3-57 The properties of compressed liquid water at a specified state are to be determined using the compressed liquid tables, and also by using the saturated liquid approximation, and the results are to be compared.

Analysis Compressed liquid can be approximated as saturated liquid at the given temperature. Then from Table A-4,

$$T = 80°\text{C} \quad \Rightarrow \quad \begin{aligned} v &\cong v_{f\,@\,80°\text{C}} = 0.001029\ \text{m}^3/\text{kg} \quad (0.90\%\ \text{error}) \\ u &\cong u_{f\,@\,80°\text{C}} = 334.97\ \text{kJ/kg} \quad (1.35\%\ \text{error}) \\ h &\cong h_{f\,@\,80°\text{C}} = 335.02\ \text{kJ/kg} \quad (4.53\%\ \text{error}) \end{aligned}$$

From compressed liquid table (Table A-7),

$$\left.\begin{matrix} P = 20\ \text{MPa} \\ T = 80°\text{C} \end{matrix}\right\} \begin{matrix} v = 0.00102\ \text{m}^3/\text{kg} \\ u = 330.50\ \text{kJ/kg} \\ h = 350.90\ \text{kJ/kg} \end{matrix}$$

The percent errors involved in the saturated liquid approximation are listed above in parentheses.