

**Objective:** To estimate depth of rock scour for foundations (shallow foundations/drilled shafts) in rock per direction of ODOT.  
**Method:** In accordance with FHWA Publication No. FHWA-HIF-12-003, Hydraulic Engineering Circular No. 18 (HEC-18) and ODOT's BDM Section 305.2.1.2.b

**Erodibility Index (K):**

**Givens:**

$$RQD := 85$$

Rock Quality Designation, Unit: Percentage

$$J_n := 2.73$$

Rock Joint Set Number (Boring Logs, HEC-18 Table 4.23)

Per ODOT BDM: If  $J_n$ , cannot be determined from observation or bore hole data, then assume  $J_n = 5$ .

$$J_r := 2.0$$

Joint Roughness Number (Boring Logs, HEC-18 Table 4.24)

Per ODOT BDM: If  $J_r$ , cannot be determined from observation or bore hole data, then assume  $J_n = 1$ .

$$J_a := 1.0$$

Joint Alteration Number (Boring Logs, HEC-18 Table 4.25)

Per ODOT BDM: If  $J_a$ , cannot be determined from observation or bore hole data, then assume  $J_n = 5$ .

$$J_s := 0.6$$

Relative Joint Orientation Parameter  
(Boring Logs, HEC-18 Table 4.26)

Per ODOT BDM: If  $J_s$ , cannot be determined from observation or bore hole data, then assume  $J_n = 0.4$ .

$$M_s := 8.39$$

Intact Rock Mass Strength Parameter (ODOT BDM, Sect. 305.2.1.2.b.B.6.b)

**Analysis:**

$$K_b := \frac{RQD}{J_n} = 31.14$$

Block Size Parameter (HEC-18, Eq. 4.18 )

$$K_d := \frac{J_r}{J_a} = 2$$

Shear Strength Parameter (HEC-18, Eq. 4.19 )

$$K := M_s \cdot K_b \cdot K_d \cdot J_s = 313.47$$

Erodibility Index (HEC-18, Eq. 4.17 )

**Approach Flow Stream Power (Pa):**

**Givens:**

$$\rho := 1000$$

Mass Density of Water (kg/m<sup>3</sup>)

**Analysis:**

$$\tau_{c\_Pa} := \rho \cdot \left( \frac{1000 \cdot K^{0.75}}{7.853 \cdot \rho} \right)^{\frac{2}{3}}$$

$$\tau_{c\_Pa} = 4481.4$$

Critical shear stress (Pa)

$$\tau_{c\_psf} := \tau_{c\_Pa} \cdot \frac{1}{47.88} \text{ psf}$$

$$\tau_{c\_psf} = 93.6 \text{ psf}$$

Critical shear stress (Psf)

$$D_{50\_equivalent} := \tau_{c\_Pa}$$

$$D_{50\_equivalent} = 4481.4$$

Equivalent D50 (mm)

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