37.33 **A $4in$ thick composite wall has an R-value of of $8\frac{hr \cdot ft^{2} \cdot ^{\circ}F}{Btu}$. The inside and outside convective heat transfer coefficients are $1.5\frac{Btu}{hr \cdot ft^{2} \cdot ^{\circ}F}$ and $3\frac{Btu}{hr \cdot ft^{2} \cdot ^{\circ}F}$, respectively. What is the total thermal resistance?**

A. $0.1\frac{hr \cdot ft^{2} \cdot ^{\circ}F}{Btu}$

B. $0.9\frac{hr \cdot ft^{2} \cdot ^{\circ}F}{Btu}$

C. $1.1\frac{hr \cdot ft^{2} \cdot ^{\circ}F}{Btu}$

D. $9.0\frac{hr \cdot ft^{2} \cdot ^{\circ}F}{Btu}$

The R-value for a Composite Wall is the thermal resistance for all materials from which the wall is composed. Film coefficients are an outcome of the orientation, air velocity, and other fluid characteristics, and not a function of the wall construction. Therefore, when calulating the total thermal resistance, the effect of films must be added separately if they are able to be known. In this case, the film coefficients for inside and outside are both given. Write an expression for the total resistance, substitute, and solve.

$$R_t = \frac{1}{h_i} + R + \frac{1}{h_o}$$

$$R_t = \frac{1}{1.5\frac{Btu}{hr \cdot ft^{2} \cdot ^{\circ}F}} + 8\frac{hr \cdot ft^{2} \cdot ^{\circ}F}{Btu} + \frac{1}{3\frac{Btu}{hr \cdot ft^{2} \cdot ^{\circ}F}} = 9\frac{hr \cdot ft^{2} \cdot ^{\circ}F}{Btu}$$

Answer D