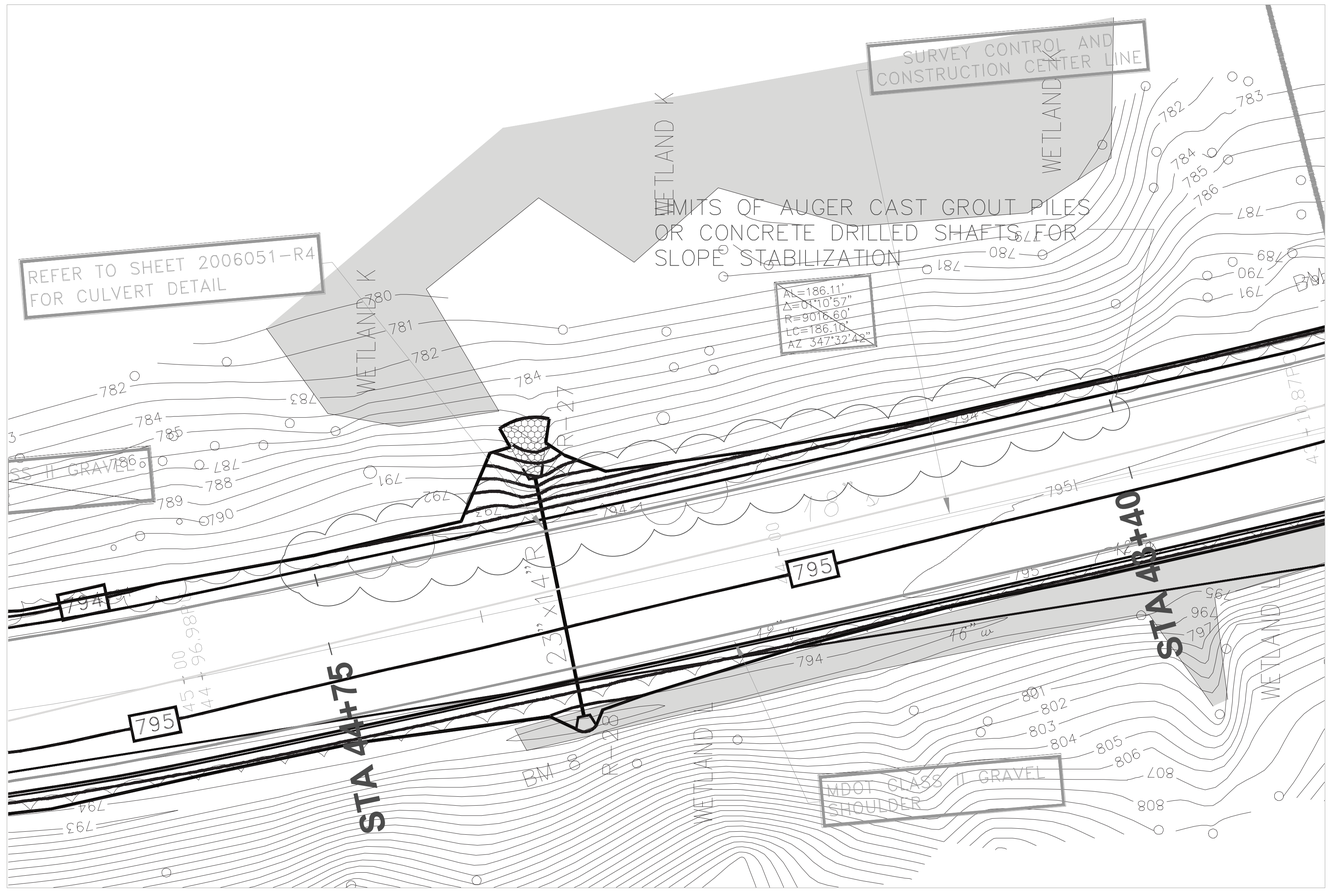
CONSTRUCTION DRAWINGS
PREPARED FOR:

HURON RIVER DRIVE

SLOPE STABILIZATION DESIGN

CITY OF ANN ARBOR, WASHTENAW COUNTY, MICHIGAN



SCHEMATIC PLAN VIEW:
FOR ILLUSTRATION PURPOSES ONLY.
DO NOT USE THIS FOR WALL LAYOUT.
RSS MUST BE LAYED OUT BY REGISTERED LAND SURVEYOR

INDEX

3 WORKING DAYS
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CALL MISS DIG
1-800-482-7171
(TOLL FREE)

THE LOCATIONS OF EXISTING UNDERGROUND UTILITIES ARE SHOWN IN AN APPROXIMATE WAY ONLY AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK, AND AGREES TO BE FULLY RESPONSIBLE FOR ANY AND ALL DAMAGES WHICH MIGHT BE OCCASIONED BY THE CONTRACTORS FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.

NOTICE:
CONSTRUCTION SITE SAFETY IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR; NEITHER THE OWNER NOR THE ENGINEER SHALL BE EXPECTED TO ASSUME ANY RESPONSIBILITY FOR SAFETY OF THE WORK, OF PERSONS ENGAGED IN THE WORK, OF ANY NEARBY STRUCTURES, OR OF ANY OTHER PERSONS.

CAD FILE NAME: 13-1022.dwg
DRAWING SCALE: AS SHOWN
DRAWING DATE: 10-23-2013

"HURON RIVER DRIVE"
SLOPE STABILIZATION DESIGN
CITY OF ANN ARBOR PROJECT MANAGEMENT UNIT
CITY OF ANN ARBOR, WASHTENAW COUNTY, MI

TITLE SHEET

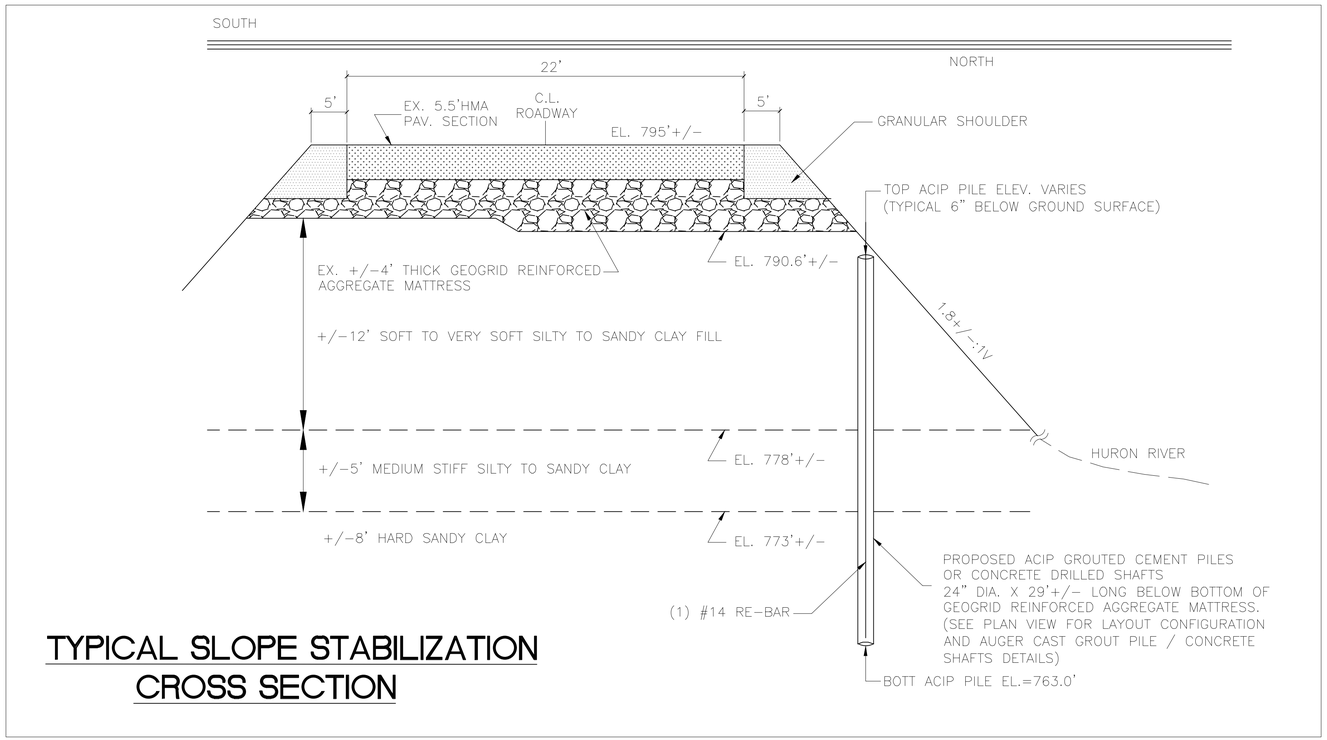
SEAL

DATE	REVISIONS	BY
11/03/15	REV. PER CITY REVIEW	J.A.
10/23/13	SUBMITTAL	J.A.

DRAWN BY: D.H.
CHECKED BY: J.T.A.
APPROVED BY: J.T.A.

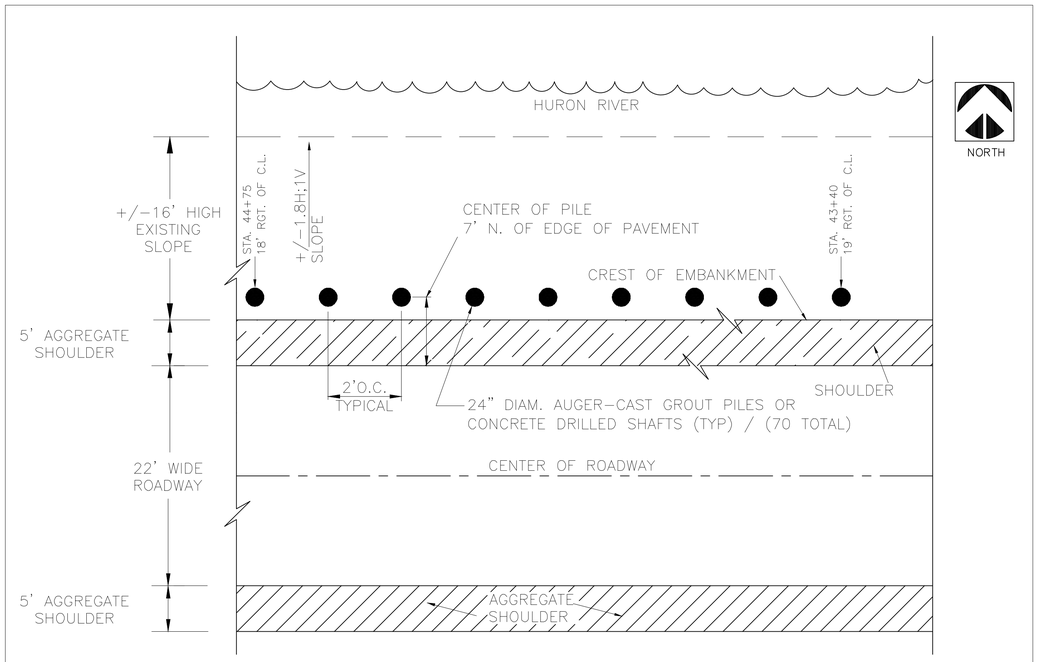
AGS
APPLIED GEOTECHNICAL SERVICES, INC.
15798 RIVERSIDE DRIVE, LIVONIA, 48154 MICHIGAN
(734) 679-0379 FAX: (734) 293-5077

PROJECT No: 13-1022
SHEET No: 1 of 4

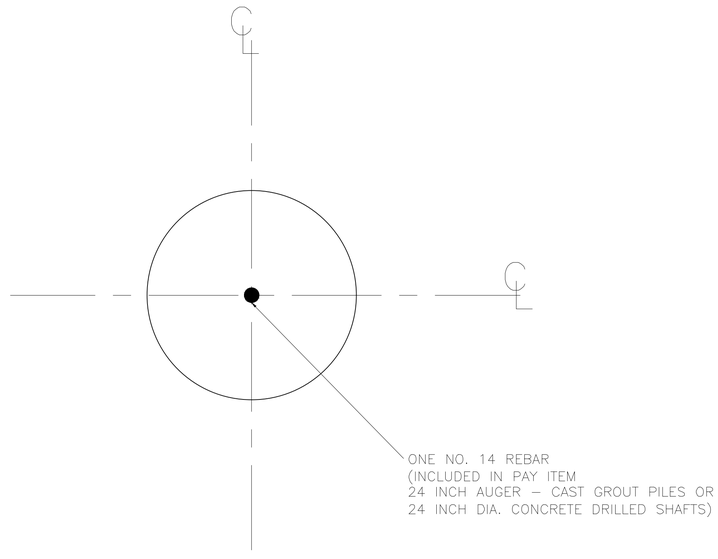


TYPICAL SLOPE STABILIZATION CROSS SECTION

QUANTITIES:		
ITEM	**UNIT**	**QUANTITY**
AUGER CAST GROUT PILE OR CONCRETE DRILLED SHAFT	EA.	70



HURON RIVER DRIVE
AUGER - CAST GROUT PILES, 24 INCH LAYOUT PLAN VIEW



24" DIA. AUGER - CAST GROUT PILES / CONCRETE DRILLED SHAFTS
24 INCH PILE / DRILLED SHAFT SECTION DETAIL

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TYPICAL DETAILS

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PROJECT No: 13-1022

CONSTRUCTION NOTES AUGER – CAST PILES

SPECIFICATIONS FOR AUGER–CAST PILES

MATERIALS

Grout for auger–cast piles shall have a minimum compressive strength f'c of 4,000 psi at 28 days.
The contractor shall be responsible for producing grout used in work complying with the following specifications:

–Grout mix consistency: Tested in accordance with ASTM C 939.
–Portland Cement: Conform to ASTM C 150.
–Mineral Filler: Finely powdered siliceous material that possesses property of combining lime liberated during process of hydration of Portland cement.
–Fluidifier: Compound possessing characteristics which will increase fluidity of mixture, reduce bleeding, assist in dispersal of cement grains, and neutralize setting shrinkage of high strength cement grout. Commercially available admixes shall show prior test results before acceptance.
–Fine Aggregate: Meet requirements of ASTM C 33 and consist of hard, dense, durable, uncoated rock particles free from injurious amounts of silt, loam, lumps, soft or flaky particles, shale, alkali, organic matter, mica and other deleterious substances. If washed, washing method shall not remove desirable fines and sand shall subsequently be permitted to drain until residual–free moisture is reasonable uniform and stable. Well graded from fine to coarse with fineness modulus between 1.40 and 3.40. Fineness modulus is defined as total divided by 100 of cumulative percentages retained on U.S. standard Sieves Nos. 16, 30, 50, and 100.
–Aggregates must be from MDOT prequalified source.

Contractor must submit proposed grout mix design for approval at least one week prior to the start of construction.

INSTALLATION OF PILES

Install piles with consideration for safety of adjacent structures and property, by a method which leaves their strength unimpaired.

Place augured piles by rotating continuous flight hollow shaft auger into ground to predetermined depth. Auger should be advanced continuously at a rate which will prevent the removal of excess soil. Pump grout with sufficient pressure as auger is withdrawn to fill auger hole, prevent hole collapse or squeezing, and ensure lateral penetration of grout into soft or porous zones of surrounding soil is achieved.

Carry head of grout at least five (5) feet above injection point around perimeter of auger flight at all times during raising of auger so that grout has a displacing action by preventing any loose material from caving into hole. Use this method of placement at all times. Do not depend on hole to be sufficiently stable to retain its shape without support from earth–filled auger.

The formation of each pile shall be in a continuous, uninterrupted operation once grouting has started. If grouting is interrupted or pressure drops indicating too rapid of a withdrawal of the auger, the pile shall be re–drilled to the original depth and the pile reformed if the grout in the shaft has not begun to set. A discontinuous installation operation may be cause for rejection.

INSTALLATION OF REINFORCING STEEL

Reinforcing steel shall be placed accurately as shown on the project plans while the grout is still fluid. The use of spiders or guides shall be used as required to maintain minimum cover as called for on the shop drawings and to assure proper location within the grout column.

MIXING AND PUMPING OF GROUT

Use only accepted pumping, continuous mixing and agitating equipment in preparation in handling of grout. Equip grout pump, at all times, with pressure gauge in good working condition to monitor pressure at which grout is placed. Remove oil or other rust inhibitors from mixing drums and grout pumps.

If ready–mix grout is used, use agitating storage tank of sufficient size between ready–mix truck and grout pump to ensure homogeneous operation, grout must be re–circulated through pump.

Materials shall produce homogenous grout of desired consistency. Prior to placement in holes, test grout consistence in accordance with ASTM C 939; results shall be within +/– 5 percent of design mix test results.
Test grout mix by making 1 set of test cylinders for each day of grout placement or for every 150 cubic yards of grout placed in one day. Set of cylinders: 1 cylinder tested at 7 days, 3 cylinders tested at 28 days, and 1 hold cylinder. Make and test cylinders in accordance with ASTM C 1019.

Prior to the start of grout pumping, the auger shall be raised 6 to 12 inches and after grout pressure has built up, indicating the discharge of grout, the auger shall be re–drilled to the original depth before the pile is formed.
The grout shall be pumped with sufficient pressure as the auger is withdrawn to fill the augered hole preventing hole collapse or squeezing and to cause lateral penetration of the grout into soft or porous zones of the surrounding soil.
During the pumping of grout, to form the pile, the auger shall be withdrawn in a smooth continuous motion.
A head of at least five (5) feet of grout above the injection point shall be carried around the perimeter of the auger flighting at all times during the raising of the auger so that the grout has a displacing action to prevent soil caving and retain the shape of the augured hole.

Place grout for piles by methods that ensure entire volume of pile is filled. The volume of grout placed in each pile shall be monitored and shall be greater than the theoretical volume of the augered hole. The piles not meeting this requirement shall be rejected and the cause investigated for a resolution. Proposed resolution of rejected piles shall be submitted to the City of Ann Arbor Project Management Services Unit for review and approval. Place grout for each pile in one continuous operation; stoppage at an intermediate point will not be permitted.
Make necessary preparations to properly deposit and vibrate grout and protect from freezing, especially where pile protrudes above grade. If grout has been placed above cut off elevation, excess grout and temporary metal sleeve, if any, above that elevation shall be removed by saw cutting.

TOLERANCES

Exercise care and diligence in placing piles at exact locations as no deviation in excess of 6 inches will be permitted, except as specifically provided.

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PROJECT No: 13–1022

SPECIFICATIONS FOR DRILLED SHAFTS ALTERNATIVE

DEFINITIONS

A. The words and terms used in these Specifications conform with the definitions given in ACI 336.1.

B. The terms "drilled shaft" and "drilled pier " are used interchangeably.

REFERENCES

A. ADSC: Association of Drilled Shaft Contractors:
   1. "Standards and Specifications for the Foundation Drilling Industry"
B. American Concrete Institute (ACI):
   1. ACI 336.1 Reference Specification for the Construction of Drilled Piers

SUBMITTALS

A. Portland Cement Concrete: At least one week prior to the start of work, contractor shall submit concrete mix designs to the City of Ann Arbor for review and approval. Concrete mixes shall be submitted for "dry" and "wet" construction methods. Include submittal for tremie concrete equipment and placement method. Concrete Mix Design Submittal must include historical compressive strength test results for the mix.

B. Concrete Reinforcement: At least one week prior to the start of work, contractor shall provide submittals for proposed reinforcing steel.

C. Drilling Equipment: Submit description of equipment including but not limited to power rating, torque, downward thrust, and type and size of drilling tools to be used.

D. Records and Reports: Submit daily reports and shaft record reports or logs as required by ADSC's "Standards and Specifications,"using ADSC formats for forms.

QUALITY ASSURANCE

A. Construction Standards: Drilled shaft foundations shall be constructed in accordance with applicable requirements of ACI 336.1 and ADSC's "Standards and Specifications for the Foundation Drilling Industry."

B. Design Criteria:

1. Drilled shaft shall consist of monolithically cast–in–place concrete drilled drilled piers of the size indicated on Sheet 2 of the plan set.

2. Drilled Shafts shall be straight cylindrical shaft type as indicated.

3. Drilled Shafts shall extend from the indicated concrete cutoff elevation to the indicated tip elevation.

C. Tolerances:

1. Maximum variation of the center of any shaft foundation from the required location: 2 inches, measured at the ground surface.

2. Bottom Diameter: minus zero, plus 6 inches, measured in any direction.

3. Maximum variation from plumb: 1:40.
4. Maximum bottom level tolerance: plus or minus 2 inches.

D. Inspection of Shaft Excavations:
   1. The Contractor shall provide equipment for checking the dimensions and alignment of each shaft excavation. Dimensions and alignment shall be determined jointly by the Contractor and the Engineer. Final shaft depths shall be measured with an appropriate weighted tape measure or other approved method after final cleaning.

   2. Drilled shafts shall have less than 1/2 inch of sediment at the time of placement of concrete. Maximum depth of sediment or debris at any place on the base of the shaft shall not exceed 1–1/2 inches. Shaft cleanliness will be determined by the Engineer by visual inspection.

SEQUENCING AND SCHEDULING

A. Unless otherwise permitted by the Engineer, the Contractor shall schedule drilling or excavating, installation of reinforcing steel, and concrete placement so that each excavated shaft is poured the same day that the drilling is performed.

B. Do not permit vibration or excessive wheel loads within the immediate vicinity of any shaft excavation until placement of concrete is complete. Maintain excavation stability at all times.

MATERIALS

A. Concrete Reinforcement: Concrete reinforcing steel shall be Grade 60.

B. Portland Cement Concrete: Portland cement concrete shall have a minimum 28 compressive strength f'c of 4,000 psi at 28 days. For "dry" construction methods, concrete shall be designed for a slump of 5 to 7 inches. For "wet" construction methods, concrete shall be designed for a slump of 7 to 9 inches for placement by tremie methods.

C. Steel Casing:

1. Where earth wall of drilled shaft is unstable or has a tendency to slough, crumble, or fall away, provide temporary steel casing to stabilize the shaft wall.

2. Inside diameter of the casing shall be the full diameter of the drilled shaft foundation as indicated, plus or minus ½ inch.

3. Steel casing shall have adequate strength to withstand the pressure of concrete placement without distortion.

4. Inside surfaces of steel casing shall be smooth and coated to facilitate easy lifting and removal during placement of concrete.

EXCAVATING AND DRILLING EQUIPMENT

A. Excavating and drilling equipment shall have adequate capacity, including power, torque, and down thrust to excavate a hole of the maximum diameter and to a depth of 20 percent beyond the depth indicated. Excavation and overreaming tools shall be of adequate design, size, and strength to perform the work indicated.

B. When the material encountered cannot be drilled using conventional earth augers or overreaming tools, special drilling equipment shall be provided, including rock core barrels, rock tools, air tools, and other equipment as necessary to construct the shaft excavation to the size and depth indicated.

EXCAVATION

A. General:

1. Excavate for drilled shafts by drilling to advance the excavation to the required bottom elevation. Avoid over excavation. Excavation shall be performed through whatever materials are encountered to the dimensions, depths, and tolerances indicated.

2. Protect excavated walls with temporary steel casing as necessary to prevent cave–ins, displacement of the surrounding earth, water incursion, injury to personnel, and damage from construction operations. Maintain indicated neat lines of excavation for cased areas.

3. Make bottom surfaces level within the tolerances specified herein. Remove loose material, debris, and muck with cleaning buckets.

B. Ground Water Control:

1. Notify the Engineer immediately when ground water is encountered.

2. Suitable steel casings shall be furnished and placed when necessary to control water. Drilling mud or chemical stabilizers shall not be used unless permitted by the Engineer.

C. Inspection: After completion of excavation and prior to placement of reinforcing steel, the condition of the excavation will be inspected by the Engineer. Use clean–out buckets or air- lifts to remove sloughage or other loose material from the shaft prior to placing reinforcing steel and concrete. An accumulation of soil or rock in the bottom of the excavation will not be permitted.

INSTALLATION OF CONCRETE REINFORCEMENT

1. Lower reinforcing steel into the hole in such a manner as to prevent damage to the walls, and place and tie or clip symmetrically about the axis of the shaft. Use centering devices to maintain the reinforcing steel in place throughout the concrete placement.

CONCRETE PLACEMENT

1. Place concrete in dry excavations whenever practicable. Use all practicable means to obtain a dry excavation before and during concrete placement.

WITHDRAWAL OF TEMPORARY STEEL CASING

1. Where temporary steel casings are used to support the excavation walls, withdraw the casing as the concrete is being placed. Remove the steel casing in such a manner so that the lower edge of the steel liner will always remain a minimum of 5 feet below the surface of the concrete as placed to prevent water and/or soils from entering the casing from the bottom.

FIELD QUALITY CONTROL

1. Inspections and Tests: The City of Ann Arbor shall perform inspections and tests of concrete during placement.

2. Records and Reports: Keep a record, on an approved form, for each drilled shaft installed. Record on the form the location, dimensions, elevations of top and bottom, depth of stratum penetration, condition of bottom of excavation, concrete placement data, a continuous record of actual concrete volume placed versus theoretical volume, and any other data called for on the approved report form or pertinent to the drilled shaft construction.

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