Pipe Design Parameters :

Pipe Cover:	$H := 6 \ ft$	*Field Survey*
Nominal Pipe Diameter:	$D := 24 \ in$	*As Builts*

Cross-sectional Area: $\quad A := \pi \cdot \left(\dfrac{D}{2}\right)^2 = 452 \ in^2$

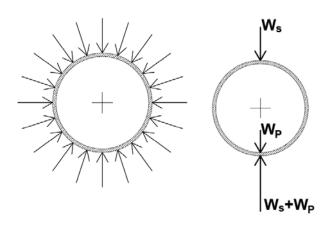|		
Pipe Outside Diameter:	$D_o := 2.15 \ ft$	*DIPRA Thrust Restraint Design - Table 2*
Working Pressure:	$P_W := 60 \ psi$	
Unit Weight of Pipe:	$W_p := 57 \ plf$	*DIPRA Thrust Restraint Design - Table 2*

Soil Characteristics :

Soil Unit Weight:	$\gamma := 120 \ pcf$	*Buried Flexible Steel Pipe, pg 110*
Soil Internal Friction Angle:	$\varphi' := 0.3 \ rad$	*Buried Flexible Steel Pipe, pg 110*

Calculate Unit Frictional Force, F$_f$:

Soil Pressure   Soil Force

Vertical Soil Pressure:
$$P_s := \gamma \cdot H = 720 \ psf$$

Soil Weight per Length:
$$W_s := \pi \cdot D_o \cdot P_s = 4863 \ plf$$

Pipe Weight per Length: *DIPRA Thrust Restraint Design - Table 2*
$$W_p := 57 \ plf$$

Unit Normal Force:
$$W := W_s + W_p = 4920 \ plf$$

$$F_f := W \cdot \tan(\varphi') = 1522 \ plf$$

Calculate Force To Be Restrained, F$_u$:

Operating Pressure: $P_o := 60 \ psi$
Factor of Safety: $FS := 1.5$

$$P_u := P_o \cdot FS = 90 \ psi$$

$$F_u := P_u \cdot A = 40715 \ lbf$$

Linear Feet of Dead Pipe to Restrain Force:

$$L := \dfrac{F_u}{F_f} = 27 \ ft$$