

33. The volume V_{cav} of the cavities is the difference between the volume V_{cast} of the casting as a whole and the volume V_{iron} contained: $V_{\text{cav}} = V_{\text{cast}} - V_{\text{iron}}$. The volume of the iron is given by $V_{\text{iron}} = W/g\rho_{\text{iron}}$, where W is the weight of the casting and ρ_{iron} is the density of iron. The effective weight in water (of density ρ_w) is $W_{\text{eff}} = W - g\rho_w V_{\text{cast}}$. Thus, $V_{\text{cast}} = (W - W_{\text{eff}})/g\rho_w$ and

$$\begin{aligned} V_{\text{cav}} &= \frac{W - W_{\text{eff}}}{g\rho_w} - \frac{W}{g\rho_{\text{iron}}} \\ &= \frac{6000 \text{ N} - 4000 \text{ N}}{(9.8 \text{ m/s}^2)(1000 \text{ kg/m}^3)} - \frac{6000 \text{ N}}{(9.8 \text{ m/s}^2)(7.87 \times 10^3 \text{ kg/m}^3)} \\ &= 0.126 \text{ m}^3 . \end{aligned}$$