Vaulted Ceiling RSI Calculation

Zone 5

HRV

Assembly	**RSI Value**
*Exterior Air Film	0.03
Asphalt Shingles	0
½" Plywood Sheathing	0
2' x4" Blocking	0
2' x 10" Roof Joists 16" o.c. + R32 Roxul Batt Insul	1.47 (Step 3)
6mil Poly VB	0
1/2" GWB	0.08
*Interior Air Film	0.11
Total RSI	**4.78**
Required RSI	**4.67** (Step 2)

How to Determine the Total RSI value for the assembly listed above

Step 1:

You must know which Zone you are located in and if there is an HRV.

Step 2:

Determine the required RSI value for the opaque assembly by going to Table 9.36.2.6. B (with an HRV).
As per the chart below the required RSI is **4.67**

Table 9.36.2.6.B.
Effective Thermal Resistance of Above-ground Opaque Assemblies in Buildings with a Heat-Recovery Ventilator
Forming part of Sentence 9.36.2.6.(1)

Above-ground Opaque *Building* Assembly	**Heating Degree-Days of *Building* Location,[(1)] in Celsius Degree-Days**					
	Zone 4 < 3000	**Zone 5 3000 to 3999**	**Zone 6 4000 to 4999**	**Zone 7A 5000 to 5999**	**Zone 7B 6000 to 6999**	**Zone 8 ≥ 7000**
	Minimum Effective Thermal Resistance (RSI), (m^2·K)/W					
Cathedral ceilings and flat roofs	4.67	4.67	4.67	5.02	5.02	5.02

Step 3:

Determine the RSI of each component.

1. The framing and cavity insulation is determined using the calculation provided in A-9.36.2.4.(1)D.
    a. Only the insulation within the bottom chord is captured in this calculation. The remainder above the bottom chord is added as a layer of continuous insulation.

$$\text{RSIparallel} = \frac{100}{\left(\frac{\%\ of\ area\ of\ framing}{RSI\ f}\right) + \left(\frac{\%\ of\ area\ of\ cavity}{RSI\ c}\right)}$$

$$\text{RSIparallel} = \frac{100}{\left(\frac{13}{2.0}\right) + \left(\frac{87}{5.64}\right)}$$

$$\text{RSIparallel} = \frac{100}{(6.50) + (15.43)}$$

$$\text{RSIparallel} = \frac{100}{21.93}$$

$$\text{RSIparallel} = 4.56$$

    b. Table A-9.36.2.4.(1)A is used to determine the % of cavity and framing used in the calculation above.

Table A-9.36.2.4.(1)A.
Framing and Cavity Percentages for Typical Wood-frame Assemblies[(1)]

Wood-frame Assemblies	Frame Spacing, mm o.c.									
	304		406		488		610		1220	
	% Area Framing	% Area Cavity	% Area Framing	% Area Cavity	% Area Framing	% Area Cavity	% Area Framing	% Area Cavity	% Area Framing	% Area Cavity
roofs with lumber rafters and ceilings with lumber joists	–	–	13	87	11.5	88.5	10	90	–	–

    c. The RSIf (2.0 in this case) is determined by multiplying the actual length of the stud (9.25” or 235mm) by its RSI value listed in table A-9.36.2.4.(1)D.
        i. 0.0085 (m²•K)/W per mm x235mm =**2.0**
        ii.
    d. The RSIc (5.64) is determined in this case from the RSI value listed for the product as per the manufacture spec, all we have to do is convert it to metric.
        iii. Convert the R value to RSI
            a. R32 ÷5.678 =**5.64**

2. The value for most common components can just be taken from Table A-9.36.2.4.(1)D. The manufacture specification is required to be submitted for all items which are not listed here.

3. An exterior air film is added where applicable. For example, an attic assembly will have an exterior air film. A floor slab assembly will **not** have an exterior air film. The value is found in Table A-9.36.2.4.(1)D.

4. An interior air film is added to every assembly. The value is found in Table A-9.36.2.4.(1)D.

Table A-9.36.2.4.(1)D.
Thermal Resistance Values of Common Building Materials[(1)]

Air Films	Thickness of Material	Thermal Resistance (RSI), $(m^2 \cdot K)/W$ per mm	Thermal Resistance (RSI), $(m^2 \cdot K)/W$ for thickness listed
Exterior:			
ceiling, floors and walls wind 6.7 m/s (winter)	—	—	0.03
Interior:			
ceiling (heat flow up)	—	—	0.11
floor (heat flow down)	—	—	0.16
walls (heat flow horizontal)	—	—	0.12

Step 4:

1. Once you have determined all the values for the assembly, add them up and voilà, you have determined its RSI value☺