Bridgman Tables
Convenient for Single-component Pressure Explicit Equations of State and Constant Pressure Heat Capacity

I. Volume

1. $(\partial p)_V = -(\partial V)_p = \left(\dfrac{\partial p}{\partial T}\right)_V$

2. $(\partial T)_V = -(\partial V)_T = 1$

3. $(\partial S)_V = -(\partial V)_S = \dfrac{C_P}{T} + \dfrac{\left(\dfrac{\partial p}{\partial T}\right)_V^2}{\left(\dfrac{\partial p}{\partial V}\right)_T}$

4. $(\partial U)_V = -(\partial V)_U = C_P + \dfrac{T\left(\dfrac{\partial p}{\partial T}\right)_V^2}{\left(\dfrac{\partial p}{\partial V}\right)_T}$

5. $(\partial H)_V = -(\partial V)_H = C_P + \dfrac{T\left(\dfrac{\partial p}{\partial T}\right)_V^2}{\left(\dfrac{\partial p}{\partial V}\right)_T} + V\left(\dfrac{\partial p}{\partial T}\right)_V$

6. $(\partial A)_V = -(\partial V)_A = -S$

7. $(\partial G)_V = -(\partial V)_G = -S + V\left(\dfrac{\partial p}{\partial T}\right)_V$

II. Temperature

1. $(\partial V)_T = -(\partial T)_V = -1$

2. $(\partial p)_T = -(\partial T)_p = -\left(\dfrac{\partial p}{\partial V}\right)_T$

3. $(\partial S)_T = -(\partial T)_S = -\left(\dfrac{\partial p}{\partial T}\right)_V$

4. $(\partial U)_T = -(\partial T)_U = p - T\left(\dfrac{\partial p}{\partial T}\right)_V$

5. $(\partial H)_T = -(\partial T)_H = -T\left(\dfrac{\partial p}{\partial T}\right)_V - V\left(\dfrac{\partial p}{\partial V}\right)_T$

6. $(\partial A)_T = -(\partial T)_A = p$

7. $(\partial G)_T = -(\partial T)_G = -V\left(\dfrac{\partial p}{\partial V}\right)_T$

III. Pressure

1. $(\partial V)_p = -(\partial p)_V = -\left(\dfrac{\partial p}{\partial T}\right)_V$

2. $(\partial T)_p = -(\partial p)_T = \left(\dfrac{\partial p}{\partial V}\right)_T$

3. $(\partial S)_p = -(\partial p)_S = \dfrac{C_P}{T}\left(\dfrac{\partial p}{\partial V}\right)_T$

4. $(\partial U)_p = -(\partial p)_U = C_P\left(\dfrac{\partial p}{\partial V}\right)_T + p\left(\dfrac{\partial p}{\partial T}\right)_V$

5. $(\partial H)_p = -(\partial p)_H = C_P\left(\dfrac{\partial p}{\partial V}\right)_T$

6. $(\partial A)_p = -(\partial p)_A = p\left(\dfrac{\partial p}{\partial T}\right)_V - S\left(\dfrac{\partial p}{\partial V}\right)_T$

7. $(\partial G)_p = -(\partial p)_G = -S\left(\dfrac{\partial p}{\partial V}\right)_T$

IV. Entropy

1. $\quad (\partial p)_S = -(\partial S)_p = -\dfrac{C_P}{T}\left(\dfrac{\partial p}{\partial V}\right)_T$

2. $\quad (\partial T)_S = -(\partial S)_T = \left(\dfrac{\partial p}{\partial T}\right)_V$

3. $\quad (\partial V)_S = -(\partial S)_V = -\dfrac{C_P}{T} - \dfrac{\left(\dfrac{\partial p}{\partial T}\right)_V^2}{\left(\dfrac{\partial p}{\partial V}\right)_T}$

4. $\quad (\partial U)_S = -(\partial S)_U = p\left[\dfrac{C_P}{T} + \dfrac{\left(\dfrac{\partial p}{\partial T}\right)_V^2}{\left(\dfrac{\partial p}{\partial V}\right)_T}\right]$

5. $\quad (\partial H)_S = -(\partial S)_H = -\dfrac{V}{T}\left[C_P\left(\dfrac{\partial p}{\partial V}\right)_T\right]$

6. $\quad (\partial A)_S = -(\partial S)_A = p\left[\dfrac{C_P}{T} + \dfrac{\left(\dfrac{\partial p}{\partial T}\right)_V^2}{\left(\dfrac{\partial p}{\partial V}\right)_T}\right] - S\left(\dfrac{\partial p}{\partial T}\right)_V$

7. $\quad (\partial G)_S = -(\partial S)_G = -\dfrac{V}{T}\left[C_P\left(\dfrac{\partial p}{\partial V}\right)_T\right] - S\left(\dfrac{\partial p}{\partial T}\right)_V$

V. Internal Energy

1. $(\partial p)_U = -(\partial U)_p = -C_P\left(\dfrac{\partial p}{\partial V}\right)_T - p\left(\dfrac{\partial p}{\partial T}\right)_V$

2. $(\partial T)_U = -(\partial U)_T = -p + T\left(\dfrac{\partial p}{\partial T}\right)_V$

3. $(\partial V)_U = -(\partial U)_V = -C_P - \dfrac{T\left(\dfrac{\partial p}{\partial T}\right)_V^2}{\left(\dfrac{\partial p}{\partial V}\right)_T}$

4. $(\partial S)_U = -(\partial U)_S = -p\left[\dfrac{C_P}{T} + \dfrac{\left(\dfrac{\partial p}{\partial T}\right)_V^2}{\left(\dfrac{\partial p}{\partial V}\right)_T}\right]$

5. $(\partial H)_U = -(\partial U)_H = -p\left[C_P + \dfrac{T\left(\dfrac{\partial p}{\partial T}\right)_V^2}{\left(\dfrac{\partial p}{\partial V}\right)_T} + V\left(\dfrac{\partial p}{\partial T}\right)_V\right] - V\left[C_P\left(\dfrac{\partial p}{\partial V}\right)_T\right]$

6. $(\partial A)_U = -(\partial U)_A = p\left[C_P + \dfrac{T\left(\dfrac{\partial p}{\partial T}\right)_V^2}{\left(\dfrac{\partial p}{\partial V}\right)_T} + S\right] - ST\left(\dfrac{\partial p}{\partial T}\right)_V$

7. $(\partial G)_U = -(\partial U)_G = pS - \left[pV + ST\right]\left(\dfrac{\partial p}{\partial T}\right)_V - VC_P\left(\dfrac{\partial p}{\partial V}\right)_T$

VI. Enthalpy

1. $$(\partial p)_H = -(\partial H)_p = -C_P\left(\frac{\partial p}{\partial V}\right)_T$$

2. $$(\partial T)_H = -(\partial H)_T = T\left(\frac{\partial p}{\partial T}\right)_V + V\left(\frac{\partial p}{\partial V}\right)_T$$

3. $$(\partial V)_H = -(\partial H)_V = -C_P - \frac{T\left(\frac{\partial p}{\partial T}\right)_V^2}{\left(\frac{\partial p}{\partial V}\right)_T} - V\left(\frac{\partial p}{\partial T}\right)_V$$

4. $$(\partial S)_H = -(\partial H)_S = \frac{V}{T}\left[C_P\left(\frac{\partial p}{\partial V}\right)_T\right]$$

5. $$(\partial U)_H = -(\partial H)_U = p\left[C_P + \frac{T\left(\frac{\partial p}{\partial T}\right)_V^2}{\left(\frac{\partial p}{\partial V}\right)_T} + V\left(\frac{\partial p}{\partial T}\right)_V\right] + V\left[C_P\left(\frac{\partial p}{\partial V}\right)_T\right]$$

6. $$(\partial A)_H = -(\partial H)_A = p\left[C_P + \frac{T\left(\frac{\partial p}{\partial T}\right)_V^2}{\left(\frac{\partial p}{\partial V}\right)_T}\right] + [pV - ST]\left(\frac{\partial p}{\partial T}\right)_V - SV\left(\frac{\partial p}{\partial V}\right)_T$$

7. $$(\partial G)_H = -(\partial H)_G = -V\left[C_P + S\left(\frac{\partial p}{\partial V}\right)_T - ST\left(\frac{\partial p}{\partial T}\right)_V\right]$$

VII. Helmholtz Free Energy

1. $(\partial p)_A = -(\partial A)_p = -p\left(\dfrac{\partial p}{\partial T}\right)_V + S\left(\dfrac{\partial p}{\partial V}\right)_T$

2. $(\partial T)_A = -(\partial A)_T = -p$

3. $(\partial V)_A = -(\partial A)_V = S$

4. $(\partial S)_A = -(\partial A)_S = -p\left[\dfrac{C_P}{T} + \dfrac{\left(\dfrac{\partial p}{\partial T}\right)_V^2}{\left(\dfrac{\partial p}{\partial V}\right)_T}\right] + S\left(\dfrac{\partial p}{\partial T}\right)_V$

5. $(\partial U)_A = -(\partial A)_U = -p\left[C_P + \dfrac{T\left(\dfrac{\partial p}{\partial T}\right)_V^2}{\left(\dfrac{\partial p}{\partial V}\right)_T} + S\right] + ST\left(\dfrac{\partial p}{\partial T}\right)_V$

6. $(\partial H)_A = -(\partial A)_H = -p\left[C_P + \dfrac{T\left(\dfrac{\partial p}{\partial T}\right)_V^2}{\left(\dfrac{\partial p}{\partial V}\right)_T}\right] + [ST - pV]\left(\dfrac{\partial p}{\partial T}\right)_V + SV\left(\dfrac{\partial p}{\partial V}\right)_T$

7. $(\partial G)_A = -(\partial A)_G = S\left[p + V\left(\dfrac{\partial p}{\partial V}\right)_T\right] - pV\left(\dfrac{\partial p}{\partial T}\right)_V$

VIII. Gibbs Free Energy

1. $$(\partial p)_G = -(\partial G)_p = S\left(\frac{\partial p}{\partial V}\right)_T$$

2. $$(\partial T)_G = -(\partial G)_T = V\left(\frac{\partial p}{\partial V}\right)_T$$

3. $$(\partial V)_G = -(\partial G)_V = S - V\left(\frac{\partial p}{\partial T}\right)_V$$

4. $$(\partial S)_G = -(\partial G)_S = \frac{V}{T}\left[C_P\left(\frac{\partial p}{\partial V}\right)_T\right] + S\left(\frac{\partial p}{\partial T}\right)_V$$

5. $$(\partial U)_G = -(\partial G)_U = -pS + \left[pV + ST\left(\frac{\partial p}{\partial T}\right)_V + VC_P\left(\frac{\partial p}{\partial V}\right)_T\right.$$

6. $$(\partial H)_G = -(\partial G)_H = V\left[C_P + S\left(\frac{\partial p}{\partial V}\right)_T + ST\left(\frac{\partial p}{\partial T}\right)_V\right.$$

7. $$(\partial A)_G = -(\partial G)_A = -S\left[p + V\left(\frac{\partial p}{\partial V}\right)_T\right] + pV\left(\frac{\partial p}{\partial T}\right)_V$$