

Thrust Block Design

1. Poisson's Ratio – Negative Ratio of Transverse to Axial Strain
2. Pull Out Prevention Required for In-Line Non-Restrained Joints – Sleeve, Bell
3. Fully Restrained Joints Do Not Require Thrust Blocks – Fusion, MJ, Flange Adapter

Pull Out Force? PPI Handbook Chap. 7

$$F_p = \frac{P(DR - 1)}{2} \mu \pi D_M^2 \left[\frac{1}{DR} - \frac{1}{DR^2} \right]$$

P = internal pressure, lb/in²

μ = Poisson ratio (0.45 long, 0.35 short)

D_M = pipe mean diameter, in

Thrust Block Sizing? PPI Field Manual

$$A = 1.5 \times \frac{F_p}{q}$$

FS = 1.5 = Factor of Safety

q = soil bearing capacity, lb/ft²

Example: 20" DR11 at 200psi, 1500 lb/ft² sand soil

$$F_p = \frac{200(11 - 1)}{2} 0.35 \pi (20 - 1.818)^2 \left[\frac{1}{11} - \frac{1}{11^2} \right] = 30,041 \text{ lbs}$$

$$A = 1.5 \times \frac{30,041}{1500} = 30.04 \text{ ft}^2 \quad \text{area of concrete in contact with soil}$$

