The PC model: The PC (Phase-Change) model is the most accurate of all models and is used for evaluation of properties of fluids. The PC model must be used whenever there is any possibility of any phase change (boiling or condensation for example).

Locate the state: Evaluation of a state begins with determining the phase composition and locating the state on a T-s diagram. Read Sec. 3.4.6 for a detailed algorithm to locate the state.

Superheated vapor: Interpolate from the superheated tables.

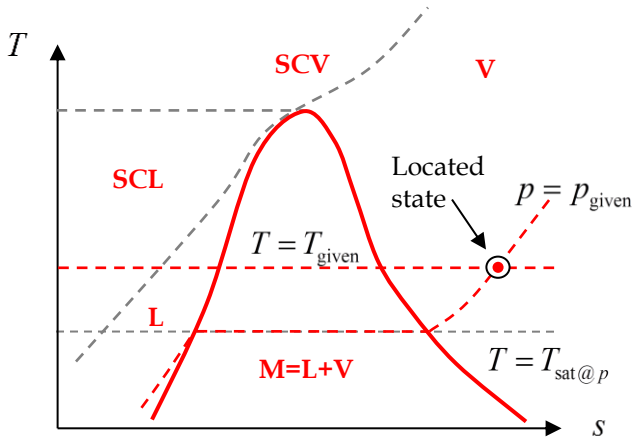

Fig. 3.37 The phase composition (V, M, L, etc.) can be detected from the intersection of the constant-pressure and constant-temperature lines.

Saturated mixture of liquid and vapor: Interpolate from the saturation pressure or temperature tables. For a mixture the goal should be to find the quality which is used to find specific properties of a mixture. For a saturated liquid or vapor the quality is known (0 or 1).

$$b=(1-x)b_{f@T}+xb_{g@T};\quad \left[\text{Unit of B}(=mb)\text{ per unit mass}\right] \tag{1}$$

Subcooled liquid: Use the CL (compressed liquid) sub-model to obtain liquid properties from the saturation table.

CL sub-model:

v, u and s depend on T only. Only h depends on h. Therefore, use the temperature-sorted saturation table to obtain

$$v=v_{f@T};\ \ u=u_{f@T};\ \ s=s_{f@T};\ \ h=u+pv=u_{f@T}+pv_{f@T} \tag{2}$$

General State Equations: (Applies to any substance)

$$m=\rho V;\ \ \rho=\frac{1}{v};\ \ \text{ke}=\frac{V^2}{2000};\ \ \text{pe}=\frac{gz}{1000};\ \ e\equiv u+ke+pe;\ \ j\equiv h+ke+pe;\ \ h\equiv u+pv \tag{1}$$

$$E=me;\ \ S=ms;\ \ KE=m(\text{ke});\ \ PE=m(\text{pe}) \tag{2}$$

$$\dot{m}=\rho AV;\ \ \dot{V}=AV;\ \ \dot{E}=\dot{m}e;\ \ \dot{S}=\dot{m}s \tag{3}$$

$$Tds=du+pdv=dh-vdp;\quad c_v\equiv\left(\frac{\partial u}{\partial T}\right)_v;\ c_p\equiv\left(\frac{\partial h}{\partial T}\right)_p \tag{4}$$

Reference: Chapter 1 introduces the concept of states and properties, Chapter 3 covers various material models and state evaluation, and Chapter 11 introduces advanced concepts on property evaluation. Read more about the PC model in Sec. 3.4.