K_o = coefficient of pressure at rest

α = adhesion factor (curve fit to plots of recommended values in Figure B.2)

$\alpha = 0.608 - 0.123c - \frac{0.274}{c^2+1} + \frac{0.695}{c^3+1}$ where c is in ksf or kPa/50

δ = interface angle of friction for pipe and soil = $f\phi$

ϕ = internal friction angle of the soil

f = coating dependent factor relating the internal friction angle of the soil to the friction angle at the soil-pipe interface

Representative values of *f* for various types of external pipe coatings are provided in the following table:

Pipe Coating	*f*
Concrete	1.0
Coal Tar	0.9
Rough Steel	0.8
Smooth Steel	0.7
Fusion Bonded Epoxy	0.6
Polyethylene	0.6

Table B.1 Friction factor f for Various External Coatings

Δ_t = displacement at T_u

= 0.1 inches (3 mm) for dense sand

= 0.2 inches (5 mm) for loose sand

= 0.3 inches (8 mm) for stiff clay

= 0.4 inches (10 mm) for soft clay

B.2 Lateral Soil Springs

The maximum lateral soil force per unit length of pipe that can be transmitted to the pipe is:

$$P_u = N_{ch}cD + N_{qh}\bar{\gamma}HD \qquad \text{(B-2)}$$

where:

N_{ch} = horizontal bearing capacity factor for clay (0 for $c = 0$)

N_{qh} = horizontal bearing capacity factor (0 for $\phi = 0°$)

The expressions below for N_{ch} and N_{qh} are closed form fits to published empirical (plotted) results (see Figure B.3).