

# Effective R-value of block wall with insulation between strapping

| 23% framing-no windows   | R-Value     |          |
|--------------------------|-------------|----------|
|                          | Cavity      | Studs    |
| Outside air film         | 0.17        | 0.17     |
| 8" CMU                   | 0.64        | 0.64     |
| 1/2" OSB                 | 0           | 0        |
| 1" x 3"                  | n/a         | 1.06     |
| cavity insulation        | 5           | n/a      |
| 1/2" gypsum              | 0.45        | 0.45     |
| Interior air film        | 0.68        | 0.68     |
| <b>Sub-Totals</b>        | <b>6.94</b> | <b>3</b> |
| <b>Total Wall R- Val</b> | <b>4.64</b> |          |

# Effective R-value of 2 x 4 wall with no foam sheathing

| 23% framing-no windows   | R-Value      |             |
|--------------------------|--------------|-------------|
|                          | Cavity       | Studs       |
| Outside air film         | 0.17         | 0.17        |
| Exterior insulation      | 0            | 0           |
| 1/2" OSB                 | 0.62         | 0.62        |
| 2 x 4 stud-wood          | n/a          | 3.71        |
| cavity insulation        | 13           | n/a         |
| 1/2" gypsum              | 0.45         | 0.45        |
| Interior air film        | 0.68         | 0.68        |
| <b>Sub-Totals</b>        | <b>14.92</b> | <b>5.63</b> |
| <b>Total Wall R- Val</b> | <b>10.17</b> |             |

# Effective R-value of 2 x 6 wall with R-5 foam sheathing

| 23% framing-no windows   | R-Value      |              |
|--------------------------|--------------|--------------|
|                          | Cavity       | Studs        |
| Outside air film         | 0.17         | 0.17         |
| Exterior insulation      | 5            | 5            |
| 1/2" OSB                 | 0.62         | 0.62         |
| 2 x 6 stud-wood          | n/a          | 5.83         |
| cavity insulation        | 19           | n/a          |
| 1/2" gypsum              | 0.45         | 0.45         |
| Interior air film        | 0.68         | 0.68         |
| <b>Sub-Totals</b>        | <b>25.92</b> | <b>12.75</b> |
| <b>Total Wall R- Val</b> | <b>19.42</b> |              |

# What's my R-Value?

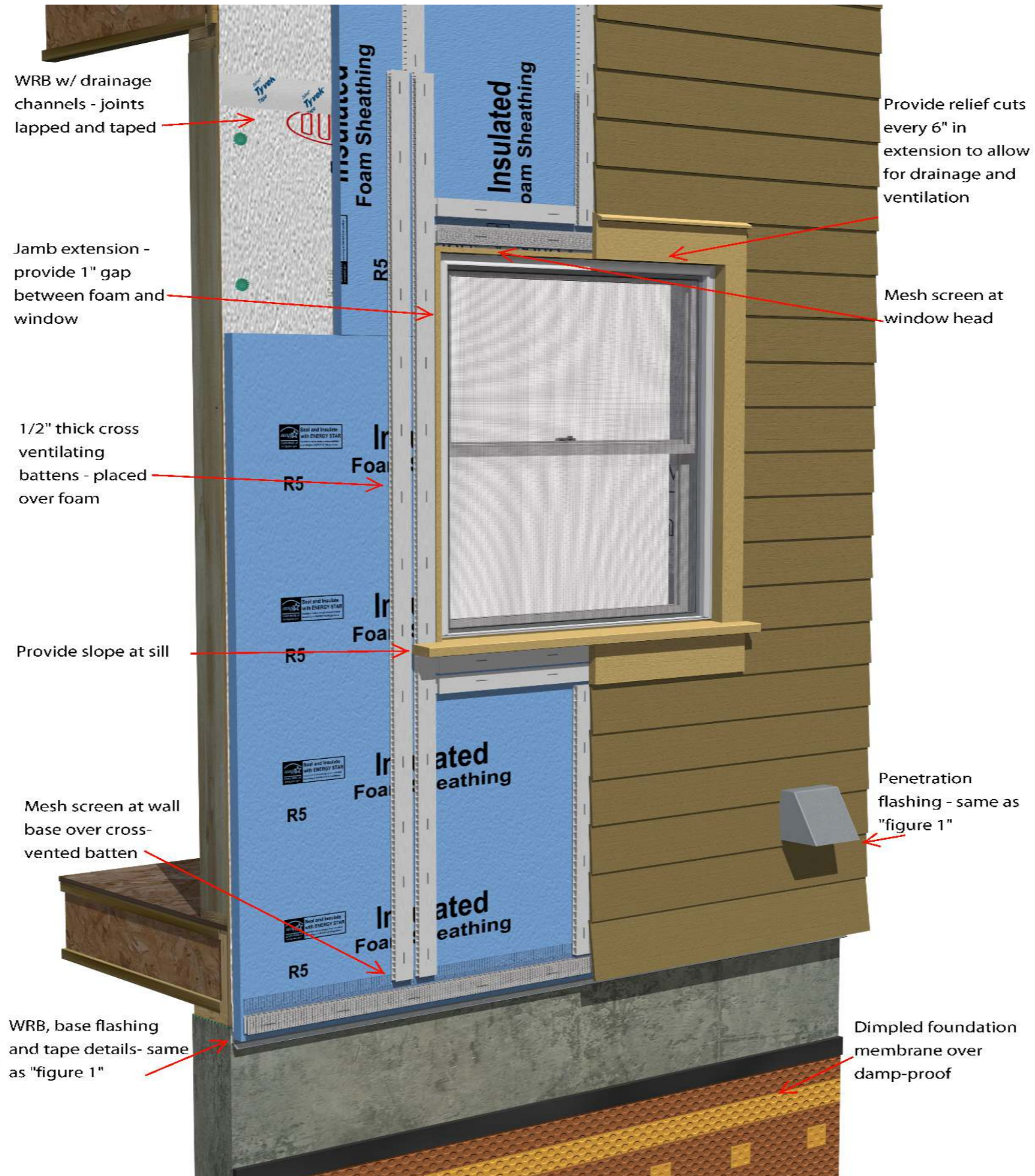
| 2" x 4/6" wall with various cavity and/or continuous insulation      | Total wall R-Value - including framing, insulation, sheetrock, OSB etc... |
|--|---|
| 2 x 4 wall with R- 13 insulation                                     | 10.17   |
| 2 x 4 wall with R-13 insulation and R-5 exterior                     | 15.17   |
| R-13 blown cavity + R-10 cont. ext. insulation                       | 20.17   |
| R-13 blown cavity + R-20 cont. ext. insulation                       | 30.13   |
| Staggered stud (2 x 4 on 2 x 6 plate) with R-24.5 cavity insulation. | 16.60   |

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# What's my R-Value?

| 2" x 6" wall with various cavity and/or continuous insulation                      | Total wall R-Value - including framing, insulation, sheetrock, OSB etc... |
|--|---|
| R-19 cavity insulation ( batts - perfect install )                                 | 14.42   |
| R-21 blown cavity ( fiberglass etc.)   | 15.05   |
| HD spray foam ( 2" + R-14 blown) a.k.a. flash and blow - total cavity R-val = 27.8 | 16.58   |
| R-21 blown cavity + R-5 cont. ext. insulation                                      | 20.05   |
| R-21 blown cavity + R-10 cont. ext. insulation                                     | 25.05   |
| R-21 blown cavity + R-20 cont. ext. insulation                                     | 35.05   |

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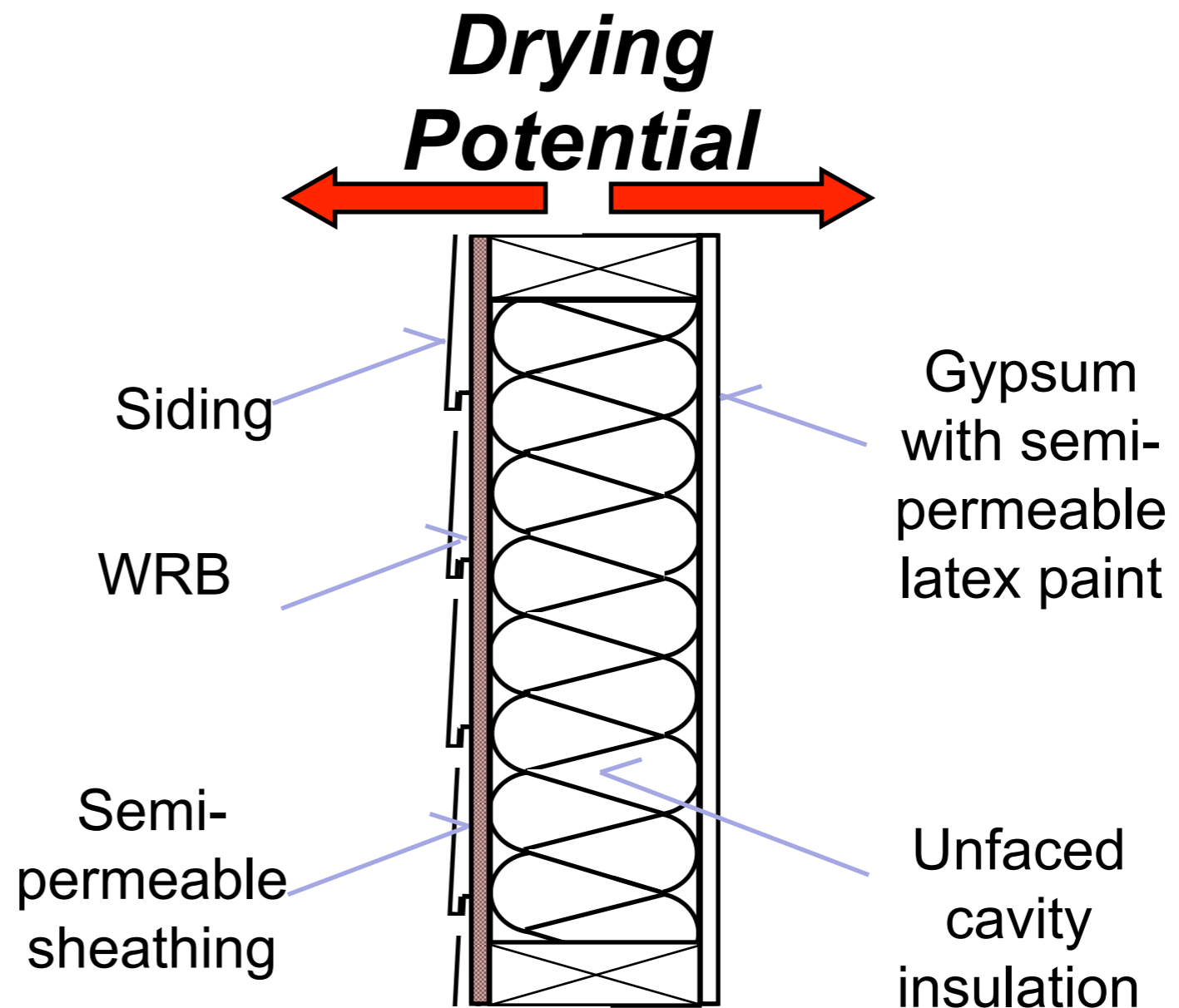


# Regional issue: Mixed Humid

Moisture drive depends on season

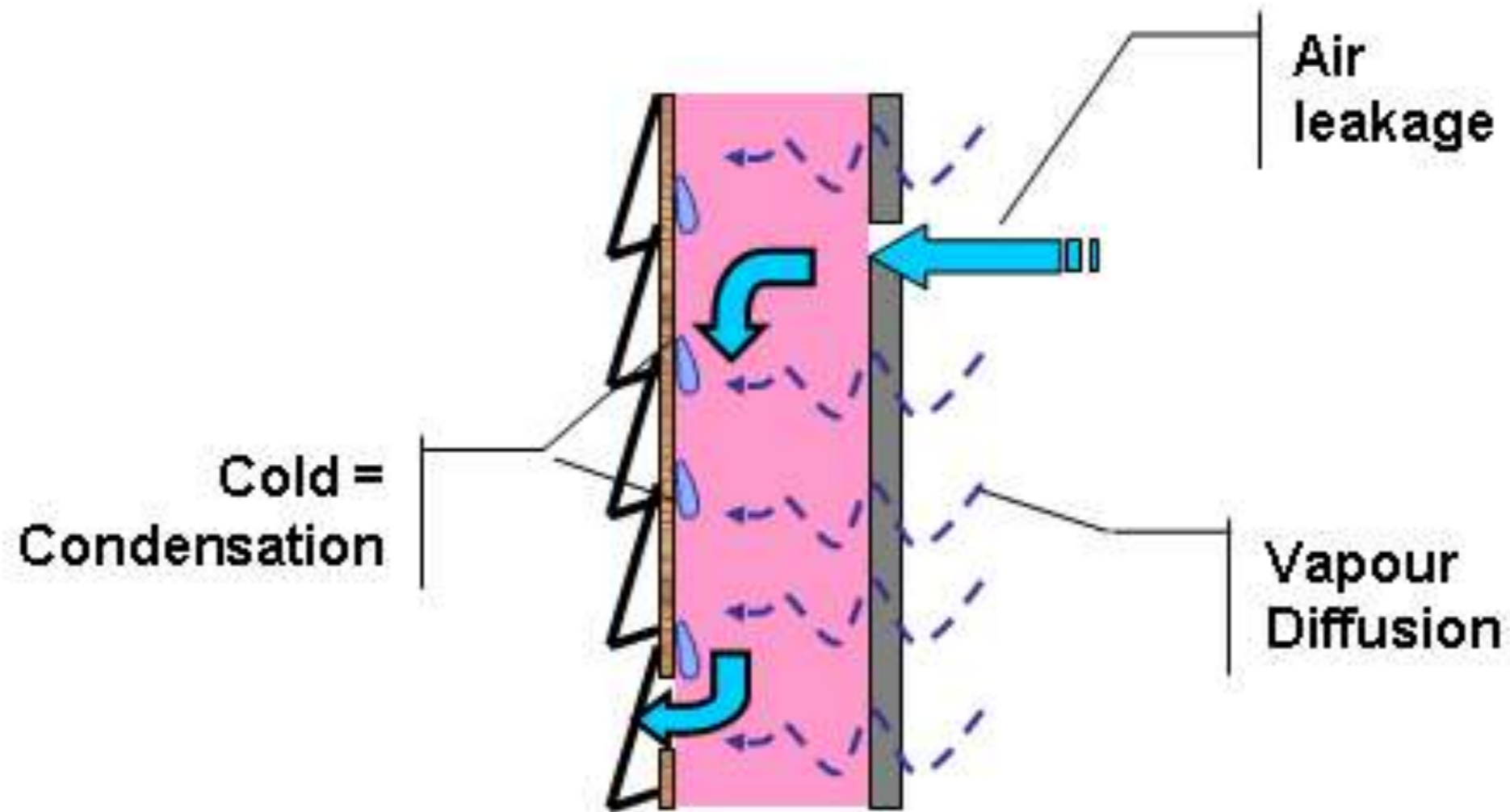
“flow thru” dries in or out

Foam sheathing a good idea



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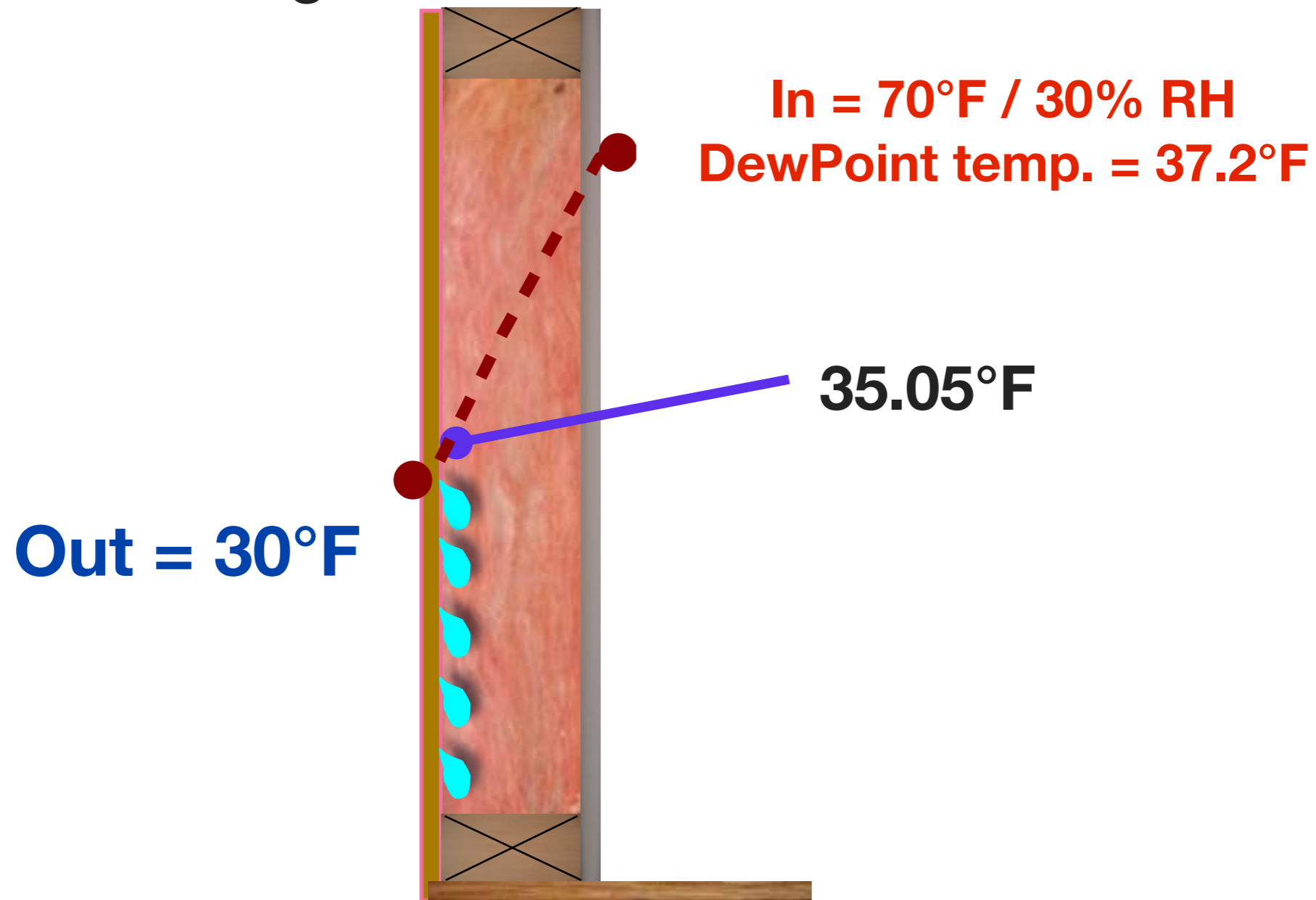
# Uncontrolled air leakage can result in condensation of moisture in buildings



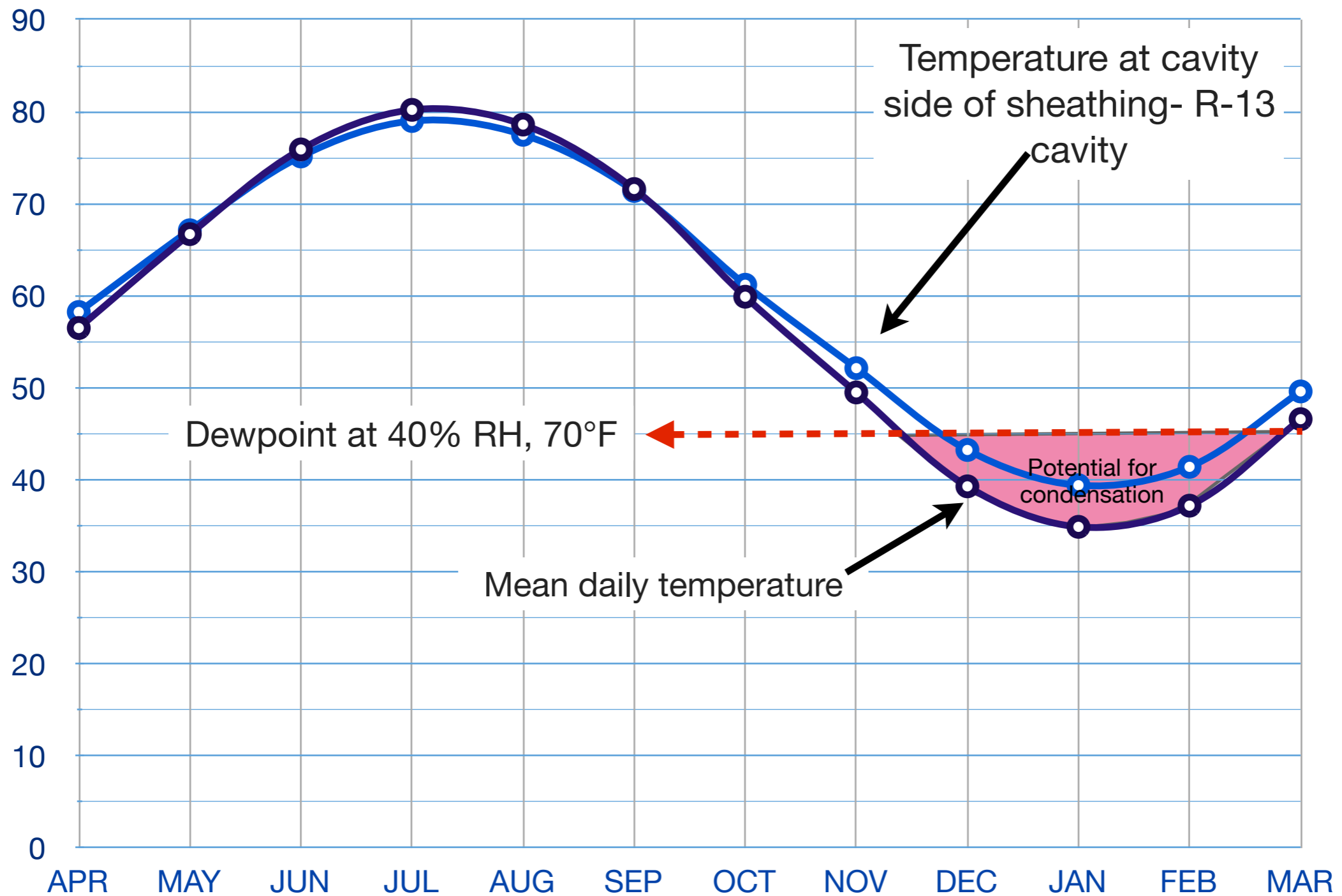


# Surface temperature calculation - 2 x 4 walls, w/ R-13 insulation

Temp. @ sheathing



# Climate zone 4 wall - 2 x 4 framed wall with R-13 in cavity.

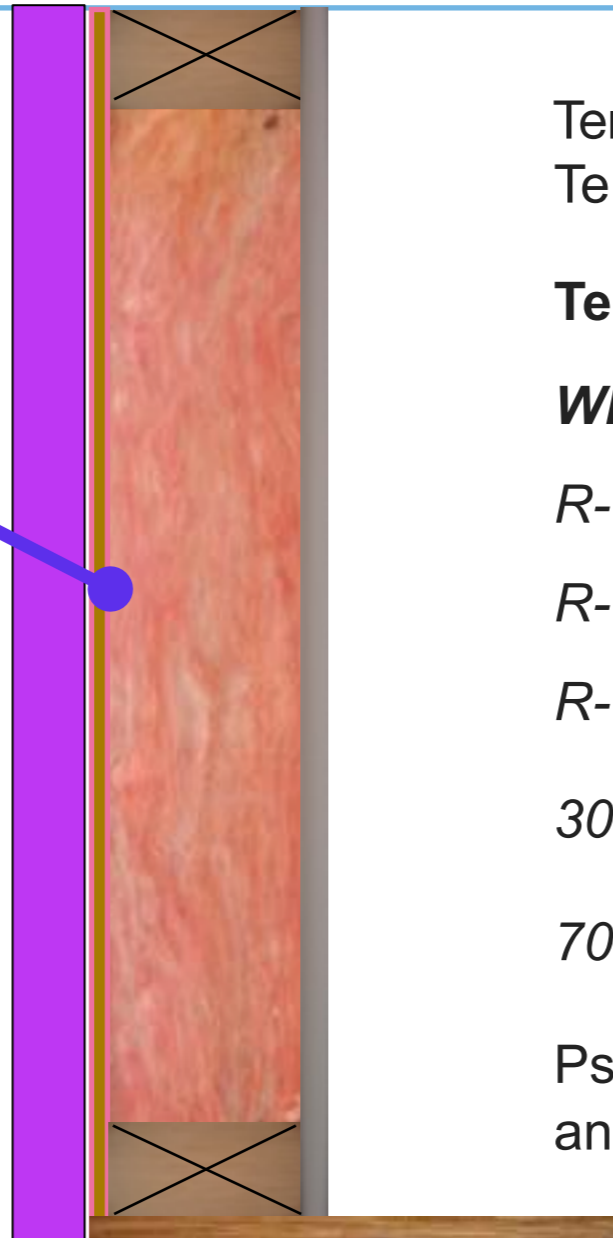


Quick calculation-2 x 4 (R-13) wall + R-5 exterior insulation. Inside it is 70 F and 30% RH, outside is 30 F.

**Temp. @ sheathing**

**?°F**

**30°F**



Temp at Sheathing = Ratio of R-Value x  $\Delta T$  + Outdoor Temp.

$$\text{Temp at sheathing} = 6/19 \times 40 + (30) = 42.63^\circ \text{ F}$$

**Where:**

*R-5 Exterior Insulation + R-1 OSB/PLY = R-6*

*R-13 cavity insulation*

*R-19 = exterior insulation + Interior insulation + OSB etc..*

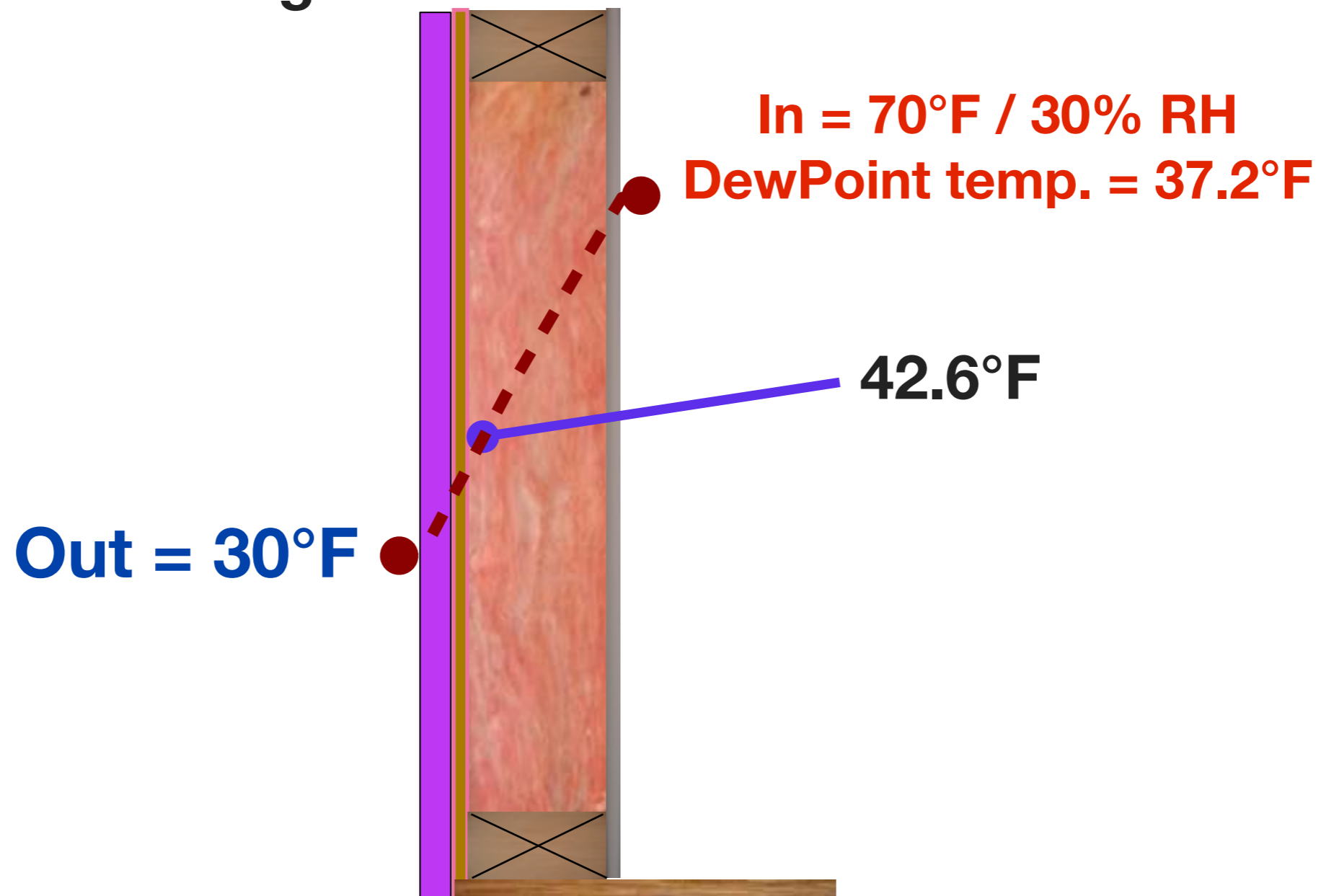
*30° F Outside*

*70° F Inside*

Psychrometric chart indicates a DP temp of 37.2 @ 70° F and 30% RH

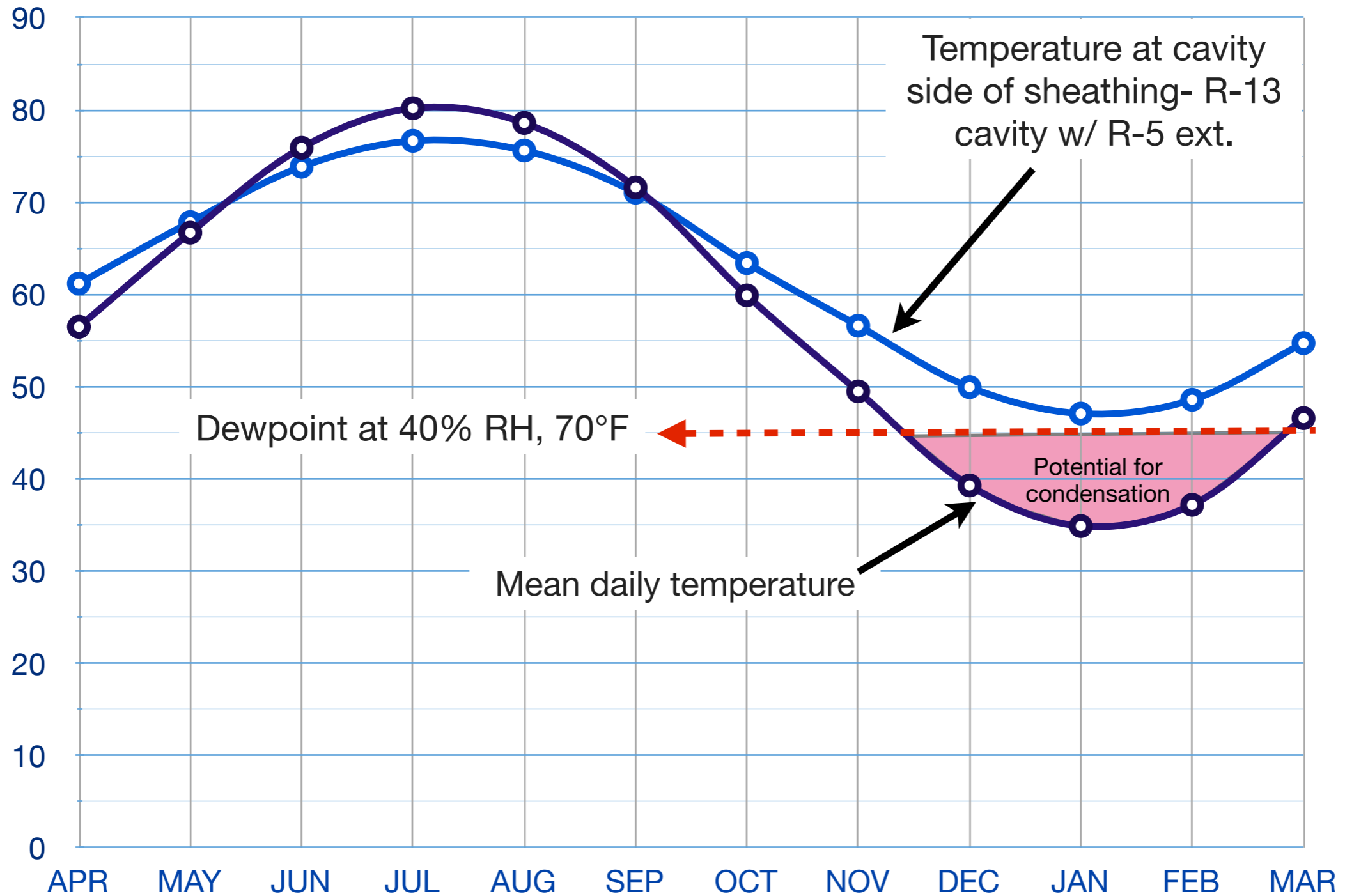
Surface temperature calculation - 2 x 4 walls,  
w/ R-13 insulation + R5 ext.

### Temp. @ sheathing



32% of the total wall R-value is outside sheathing plane

# Climate zone 4 wall - R-5 ext insulation on 2 x 4 framed wall with R-13 in cavity.

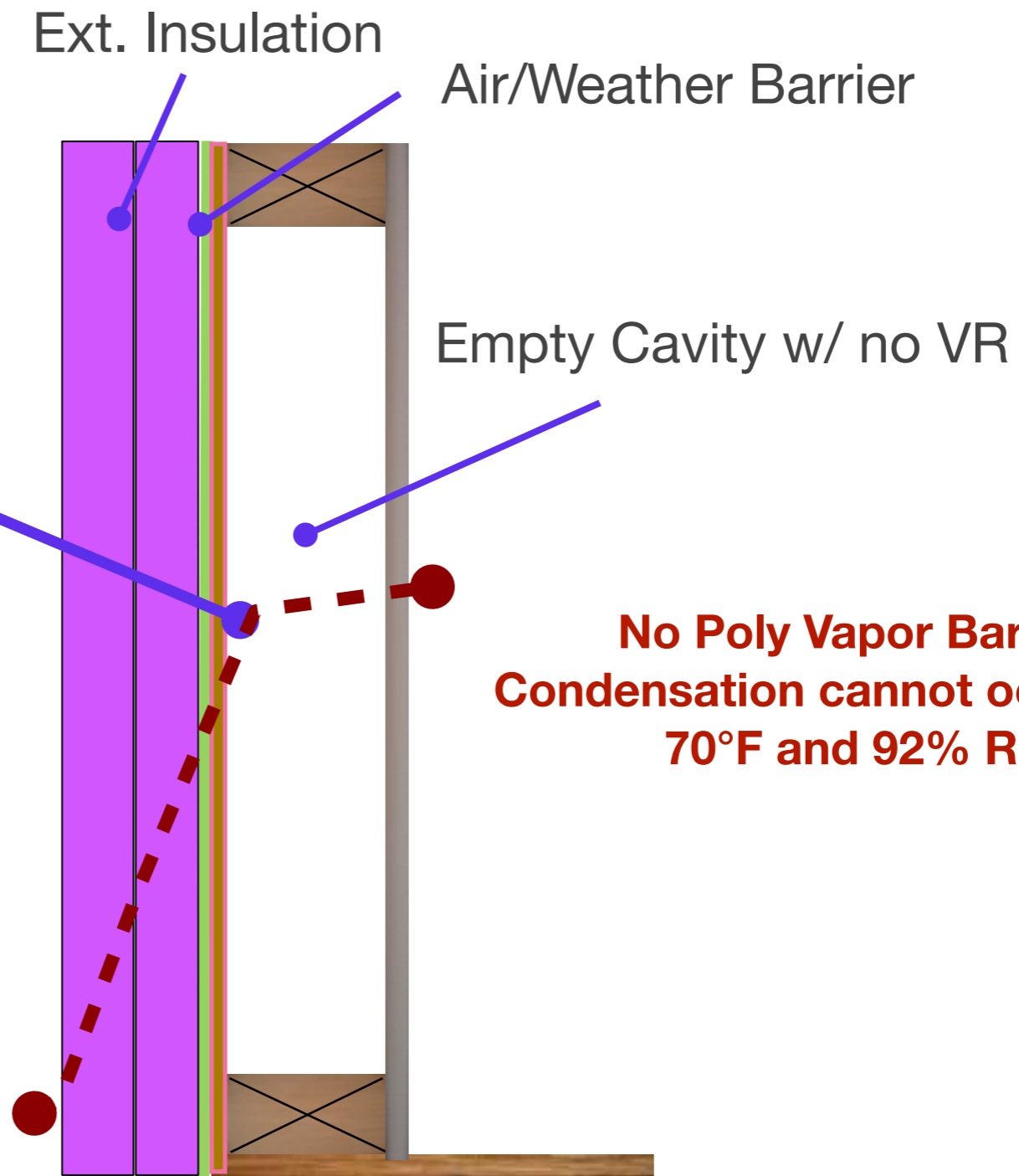


# Surface temperature calculation -CLZ 7 (extreme - REMOTE 2 x 4/6 walls Ext. insulation= R-25

**Temp. @ sheathing**

**67.14 °F**

**Average Outdoor  
Temp= -10°F**



Class III Vapor retarders (semi-permeable) are permitted if:

Permeance of  
< 10 or >1.0

| Climate Zone    | Minimum Cont. Insulation R-Value |             |
|-----------------|----------------------------------|-------------|
|                 | 2 x 4 walls                      | 2 x 6 walls |
| Marine & Zone 4 | R-2.5                            | R-3.75      |
| Zone 5          | R-5                              | R-7.5       |
| Zone 6          | R-7.5                            | R-11.25     |
| Zones 7 & 8     | R-10                             | R-15        |

2009 IRC section R601.3.1

2012 IRC section R806.5- Condensation Control

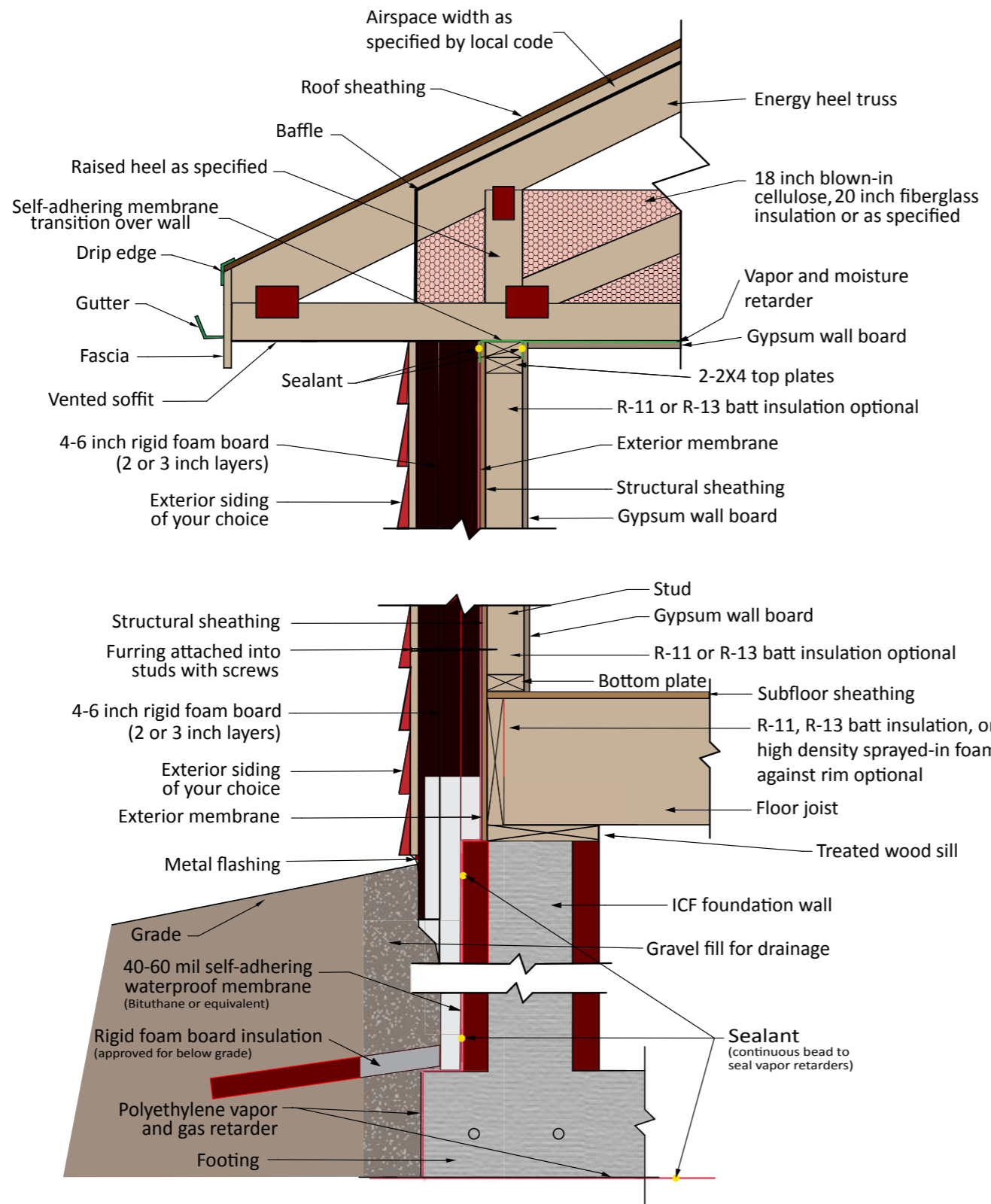


Figure 1. WALL CROSS SECTION

A great Alaska Partner -CCHRC



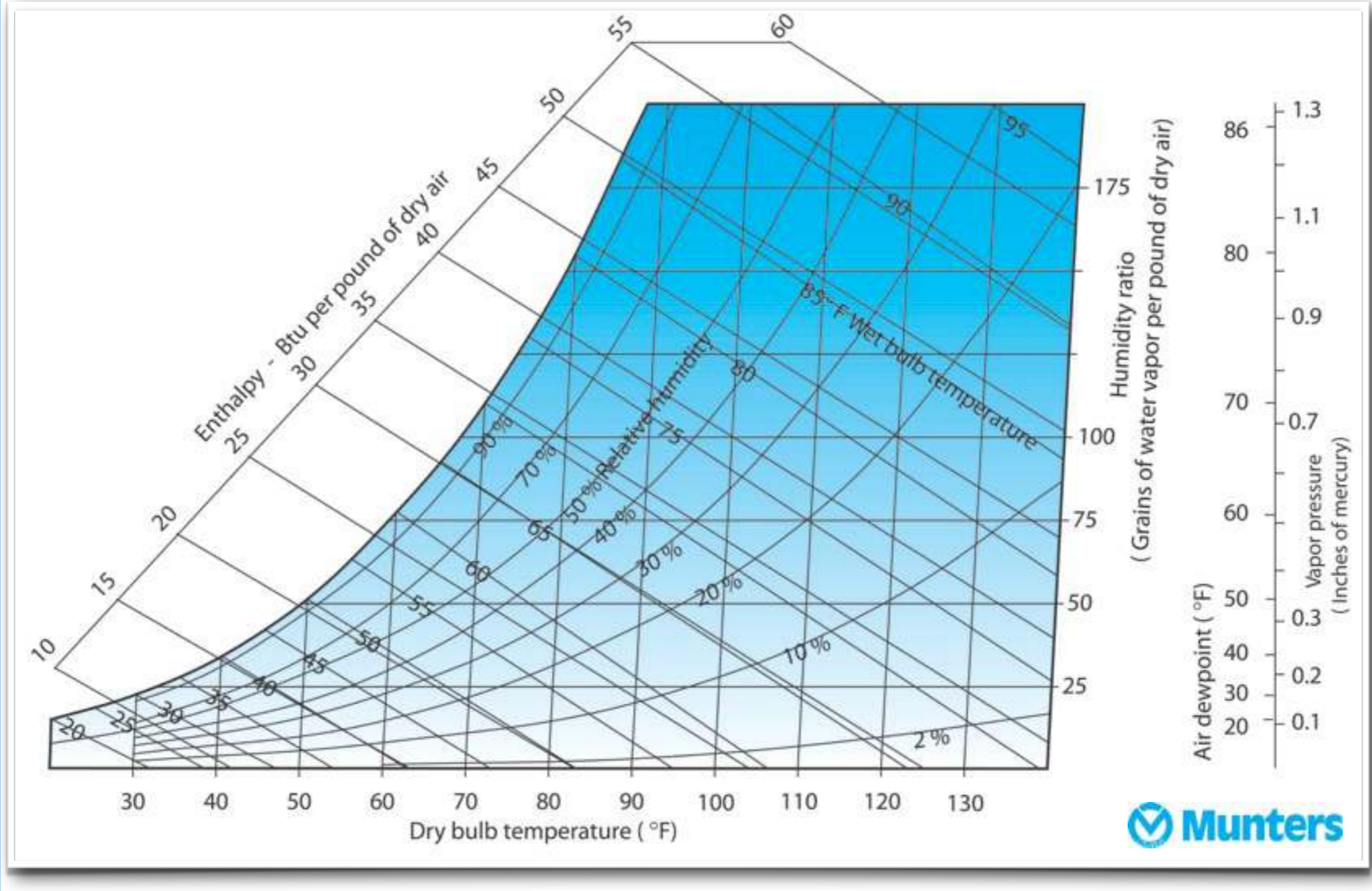


Image from CCHRC REMOTE manual



Image from CCHRC

# Psychrometric Exercise



Determine the dewpoint temp. of air at a temperature of 70°F and a relative humidity of 50%

