TEXAS DEPARTMENT OF TRANSPORTATION

TECHNICAL PROVISIONS

FOR

SH 99 GRAND PARKWAY SEGMENTS H, I-1 AND I-2

ATTACHMENT 8-1
HOUSTON DISTRICT GUIDELINES FOR FOUNDATION DESIGN

APRIL 30, 2015

September 12, 1988

MEMORANDUM TO: District 12 Bridge Designers and Laboratory Geotechnical Engineers

FROM: E. J. Suchicki, P.E.
Michael Ho, P.E.

SUBJECT: Guidelines for Foundation Design

The purpose of this memo is to record the foundation practices and design assumptions used over the years in this district and to standardize guidelines for foundation design.

Square Concrete Piles

Precast prestressed square concrete piles have become the standard, most used, pile in this district. The main reasons being economy and durability. The most commonly used sizes are the 16", 18", and 20" square pile. The 14" sq. pile is not recommended for use because of frequent breakage during driving and handling. The 16" sq. is the most frequently used pile and is recommended for general use. The 18" sq. and 20"sq. are used for high loads and/or when slenderness is a factor. The 24" sq. pile is seldom used and the fabricators do not stock the forms which leads to higher unit cost.

1. Maximum Design Loads & Total Length

Concrete Piling Max Service Load & Lengths				
	At Abutments & Trestle Bents		Under Footings	
Size	Max Load	Max Length	Max Load	Max Length
16" Sq.	75 Tons	75 Ft.	125 Tons	75 Ft.
18" Sq.	90 Tons	90 Ft.	175 Tons	90 Ft.
20" Sq.	110 Tons	100 Ft.	225 Tons	100 Ft.

2. Piling Lengths

Abutment Bents:

All fill material should be disregarded for load carrying capacity. Minimum length of 20 ft. At least 15 ft. penetration into natural ground except for wingwall piles.

Interior Bents:

Dry Crossings: Minimum effective penetration 20 ft. Discount the top 5 ft. of pile to allow for moisture fluctuation.

Wet Crossings: Minimum effective penetration 20 ft. below scour line. Discount the top 10 ft. below flow line for scouring. If a stream has a history of turbulent flow, more footage should be discounted for scouring.

3. Piling Length for Stability

Trestle pile bents:
Piling below scour line shall not be less than 70% of pile and cap above scour line.

Individual or strapped column footing on piling: Minimum length 30' below scour line.

One homogenous footing as under a river bridge pier: Minimum length 30' below scour line.

4. Skin friction is used in the design of a pile foundation. Point bearing is neglected in the capacity calculation.

Drilled Shafts

The amount of footage to be disregarded due to moisture fluctuations and non-reliable friction transfer is 10 ft. from finished grade.

Total capacity is based on skin friction and point bearing on soils.

For shafts with or without casing, drilled dry or with drilling mud and concrete placed normally, use soil reduction factor (S_R) of 0.7.

Maximum skin friction is 1.25 tons/sq. ft. which is further reduced by the 0.7 reduction factor.

In general, use 2 tons/sq. ft. for point bearing, regardless of soil type where the shaft is tipped in. No point bearing capacity is assumed for drilled shafts with diameter equal to or less than 24". For drilled shafts with diameters over 5 ft., the allowable point bearing load is based on Cone Penetrometer tests (Blow counts) and Figure 2 in the Foundation Exploration and Design Manual.

General Information

Piling/drilled shafts should not tip into or just above soft stratum.

When soil condition varies quite considerably from one test hole to another, the designer should consider the use of test piling. He/She shall discuss this matter with the Laboratory Engineer before making any final decision.

If the piling/drilled shafts are located in the vicinity between two test holes, a weaker hole design curve should be used for calculating the capacity.

The above are intended as guidelines only. If you have any questions on foundation design, please contact either Michael Ho, District laboratory Engineer, at extension 619 or Stanley Yin at extension 620.

All foundation designs are to be sent to the District lab for design and/or final review prior to submission to D-5. The District Laboratory is also responsible for any discussion with D-5 Geotechnical Division pertaining to foundation design matters.

Ed Jucnicki
District Bridge Engineer

Michael C. Ho
District Laboratory Engineer

EJS:ach