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## Gas Fire Sizing/Thermal Expansion Information Sheet

Contact Name: \_\_\_\_\_ Phone #: (\_\_\_\_) \_\_\_\_\_  
 Customer Company: \_\_\_\_\_ Fax #: (\_\_\_\_) \_\_\_\_\_  
 Location: \_\_\_\_\_ Tag/PSV Numbers: \_\_\_\_\_  
 Quantity: \_\_\_\_\_

**1. Vessel Data**

- Vessel Inside Diameter (D): \_\_\_\_\_ in
- Vessel Length Seam to Seam (L) (Not Applicable for Spherical Tanks): \_\_\_\_\_ ft
- Vessel Mounting:     Horizontal     Vertical     Sphere
- Type of Ends (Not Applicable for Spherical Tanks):     Flat Head     Elliptical     Hemispherical

**2. Operating Data**

- Operating Pressure: \_\_\_\_\_ psig
- Operating Temperature: \_\_\_\_\_ °F
- Set Pressure: \_\_\_\_\_ psig
- Back Pressure: \_\_\_\_\_ psig

**3. Fluid Data**

- Gas Name: \_\_\_\_\_
- Gas Constant: \_\_\_\_\_
- Molecular Weight: \_\_\_\_\_

$$T_1 = \frac{T_n \times P_1}{P_n}$$

$$F = \frac{0.1406}{C \times K} \times \frac{(T_w - T_1)^{1.25}}{T_1^{0.6506}}$$

$$A = \frac{F \times A_w}{\sqrt{P_1}}$$

$$W = 0.1406 \times \sqrt{M \times P_1} \times \frac{A_w \times (T_w - T_1)^{1.25}}{T_1^{1.1506}}$$

Either use the required orifice area to choose the orifice size or use the required flowrate in a standard blocked flow calculation to find the correct valve.

**Variables:**

$T_n$  = Operating Temperature (°R)  
 $P_n$  = Operating Pressure (psia)  
 $P_1$  = Flowing Pressure (psia)  
 Set Pressure + Allowable Over Pressure + Atmospheric Pressure  
 Allowable Overpressure is typically 21% above Set for Fire and Thermal Expansion –  $P_1 = P_{set} + P_{set} \times 0.21 + 14.7$

$T_l$  = Reliving Temperature (°R)  
 The Set Pressure may need to be lowered to lower this value, allowing for the seal material temperature limits in the PRV

$T_w$  = Maximum Wall Temperature (°R)  
 Typical used value for carbon steel is 1560°R

$M$  = Molecular Weight

$C$  = Gas Constant

$K$  = Discharge Coefficient of Relief Valve

$A$  = Required Orifice Area of Relief Valve (in<sup>2</sup>)

$W$  = Required Flowrate (lb/hr)

$A_w$  = Exposed Surface Area of the Vessel (ft<sup>2</sup>)

Spherical Tank –  $A_w = \pi \times D^2$

Flat Head Tank –  $A_w = \pi \times \left( D \times L + \frac{D^2}{2} \right)$

Elliptical Tank –  $A_w = \pi \times D \times L + 2.61 \times D^2$

Hemispherical Tank –  $A_w = \pi \times (D \times L + D^2)$