2.54

2.54 An inverted U-tube manometer containing oil ($SG = 0.8$) is located between two reservoirs as shown in Fig. P2.54. The reservoir on the left, which contains carbon tetrachloride, is closed and pressurized to 8 psi. The reservoir on the right contains water and is open to the atmosphere. With the given data, determine the depth of water, h, in the right reservoir.

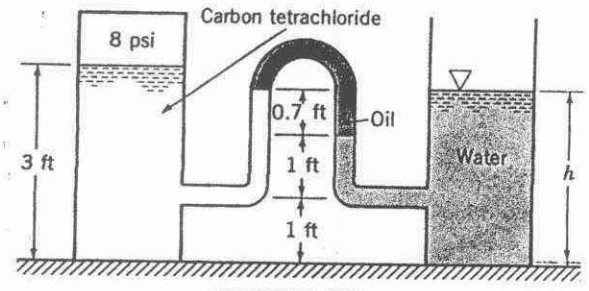

FIGURE P2.54

Let p_A be the air pressure in left reservoir. Manometer equation can be written as

$$p_A + \gamma_{CCl_4}(3\,ft - 1\,ft - 1\,ft - 0.7\,ft) + \gamma_{oil}(0.7\,ft) - \gamma_{H_2O}(h - 1\,ft - 1\,ft) = 0$$

so that

$$h = \frac{p_A + \gamma_{CCl_4}(0.3\,ft) + \gamma_{oil}(0.7\,ft)}{\gamma_{H_2O}} + 2\,ft$$

$$= \frac{\left(8\,\frac{lb}{in.^2}\right)\left(144\,\frac{in.^2}{ft^2}\right) + \left(99.5\,\frac{lb}{ft^3}\right)(0.3\,ft) + \left(57.0\,\frac{lb}{ft^3}\right)(0.7\,ft)}{62.4\,\frac{lb}{ft^3}} + 2\,ft$$

$$= \underline{\underline{21.6\,ft}}$$