# FOUNDATION RECOMMENDATIONS

PROJECT 17BP.7.R.9

T.I.P. NO. Division 7 - Group E

COUNTY Guilford

STATION ≈ 12+55 -L-

DESCRIPTION Bridge No. 187 over Reedy Fork Creek

Tributary on SR 2717 (Tickle Road)

| | INITIALS | DATE |
|---|---|---|
| DESIGN | CRB | 6/15/2012 |
| CHECKED | DJC | 6/15/2012 |
| FINAL | DJC | 6/15/2012 |

SEAL

6/15/12

NORTH CAROLINA PROFESSIONAL SEAL 21914 ENGINEER DAVID J. CORLEY

SIGNATURE

| | STATION | FOUNDATION TYPE | FACTORED RESISTANCE | MISCELLANEOUS DETAILS |
|---|---|---|---|---|
| | ≈ 12+30 -L- | Spread Footing | 13.5 tsf | Bottom of Footing Elevation = 631.2 feet +/- **(Left)** = 633.5 feet +/- **(Right)** |
| | ≈ 12+80 -L- | Spread Footing | 13.5 tsf | Bottom of Footing Elevation = 630.7 feet +/- **(Left)** = 630.5 feet +/- **(Right)** |

COMMENTS & NOTES (See Following Page)

FOUNDATION RECOMMENDATION NOTE ON PLANS AND COMMENTS

PROJECT: 17BP.7.R.9 TIP NO: Division 7 Group E COUNTY: Guilford
STATION: ≈ 12+55 -L-
DESCRIPTION: Bridge No. 187 over Reedy Fork Creek Tributary on SR 2717 (Tickle Road)

**Note on Plans:**

1. The scour critical elevations for each side of the bottomless culvert are the bottom of the footing elevations. Scour critical elevations are used to monitor possible scour problems during the life of the structure.

2. The spread footings on each side of the bottomless culvert are designed for a factored resistance of 13.5 tsf. Check field conditions for the required resistance of 30.7 tsf just before placing concrete.

3. Key in spread footings on each side of the bottomless culvert at least 12 inches into rock with minimum thickness as shown on the plans.

4. Backfill with select material, Class II meeting the requirements of Section 1016 of the Standard Specifications.

**Comments:**

1. Coefficient of friction between the cast-in-place concrete and foundation soil, $\delta = 0.53$

2. Bottom of Footing Elevations include the 12-inch key.

Bottomless Culvert

Calculate Nominal Bearing Resistance of Rock

$$q_n = \left[\sqrt{s} + \sqrt{(m\sqrt{s} + s)}\right] q_u$$

(Carter & Kulhawy, 1988)
(per AASHTO Sect. C10.6.3.2.2 and Eqn. 10.8.3.5.4c-2)

Rock Type = E (AASHTO Table 10.4.6.4-4 ; granite)

RMR ≈ 45 (estimate from AASHTO Tables 10.4.6.4-1 & 10.4.6.4-2 for fair rock joints)

$$m = m_i e^{\left(\frac{RMR-100}{14}\right)}$$

$$s = e^{\left(\frac{RMR-100}{6}\right)}$$

} Hoek-Brown Constant Eqns. for disturbed rock masses.

$m_i$ = intact rock constant = 25 (AASHTO Table 10.4.6.4-4 ; Rock Type E)

$$m = 25\, e^{\left(\frac{45-100}{14}\right)} = \underline{0.4918}$$

$$s = e^{\left(\frac{45-100}{6}\right)} = \underline{1.045 \times 10^{-4}}$$

$q_u$ = unconfined compressive strength of rock ≈ 750 ksf (conservative estimate based on rock quality and previous experience in the region)

17BP.7.R.9 ; Div. 7 ; Group E

Terracon

PROJECT: Bridge #187 over Reedy Fork Creek Tributary on SR 2717 Page 2 of 2

JOB NO. 71115060 Date 6/15/12 Comp. By C. Briggs CHECKED BY: SJE

$$q_n = \left[\sqrt{1.045\times10^{-4}} + \sqrt{\left(0.4918\sqrt{1.045\times10^{-4}} + 1.045\times10^{-4}\right)}\right](750\text{ ksf})$$

$$q_n = (0.0819)(750) = \underline{61.4\text{ ksf}}$$

$\phi_b = 0.45$ (for Shallow Foundations on Rock; AASHTO Table 10.5.5.2.2-1)

$$q_R = \phi_b q_n = 0.45(61.4) = \underline{27.6\text{ ksf}} = \boxed{13.8\text{ tsf}}$$

- Based on experience with footings bearing on rock, foundation settlements should be negligible.

Form 112—5-93