations that were performed.

This form can be generated and pre-populated from the common software programs that are used to perform HVAC load calculations in accordance with ACCA Manual J.

This guide will cover best practices for reviewing the information on this form for accuracy.

HVAC Load Calculation – Design Conditions

Tips for Enforcing the 2018 Virginia Code

Design Conditions

Winter Design Conditions

Outdoor temperature	<input type="text"/>	°F
Indoor temperature	<input type="text"/>	°F
Total heat loss	<input type="text"/>	Btu

Summer Design Conditions

Outdoor temperature	<input type="text"/>	°F
Indoor temperature	<input type="text"/>	°F
Grains difference	<input type="text"/> Δ Gr @ <input type="text"/> % Rh	
Sensible heat gain	<input type="text"/>	Btu
Latent heat gain	<input type="text"/>	Btu
Total heat gain	<input type="text"/>	Btu

Total Heat Loss describes the amount of heat that will be lost from the building during the coldest hours of the winter. This heat loss needs to be made up by a heating source. The combined capacity of the heating equipment and any supplemental heat sources should meet or exceed this value.

Cooling is described by **Sensible Gain** and **Latent Gain**, as well as **Total Heat Gain**, which is the sum of the Sensible and Latent loads. Sensible gain is the heat gained by the building in the summer. Latent gain is the moisture gain.

Contact Viridiant with any questions or comments via: admin@viridiant.org or (804) 225-9843



HVAC Load Calculation – Building Construction Information

Tips for Enforcing the 2018 Virginia Code

Building Construction Information

Building

Orientation (Front door faces)

North, East, West, South, Northeast, Northwest, Southeast, Southwest

Number of bedrooms

Conditioned floor area Sq Ft

Number of occupants

The **Orientation** should match the home's actual orientation and can be confirmed against the site plan.

The **Conditioned Floor Area** is the area served by the HVAC system. If there is a single system in the home, it should match the conditioned floor area of the whole home. If there are multiple HVAC systems, the combined value across all systems should match the conditioned floor area of the whole home.

The **Number of Bedrooms** should match the number of bedrooms in the plans. The **Number of Occupants** should equal the Number of Bedrooms + 1 (this assumes two people in the main bedroom).

If there are multiple HVAC systems in a home, combine the Number of Occupants values provided on each **Residential Plans Examiner Review Form for HVAC System Design** form provided for the home and check the total value for compliance. This will account for the whole house.



HVAC Load Calculation – Quick Check

Tips for Enforcing the 2018 Virginia Code

The **square feet per ton** is a quick metric to use to assess the accuracy of the load calculation. Historically, this value was 400-600 square feet per ton. In new construction homes, this will typically fall between 900 and 1500 square feet per ton. Values outside of that range may not be incorrect but may warrant closer scrutiny. Homes with a significant amount of glazing may have a lesser value. Homes with conditioned basements may have a greater value.

Summer Design Conditions

Outdoor temperature	<input type="text" value="93"/>	°F
Indoor temperature	<input type="text" value="75"/>	°F
Grains difference	<input type="text" value="Δ Gr @"/>	% Rh
Sensible heat gain	<input type="text" value="12347"/>	Btu
Latent heat gain	<input type="text" value="2842"/>	Btu
Total heat gain	<input type="text" value="15189"/>	Btu

Building

Orientation (Front door faces)	<input type="text" value="Southeast"/>
<small>North, East, West, South, Northeast, Northwest, Southeast, Southwest</small>	
Number of bedrooms	<input type="text" value="3"/>
Conditioned floor area	<input type="text" value="1340 Sq Ft"/>
Number of occupants	<input type="text" value="4"/>

To Check

1. Take the Total heat gain value from the Summer Design Conditions section.
2. Divide that number by 12,000 to get tons.
3. Divide the conditioned floor area by the result from step 2.

Example:

Total heat gain: 15,189

Conditioned square footage: 1,340

1. 15,189 Btu
2. $15,189 / 12,000 = 1.27$ tons
3. $1,340 / 1.27 = 1,055$ sq ft per ton

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