STANDARD SPECIFICATIONS
FOR
SUBSURFACE BORING, SAMPLING, AND TESTING

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Minor Changes to the Publication 222

101.01 GENERAL – The following stipulations, requirements and descriptions of Work are hereby defined and described as the STANDARD SPECIFICATIONS FOR SUBSURFACE BORING, SAMPLING, AND TESTING, and all shall apply to the Contract unless specifically waived in the Instructions to Bidders.

These specifications are generally written in the imperative mood. In sentences using the imperative mood, the subject, "the Contractor," is implied. Also implied in this language are "shall," "shall be," or similar words and phrases. In the Technical sections, the subject may also be a Vendor, Fabricator, or Manufacturer, who may be supplying material, products, or equipment for use on the project. The word "will" generally pertains to decisions or actions of the Department and/or Project Geotechnical Manager (PGM).

In these specifications or on the drawings, the following words or similar words refer to actions of the Department and/or PGM, unless otherwise stated: "directed," "required," "permitted," "ordered," designated," "prescribed." Also, the words "approved," "accepted," "acceptable," "satisfactory," "considered," or words with similar intent, mean by or to the Department and/or PGM, subject in each case to the final determination of the Secretary, and subject to further review, as permitted by law or permitted elsewhere in these specifications.

In these specifications, reference to a subsection of the specifications includes all general requirements of the section of which the subsection is a part.

In these specifications, the words "or equal," referring to a product, material, or process, mean "equal as determined by the Department and/or PGM."

In these specifications, the words, "as indicated," or "indicated" mean "as indicated or indicated in the prepared Contract Documents."

101.02 POINTS NOT COVERED BY STANDARD SPECIFICATIONS – Any aspects of the work not clearly defined by these specifications will be governed by the rules of the best prevailing practice for that class of work.

101.03 DEFINITIONS

ADDITIONAL WORK – Delete

AWARD – The Department's and/or PGM's written acceptance of a proposal.

BIDDER – Any individual, firm, partnership, corporation or a joint venture, submitting a proposal for the work contemplated and acting either directly or through an authorized representative.

CONTRACT DOCUMENTS – Includes the Instructions to Bidders; Bid Proposal; the Standard Specifications for Subsurface Boring, Sampling, and Testing; the Plan and Location of Borings; Contract; and the Contract Agreement.

CONTRACT/CONTRACT TIME –The duration specified in the Contract Agreement, commencing with the date of Notice-to-Proceed, over which the work is to be completed.

CONTRACTOR – A person, persons or corporation who has agreed to perform the work by their signature on the Contract Agreement. Also, the Contractor's authorized representative at the site of the work.

CONTRACTOR'S REPRESENTATIVE – Individual authorized by the Contractor to be in charge of the work.

DEPARTMENT – Pennsylvania Department of Transportation.

ENGINEERING DISTRICT – Geographic division of the Department for the purposes of management, design, construction, and maintenance.

ENGINEER'S REPRESENTATIVE – The individual authorized by the Engineer to administer the Subsurface Boring, Sampling and Testing Contract (SBSTC).

EXTRA WORK – Delete

FIELD SUPERVISOR – The individual authorized by the Contractor to be in charge for Work completed on-site.

IN WRITING – Communication between parties delivered or sent, and received, in the form of a written letter, e-mail, facsimile, or telegram.

INSPECTOR – Person representing the PGM during drilling at the site to make inspections of contract performance and of material furnished.

LOCAL TRAFFIC – Vehicular traffic that originates or terminates within the project limits.

NOTICE-TO-PROCEED – Written notice, issued by the Engineer, to authorize the Contractor to commence work.

NOTICE-TO-PROCEED DATE – The date, established in writing by the Department, on which work is to begin.

POTABLE WATER – Water for human consumption that meets the biological and chemical standards of 25 PA Code § Chapter 109, Safe Drinking Water Act

PROJECT GEOTECHNICAL MANAGER (PGM) – The person, persons or corporation responsible on behalf of the Department for geotechnical work. For purposes of the SBST Contract, the authorized representative which has entered into the Contract with the Contractor.

PROPOSAL – The offer of a bidder, on the Bid Proposal, to perform the work at the prices bid or predetermined.

ROCK – Indurated mass of mineral aggregates that cannot normally be excavated by manual methods alone and that cannot be satisfactorily penetrated and sampled by standard soil boring and sampling techniques.

SECRETARY – The Secretary of Transportation or a Deputy Secretary of Transportation of Pennsylvania.

SOIL – Unconsolidated material derived from physical, chemical and biological degradation of rock that can normally be excavated by manual methods alone and that can be satisfactorily penetrated and sampled by standard soil boring and sampling techniques.

SUBCONTRACTOR – Any individual, partnership, firm, corporation, or joint venture, who/which undertakes, with prior consent of the Department, part of the work under the terms of the Contract, with and responsible to the prime Contractor by virtue of an agreement.

SURETY – A corporate body, which is bound with and for the Contractor, for the satisfactory performance of the Contractor's work and for the prompt payment in full for material, labor, equipment rentals, and utility services, as provided in the bonds.

TRAFFIC CONTROL PLAN – A developed method or scheme for safely and efficiently moving traffic through or around a highway work zone in accordance with *67 Pa Code, Chapter 212*.

WORK – The furnishing of all tools, equipment, materials, supplies, transportation, labor, supervision, logs, records, and all things necessary or incidental to compliance with the requirements of the Contract Documents.

SECTION 102 - BIDDING REQUIREMENTS AND CONDITIONS

Minor Changes to Publication 222

102.01 INTERPRETATION OF APPROXIMATE ESTIMATE OF QUANTITIES - The estimates of quantities, shown in the Instructions to Bidders and Bid Proposal are approximate and are shown only as a basis for the calculation upon which the Contract award is to be made. The Department and PGM do not assume any responsibility that the estimated quantities will actually be required, nor will the Contractor be allowed to plead misunderstanding or deception because of the quantity estimates or because of the character of the work, the location, or other conditions. The Department and/or PGM reserve the right to increase, to decrease, or to omit any of the quantities of work. An increase or decrease of the quantities of the items will not be sufficient grounds for granting an increase in the unit prices bid.

102.02 INSPECTION OF SITE BY BIDDER – It is expected that the contractor visit work sites prior to commencement of drilling activities. The Department accepts no responsibility for time delays due to improper preparations by the contractor

SECTION 103 - GENERAL CONTRACT/CONTRACT CONDITIONS AND REQUIREMENTS

Major Changes to Publication 222

103.01 CONTRACT TIME - Complete all work within the time period specified in the Contract Agreement. The Contract time will be calculated in calendar days from the date of Notice to Proceed.

103.02 Delete

103.03 Delete

103.04 Delete

103.05 LIQUIDATED DAMAGES - Any work that remains uncompleted after the time specified in the Contract Agreement for project completion, the sum of $800 per inspector per 8hour day (plus $80/hour for any amount of time over 8-hours on that day), unless otherwise stated in the proposal, will be deducted from money due or to become due. This deduction will not be assessed as a penalty, but as liquidated damages. Liquidated damages are only calculated to recover losses incurred by the Department or fees paid by the Department. The liquidated damages minimum rate is compensation for salary, overhead, and expenses incurred for late delivery or untimely performance of the particular Contract. A Contract time extension may be made, at the discretion of the PGM, as applicable beyond the period specified in the Contract, when the Contractor is not responsible for the delayed completion of the work. In such cases, the Contractor is liable for liquidated damages for delays commencing from the date on which the extended period expires.

In the event the Contractor is declared in default and the Contract is terminated in accordance with the provisions of *Section 103.06*, liquidated damages will be charged as provided by this section, and such amounts, if any, will be deducted from money due or to become due to the Contractor or the surety. If the total amount chargeable as liquidated damages exceeds the amount payable to the Contractor or the surety, the excess is to be paid to the PGM by the Contractor or the surety.

103.06 SUSPENSION OF WORK – Work may be suspended by the PGM, wholly or in part, for the following reasons:

- failure to carry out orders;
- failure to perform any provisions of the Contract; or
- unforeseen conditions not anticipated in estimating the Contract time required for the completion of the work.

Written notification will be given of the action to be undertaken and the reason for the actions. After receipt of notice of suspension, take all reasonable steps to minimize the further incurrence of costs or expenses under the Contract. Payment will be made for the work actually accomplished up to date of suspension, and accepted by the PGM, at the unit prices set forth in the Bid Proposal. Payment will also be made for any minimum and reasonable costs and expenses agreed to by the DGE, the PGM and Contractor in writing that may be required to permit the maintenance of equipment in standby condition so that services may be resumed if conditions so warrant in the opinion of the DGE.

103.07 TERMINATION OF CONTRACT –

(a) Termination Due to Delay, Neglect, or Default. The Contractor may be declared in default for the following reasons:

- Failure to cooperate and meet schedules presented by the engineer.
- failure to perform the work with sufficient labor, equipment, or material to insure the completion of the specified work in accordance with the Contract terms;
- unsatisfactory performance of the work;
- failure or refusal to remove material or remove and replace any work rejected as defective or unsatisfactory;
- insolvency or bankruptcy;
- commission of any act of bankruptcy or insolvency;
- assignment made for the benefit of creditors;
- failure or refusal within ten (10) days after written notice by the PGM, to make payment or show cause why payment should not be made, of any amounts due for material furnished, labor supplied or performed, for equipment rentals, or for utility services rendered, as covered by the Additional Bond for Labor and Materials; • failure to protect, to repair, or to make good any damage or injury to property; and/or
- work not carried on in an acceptable manner for any cause.

The PGM, after giving ten (10) days written notice of default will have the power and authority, without violating the Contract, to:

- declare the Contractor in default;
- take the completion of the work out of the hands of the Contractor
- appropriate or use any or all materials assembled for the project;
- enter into a contract or contracts with others for the completion of the work; or
- use such other methods that will be expedient for the completion of the Contract in a satisfactory manner.

(b) Termination for Convenience. With approval from the DGE, the PGM, after giving ten (10) days' written notice, will have the power and authority, without violating the Contract, to cause termination of the Contract for the convenience of the PGM and the Department.

(c) Payment. Subsequent to Contract termination, payment will be made at the unit prices specified in the Bid Proposal for work completed and accepted by the PGM. No other payment will be made.

(d) Disposition of Documents and Samples. In the event of termination for any reason, all finished or unfinished documents, all soil and rock samples, and other materials, at the option of the PGM become the property of the Department.

(e) Completion of Work Terminated Due to Default. In the event of default and Contract termination, the PGM may have the work required under the Contract completed in such manner as, in the PGM's judgment, will best serve the interests of the Department. The Contractor will be liable for and shall pay to the PGM any excess in cost expended over and above the cost specified in the Bid Proposal, as well as any expenses caused the PGM and Department, by the failure of the Contractor to comply with the terms of the Contract.

103.08 LAWS, ORDINANCES, REGULATIONS AND PERMITS - Comply with all laws, ordinances, rules and regulations of the Federal and State governments, or of any political subdivision thereof, which are applicable to the work to be performed under the Contract. Obtain all permits and licenses necessary to the prosecution of the work, except for work on railroad property, as described in *Section 103.12*, at no additional cost to the PGM or Department.

103.09 PATENTS AND PERMITS - Pay all royalties and indemnify and save harmless the PGM and the Department from any claims for infringement by the reason of the use of any patented designs, device, material or process to be performed or used under the Contract.

103.10 SAFE PRACTICES IN DRILLING -

(a) Responsibility. Follow generally accepted drilling practices and be responsible for all matters dealing with safety in performing the work, including safety of all persons and property during performance of the work, employees and any and all employees of subcontractors which may perform work. This requirement will apply continuously regardless of time or place, and will in no way be altered because the PGM gives general directions as to the location where samples should be taken. Additionally, the drilling contractor should not perform any work that the drill operator considers unsafe. In the event of any disputes, these must be addressed with the DGE. This does not relieve the contractor of the responsibility to thoroughly inspect the site, and come prepared to the job with equipment necessary to conduct work in a safe manner, as per *Section 102.02*. Pre-bid meetings are the primary mechanism that potentially unsafe drilling conditions that were not recognized by the PGM or the Department, can be identified by drilling contractors. If a pre-bid meeting is not conducted, such conditions must be addressed by the contractor to the PGM prior to bid, or any costs associated with mitigating the unsafe conditions may be the responsibility of the contractor.

(b) Occupational Safety and Health Regulations. Comply at all times with applicable Federal, State, and local laws, provisions, and policies governing safety and health, including the *Federal Construction Safety Act (Public Law 91-54), Federal Register Chapter XVII, Part 1910 "Occupational Safety and Health Standards"* and *Part 1926 "Occupational Safety and Health Regulations for Construction"* of *Title 29 Code of Federal Regulations*, and subsequent publications updating these regulations.

(c) Deep Mine Safety Monitoring Equipment. Borings which intercept deep mines or coal may encounter methane gas and/or carbon monoxide gas during the drilling and grouting process. Provide a monitor for the measurement of methane, carbon monoxide, and oxygen. Provide a monitor with a minimum range of measurement as follows: methane from 100 ppm (0.01%) to 50,000 ppm (5.0%); carbon monoxide from 10 ppm (0.001%) to 1,000 ppm (0.10%). Provide an operating monitor at the location of each boring where deep mines are known or suspected of being encountered; where indicated in the Contract; or as directed by the PGM. Obtain readings directly above the boring and within 12 inches of the boring opening. Maintain monitors in good operating condition, including calibration, for the life of the project. Have a monitor available to the PGM for inspection of the boring and any previously drilled holes on the project. Repair or replace monitors within twenty-four (24) hours of notice from the PGM and /or DGE. Drilling of borings in deep mined areas will not be permitted if the monitor is not present and operating as specified.

If methane above 12,500 ppm (1.25%) or carbon monoxide above 10 ppm (0.001%) is detected immediately stop work and allow the boring to naturally vent. If after 24 hours or more methane above 12,500 ppm or carbon monoxide above 10 ppm is detected, employ industry standard methods to vent the borehole. Drilling may continue if venting reduces the methane to below 12,500 ppm and carbon

monoxide below 10 ppm. If after venting for at least 24 hours the methane remains between 12,500 ppm and 25,000 ppm or carbon monoxide remains between 10 ppm and 30 ppm, grout the boring. If at any time methane above 25,000 ppm (2.5%) or carbon monoxide above 30 ppm (0.003%) is detected, evacuate the area and contact the PGM.

(d) Delete

(e) Encountering Contaminated Material. If the drilling contractor, Inspector or PGM encounters potentially contaminated material not previously suspected, during any phase of the geotechnical investigations, the operation must be halted in a safe and controlled manner, and the PGM will immediately contact the DGE. The DGE should contact the District Environmental Manager.

In such cases, the drilling contractor is required to secure the site until appropriate personnel can enter the site to complete decontamination efforts. Securing the site includes containerizing all suspected contaminated materials including the suspected samples, fluids used to clean the sampling devices, and any materials (towels, gloves, etc.) used in the containment process. If securing these materials cannot be performed in a manner that provides reasonable safety to the drilling personnel, or the suspected contaminated material is causing physical distress (e.g., due to odors), then the area should be guarded at a safe distance until properly equipped personnel arrive to containerize the materials and secure the site.

Due to the potential for encountering contaminated material, the drilling contractor shall have available for every project, at least one 55-gallon drum, incidental to the project, to containerize contaminated material for initial site securing. As many sites do not allow for safe and secure storage, the contractor shall provide additional provisions for sitting a trailer, providing a fenced area, or other temporary measures to securely store the drum, as required. The method of storing the drum must provide secure, lockable, containment.

If necessary, containerized materials may be transported off-site prior to receipt of analyses. This material may be relocated to the closest appropriate Department maintenance facility, only as a last resort. This option must be coordinated with and approved by the Department. The responsible Department maintenance facility official must be notified before any potentially contaminated samples are transported to the facility. The PGE/PGM (Project Geotechnical Engineer/Project Geotechnical Manager), or DGE if an in-house project, will make the appropriate arrangements to contact a company permitted to transport the hazardous material as required. All geotechnical samples obtained from a suspected waste site will require proper labeling in addition to those specified in *Section 215* of this publication.

Under no circumstances should site workers perform activities they are not trained and capable of performing, or that compromise personal safety.

(f) All contractor employees must wear hard hats and vests at all job sites.

103.11 LOCATION OF UTILITIES AND UNDERGROUND STRUCTURES – The Contractor shall be responsible for knowing the location of all underground utilities, overhead utilities, pipes, cables and underground structures that their employees could potentially come in contact with while on-site. It shall be the Contractor's responsibility to perform the work under the safest possible conditions, and to employ the necessary precautions to avoid these features during completion of boring, sampling and testing operations.

(a) Underground Utilities. If it is established that the location of a boring is such as to cause interference with an underground facility or structure, advise the PGM. At their discretion, the PGM may designate a new location for the boring or authorize its omission.

Before the work begins, comply with the Pennsylvania Underground Utility Line Protection Law, Act 287 of the General Assembly of Pennsylvania, 1974 as amended or superseded, which defines the procedures for notification to Public Utilities prior to excavation, drilling or demolition work by use of powered equipment or explosives. The law requires the use of the PA One-Call System to locate all utilities. In addition, the Contractor must coordinate with the public or private land owners to locate non-public underground utilities such as buried electric lines, communication cables, drainage pipes, etc. The boring location(s) shall be adequately offset where the hole location(s) conflicts with utilities and other structures in the project area including those not covered by the PA One-Call system (as indicated above). PA One-Call contact information is as follows:

PA One-Call Phone: dial **8-1-1** or call **1-800-242-1776** On-line: pa1call.org

(b) Aboveground Utilities. In order to determine the required minimum distance to stay away from overhead power lines, the PGM will contact the utility company to determine voltage in the line. For voltage to ground of 50kV or less, the minimum clearance between overhead power lines and any part of the drill rig, including any drill steel, is 10 ft. For voltages to ground over 50kV, the minimum clearance distance is 10 ft. plus 4 inches for every 10kV over 50kV. For overhead lines not containing power (e.g., cable, telephone) the minimum clearance between the lines and any part of the drill rig, including drill steel, is 10 ft. In situations where clearance between overhead lines and drill equipment is less than required above, the requirements of *1910.333(c)* of the OSHA regulations indicated above must be followed. Any work in these conditions must be coordinated by the PGM with Contractor and the appropriate utility company(ies). The Contractor shall arrange with the public utility to shield adjacent overhead power lines, as required, at no additional cost to the Engineer or Department.

103.12 WORK ON PUBLIC AND PRIVATE PROPERTY -

(a) Permission for Access. General permission to enter public or private property on which borings or test pits are located, or over which access is required, will be obtained by the PGM. The PGM will provide a copy of the "Notice of Intent to Enter" (NOITE) letter to the driller awarded the Contract (at the time of awarding the bid). In addition to the NOITE letter, the PGM will contact property owners in person or by phone at least 3 days but not more than 2 weeks prior to entering their property.

Obtain prior approval from the PGM before entering any property within the work area. Do not drill, construct an access route, or stage on any property where personal contact has not been made until given permission in writing from the Department. Any cost incurred, including but not limited to property damage, delays, or down time caused by entering any property without prior approval of the PGM, shall be borne solely by the Contractor.

(b) Arrangements for Access. Prior to entering any property, make specific arrangements for property access (including schedule, access route, etc.) with the owners of properties on which borings are located or over which access is required to perform work. Property owner information (name, address, telephone number, etc.) will be provided by the PGM. Provide all the information discussed with the property owner to the drilling Inspector. The drilling Inspector will prepare and provide the Department with written documentation of this contact if requested.

If access is denied to any property for which general permission to enter has been obtained, notify the PGM in writing. The PGM will contact the DGE if access to any property is denied.

103.13 Delete

103.14 PROTECTION OF WORK, PERSONS AND PROPERTY - Provide and maintain any barricades, lights or other safety devices necessitated by hazardous conditions or required by local authority at no additional cost to the PGM or Department.

The Contractor shall take all necessary precautions to prevent or minimize discharge of water on any roadway. Perform sweeping and salting operations of the work during drilling operations, as necessary, to prevent icy, wet, slippery, or dusty conditions which could pose undue hazards or inconvenience to property owners, pedestrians, or vehicular traffic, at no additional cost to the PGM or Department.

103.15 INJURY TO PERSONS AND DAMAGE TO PROPERTY - Promptly repair all physical damage to property resulting either directly or indirectly from the SBST operations. Every effort practical and reasonable must be made to prevent damage to property. This includes, but is not limited to, using plywood over lawn areas and soft ground, avoiding fences where possible, staying clear of structures and prepared landscaping, and minimizing trimming of trees.

Upon completion of the work, furnish satisfactory evidence that all claims arising from injury to persons or damage to property resulting from the boring, sampling and testing operations have been resolved. The acceptability of evidence that claims have been resolved will be determined by the PGM.

103.16 INSURANCE AND LIABILITY

(a) General. Obtain and pay for such insurance as will protect the Department and the PGM from claims under the Workmen's Compensation Act and from any other claims for damages for personal injury including death, or for damages to property, both real and personal, which may arise from operations under the Contract, whether such operations be by the Contractor or by anyone directly or indirectly employed by the Contractor.

(b) Coverage. Effect and maintain for the duration of the Contract the following insurance in companies or through agents, with minimum limits of coverage as specified in the Instructions to Bidders, at no additional cost to the PGM or Department:

1) WORKMEN'S COMPENSATION INSURANCE including Employers' Liability Insurance in accordance with the laws of the Commonwealth of Pennsylvania.
2) GENERAL LIABILITY INSURANCE for Bodily Injury and Property Damage, including explosion, collapse, and underground hazards coverage.
3) AUTOMOBILE INSURANCE for Bodily Injury and Property Damage covering all automotive vehicles owned or hired by the Contractor and used on this Contract not otherwise so covered by insurance, and including automatic coverage for additions to the schedule of vehicles.
4) RAILROAD INSURANCE any additional or special insurance required by the railroad.

(c) Certificates of Insurance. Deliver to the PGM, before starting the work, certificates from insurance companies or their agents, in duplicate, stating that such insurance is in force and will not be canceled during the conduct of the work without thirty (30) days written notice to the PGM. The certificate of liability insurance will include as additional named insurers, the PGM and the Department, in respect to the work to be performed by the Contractor.

(d) Additional Taxes and Insurance. Report and pay all Old Age Benefit and Social Security Taxes and other insurance as required by State and Federal Laws.

(e) Reduction of Coverage. In the event that, during the course of the work, the above limits of coverage should be reduced for any reason, the PGM and/or the Department reserve the right to terminate the Contract without waiving any other rights it may have under the law. Such termination will be effected by giving written notice thereof to the Contractor, in accordance with *Section 103.06*.

(f) Liability. In no event will the PGM or the Department, their officers, employees, or representatives be liable in any way for consequential damages of any kind. By signature on the Contract, the PGM and the Department are released from any liability for damage to property howsoever caused in connection with the performance of the work to the extent coverage is in force for such damage under a physical damage insurance policy. If any of the physical damage insurance policies do not permit release of other persons or firms from liability before a loss, obtain endorsement to such policies from the respective insurance carriers as may be necessary to affect a waiver of the right of subrogation by such insurance carriers against the PGM and the Department.

(g) Indemnification. Without limiting any other provision of the Contract, fully indemnify, save harmless, and at the PGM's request, defend the PGM and its subsidiaries, affiliated companies, agents and employees, and the Department and its officers, agents and employees, from and against any and all suits, actions, legal proceedings, claims, demands, damages, costs and expenses of whatsoever kind or character, including but not limited to attorneys' fees and expenses, arising out of or by reason of:

1) any liability or obligation in any manner caused or occasioned or claimed to be caused or occasioned by, any act, omission, fault, or negligence of the Contractor or anyone acting on their behalf, including but not limited to vendors, their sub-contractors and sub vendors, and the employees and agents of any of the foregoing, in connection with or incident to the Contract or the work to be performed hereunder; and/or
2) any injuries (including death) or damage to any person or entity employed by or acting on the Contractor's behalf under the Contract.

103.17 EQUAL OPPORTUNITY AND NON-DISCRIMINATION – In connection with the execution of the Contract, do not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin consistent with the Commonwealth of Pennsylvania Nondiscrimination Clause. Take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, color, sex, or national origin.

Comply with the Regulations of the U.S. Department of Transportation relative to non-discrimination in federally assisted programs of the Department of Transportation (Title 15, Code of Federal Regulations, Part 8(a)(b)(c)).

103.18 INTEREST OF PUBLIC OFFICIALS – No member, official, or employee of the Department or of another state or local public body during their tenure or for one year thereafter is permitted to have any interest, direct or indirect, in the Contract or the proceeds thereof.

103.19 INTEREST OF MEMBERS OF CONGRESS – No Member of or Delegate to the Congress of the United States is permitted to have any share or part of this Contract or to any benefit arising therefrom.

103.20 SUBLETTING OR ASSIGNMENT OF CONTRACTS – Do not sublet, sell, transfer, assign, or otherwise dispose of the Contract or any portion or rights, title, or interest, without the written consent of the PGM.

If consent is given, subletting a portion of the Contract will be permitted. However, do not sublet a portion equal to, or exceeding 50 percent (50%), of the original total Contract price.
"Specialty Items," as identified in the proposal, may be performed by subcontract. The cost of any specialty items performed by subcontract may be deducted from the original total Contract price before computing the amount of work permitted to be performed by subcontract. Subcontracts or transfer of Contract will not release Contractor liability under the Contract and bonds.

103.21 DISSEMINATION OF INFORMATION - Any reports, information, data, etc., given to or prepared or assembled under this Contract may not be made available to any individual or organization without prior written approval of the Department.

103.22 PUBLICATION, REPRODUCTION AND USE OF MATERIAL - No material produced in whole or in part under this Contract will be subject to copyright in the United States or in any other country. The Department will have unrestricted authority to publish, disclose, distribute, and otherwise use, in whole or in part, any reports, data, or other materials prepared under this Contract.

103.23 AUDIT, INSPECTION OF RECORDS, AND OWNERSHIP OF MATERIALS - Permit the authorized representatives of the Commonwealth of Pennsylvania to inspect and audit all data and records relating to performance of work under the Contract. Retain records for a period of at least three (3) years after completion of the Contract. At the end of three (3) years, provide the records to the Department or obtain written permission from the Department to dispose of the records.

Provide free access of the duly authorized representatives of the Department at all reasonable times to such books and records and the right to examine and audit the same and to make such transcripts there from as necessary to allow inspection of all work data, documents, proceedings, and activities.

Documents, drawings, design data, and reports used or prepared in the performance of this Contract belong to and become the property of the Department in perpetuity.

103.24 CONTINGENT FEES - If requested by the PGM, provide a sworn affidavit certifying that no company or person other than a bona fide employee was retained to solicit or secure the Contract, and that no payment or agreement to pay has been made to any company or person other than a bona fide employee, any fee, gifts, or any other consideration contingent on or resulting from the award of the Contract.

103.25 GOVERNING LAW - The Contract will be governed by the laws of the Commonwealth of Pennsylvania, and applicable federal and local laws as they may from time to time be in effect.

103.26 MISCELLANEOUS PROVISIONS

(a) Construction Bidding. Neither the Contractor nor its member companies or their affiliated companies may bid on or perform any direct construction work in connection with this project.

(b) Clean Air Act of 1970. Comply with all orders, applicable standards or regulations issued pursuant to the Clean Air Act of 1970.

SECTION 104 - CONTROL AND PERFORMANCE OF WORK

MAJOR CHANGES FOR PUBLICATION 222

104.01 SUPERVISION, PERSONNEL AND MANNER OF PROSECUTION OF WORK - Designate in writing, at the beginning of work, a competent field supervisor or foreman who will be present at the site of the work at all times and will be responsible for supervision and performance of the work. Directions given them by the PGM will be binding on the Contractor, and such directions will be confirmed in writing when so requested. Any driller who begins work under the Contract must continue to work on the project until its completion, unless the PGM requests their transfer in writing. A driller may not be transferred without the written approval of the PGM.

Prosecute the work in a manner that will promote rapidity in execution, secure safety of life and property and satisfy the objectives of the project in accordance with the Contract Documents.

104.02 **INSPECTION OF WORK** - Perform no work unless the representative of the PGM is present unless the work is off the roadway and requires no traffic control, and does not involve work that must be witnessed and logged by the Inspector. In such case, prior written authorization from the PGM is required. Provide full opportunity at all times for inspection of the work by the PGM. Immediately remedy any work not completed in accordance with the Contract Documents to the satisfaction of the Contract Documents and the PGM at no additional cost to the PGM or Department.

104.03 **WORK SCHEDULE –** Work will not be performed unless directed by the Engineer in special circumstances on the following holidays:

New Years Day
Martin L. King Jr. Day
President's Day
Memorial Day
Fourth of July
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day After Thanksgiving
Christmas Day

Or when a Holiday is celebrated by the Department

Work restrictions on limited access highway during major holidays and the following:

No Lane Restrictions are permitted between 8 am and 8 pm on S.R. 70 from Chestnut Street, Exit 15, and East; and S.R. 79 from Laboratory, Exit 33, and North.

Contact the following at least 2 weeks prior to any Traffic Control Devices being placed on the Interstates:

(a) Valerie Peterson, PennDOT District 12-0 Community Relations Coordinator at 724-439-7375 and
(b) Adam Smith, PennDOT Washington County Maintenance Manager at 724-223-4480 or
(c) Tom Boyle, PennDOT Westmoreland County Maintenance Manager at 724-832-5357 and
(d) Washington County Pennsylvania State Police Commanding Officer at 724-223-8500 or
(e) Westmoreland County Pennsylvania State Police Commanding Officer at 724-832-3288

Adhere to the following restriction:
Cease all operations at noon of the normal workday prior to the beginning of the holiday period and do not commence until noon of the day after the holiday period has ended. The Engineer will notify the Contractor of the exact dates and duration of each holiday restriction.

MAJOR HOLIDAYS – New Years Day, Easter, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, and Christmas Day.

104.04 **LOCATION OF BORINGS AND SURVEY** - The PGM will establish in the field suitable points, lines, marks, locations and elevations as required to locate test borings and/or test pits. Where possible, borings are to be located a minimum of 100 ft. from domestic water supply wells. If borings must be located within the 100 ft. distance then those locations should be indicated on the Plan and Location of Borings and discussed at the pre-bid meeting. Do not drill any borings within a radius of 10 ft. from any domestic

water supply well or spring box. Furnish, without additional compensation, such labor, temporary structures and materials as may be required by the PGM to establish and maintain such points, lines, marks, locations and elevations.

The approximate locations of the required borings and/or test pits will be provided on a plan or staked in the field with segments and offsets provided for each specific job. The exact location of the individual borings will be determined and staked by the pre-bid meeting. If boring locations have not been approved by the pre-bid meeting then the borings will be placed as close as possible to the expected locations. These borings will be identified as approximate locations.

The final locations of some borings may be modified in the field by the PGM, depending upon topographic features and subsurface conditions encountered during progress of the work.

Borings on land may be offset from the designated location by the PGM to avoid surface obstructions or impracticable working conditions. Test borings on water shall be located within a radius of five (5) feet from the designated locations.

104.05 **NUMBER AND DEPTH OF BORINGS** - The number of borings and hours of work may be increased or decreased at the discretion of the engineers. Extend all borings to the depth elevations of conditions specified unless the engineer specially directs otherwise in the field.

104.06 **SEQUENCE OF BORINGS** - The PGM reserves the right to designate the sequence in which borings will be made. Any such specific sequencing must be provided in Attachment II of the bid document.

104.07 **ABANDONED BORINGS** - No payment will be made for any boring which has been abandoned before reaching the depth, elevation or condition specified on the Plan and Location of Borings and/or in the Instructions to Bidders, unless the PGM approves and accepts the borings as being completed.

Afford the PGM the opportunity to measure the depth of any boring and to inspect samples of materials recovered before abandonment and removal of casing and drilling equipment.

104.08 **WATER FOR DRILLING OPERATIONS** – The contractor will be responsible for securing water for drilling operations. Make necessary arrangements with appropriate private property owners of Governmental Agencies for use of water supplies for drilling. No additional payment for water will be made by the Engineer or the Department for hauling or securing water supplies.

Use only potable water for drilling water if drilling operations are conducted within 100 ft. of domestic water supply wells or spring boxes. Potable water should be supplied in a clean container free of debris and/or foreign matter

Wetlands that can be used as a source of drilling water will be noted in *Attachment II*. The Department will provide a Wetland Usage Plan; detailing access, procedure of water removal, and recharge and restoration of disturbed areas.

Areas that may be wetlands but are not noted as such cannot be used without Department approval. The Department must be notified prior to using such areas. The Department will determine whether the wetland can be used as a source of water. Revision to the above plan, as noted above, will be provided for areas determined to be wetlands from which water can be obtained. Allow sufficient time for the Department's review in the scheduling of operation so that the allowable Contract time is not exceeded.

104.09 **RESTORATION OF DISTURBED AREAS** - Restore ground areas disturbed by personnel and equipment as nearly as possible to their original condition. Any agreement to modify the restoration to original-condition is strictly an agreement between the Contractor and the property owner

and is to be at no additional cost to the Department. Prior to starting the work, submit repair methods for PennDOT facilities to the Department. Exercise particular care in the restoration of property such as shrubs, lawns, fences, walls, gardens, and pavements which are damaged, and restore all property to its original or like-original condition before leaving the site. This includes seeding and mulching of disturbed areas. No additional payment will be made by the PGM or the Department for restoration of disturbed areas.

104.10 PROTECTION OF ENVIRONMENT – Add the following section: During all phases of work, the contractor shall conduct his operations to minimize:

(a) Disturbance to trees and other forms of vegetation/

(b) The contractor shall be responsible for wrapping any trees that must be used for winching.

(c) The contractor shall restrict his activities to the immediate vicinity of the boring locations as much as practical.

(d) Each rig shall be equipped with a push broom and rock salt to avoid creating unsafe roadway conditions.

(e) At no time, shall truck mounted drill rigs be permitted in or crossing wet areas. The contractor shall not perform any activities in wetlands except for those directly related to wetland borings and for obtaining drill water if no other source of water is available, as described under Section 104.08.

(f) In performing borings in wetlands, and yards, or as directed, the contractor shall access the individual borings from the upland side as much as practical. Drill rigs shall be moved by skidding or tracking rigs across a continuous layer of plywood sheeting of appropriate thickness to the boring location. Access across wetlands shall be kept to wetland, boring, irregularities in the ground surface (ruts, etc.) shall be smooth to the satisfaction of the Engineer.

104.11 TREE CUTTING - When cutting or trimming of trees is necessary to access boring locations, provide competent personnel and use proper arboricultural practices, tools, and personal protective equipment (PPE) to safely and efficiently perform the work. Use proper PPE such as hand protection, (*29 CFR 1910.266 (d)(1)(iii)*); hard hat, ANSI standards Z89.1-1989 or Z89.2-1971, (*29 CFR 1910 Subpart I*); safety glasses and face shields, ANSI Z87.1-1989, (*29 CFR 1910.266(d)(1)(vii)(A)&(B)*); hearing protection, leg protection, APA guidelines, (*29 CFR 1910.266 (d)(1)(iv)*); safety footwear, Z41-1991 compliant, ASTM F1818, Standard Specification for Foot Protection for Chain Saw Users, (*29 CFR 1910.266 (d)(1)(v)*); and first-aid kits (*29 CFR 1910.266 (d)(2)(i)*).

Conduct tree cutting operations from off the travel lanes. Promptly remove any tree trimming debris to maintain a safe work area. Clear roadway drainage ditches/swales of any debris associated with this work.

Unless otherwise specified or directed, trimmed tree limbs should be removed back to the branch collar. Trees on Department's right-of-way that require 2/3 or more of canopy removal must be removed to ground level. Removal to ground level must be no higher than three inches above the ground surface, cut parallel to the ground surface. Trees on private property that require 2/3 or more of canopy, can be removed completely at the property owner's discretion. If trees are required to be removed from maintained lawns, the stumps shall be removed to a minimum 6 inches below existing ground level, debris removed, and backfilled with topsoil, seeded and mulched.

Be mindful of the Department's right-of-way lines and any required work limits. If tree cutting work is required off the Department's right-of-way, contact affected property owners in writing informing them of the proposed work and offering them any resulting wood. Use PennDOT *Form M-689* for this purpose. Document any attempted property owner contacts, indicating the date, time, and type (personal or written). When a property owner agrees to retain the cut wood, obtain the *Form M-689*

agreement and submit a copy to the DGE. Cut wood to the agreed lengths and place on private property at the right-of-way line as per Department policy.

104.12 **SITE CLEANUP** – After completing field operations, promptly remove all equipment mobilized and material brought to the site and restore the site to its original condition, as described under *Section 104.09*. The work will not be considered complete until site cleanup has been completed and accepted by the PGM.

SECTION 105 - PAYMENT

Minor Changes for Publication 222

105.01 **GENERAL** - Perform all work for the compensation set forth in the Form of Proposal except as noted under *Section 105.03*. The compensation thus set forth includes the cost of all insurance, bonds, and other incidentals, as well as all taxes and premiums payable under Federal, State, and Local laws applicable to labor, materials, supplies furnished, or work performed.
The basis of measurement and payment is as set forth under the Technical Provisions of these Standard Specifications for Subsurface Boring, Sampling, and Testing, or as specified in the Form of Proposal, with the latter taking precedence.
For service calls, on the days when services (including any of the items on the Bid Proposal) are requested and provided but no work is started because of Department equipment/personnel breakdown, a two-hour service charge will be paid at the rate for mobilization. Days when work activity is started and Department equipment breakdown occurs after 2 hours, but before noon, four hours will be paid. Days when work activity is performed before noon and Department equipment/personnel breakdown occurs afternoon, eight hours will be paid.
Normal working hours will between 7:00 A.M. and 5:00 P.M. Monday thru Friday not to exceed 8 hours per day although workdays may be longer depending on the operation.

105.02 **UNIT PRICES** - Except for lump sum prices which are fixed and invariable, the proposed bid price per unit specified in the Bid Proposal will govern. The estimated quantities of these items are only approximate as indicated under *Section 102.02*. Depending on soil and rock conditions established during the actual boring operations in the field, the PGM reserves the right to increase or decrease the number of borings and total units of work. If the final quantities are greater or less than the estimated units listed in the Bid Proposal, additions to or deductions from the indicated proposed total price will be made based upon the proposed bid price per unit, except as noted in *Section 103.03* for changes in scope of work which will be paid for as indicated in *Section 105.03* as additional or extra work.

105.03 **Delete**

105.04 **INVOICING –** Submit two (2) copies of each monthly invoice to the engineer for work completed and accepted each month. Also, send original invoice to Pennsylvania Department of Transportation Comptroller's Office, Accounts Payable. During the course of the Contract, provide as a minimum, the following information in each invoice.

1. Project name, SAP P.O number, location, date work ordered, date work began, date work completed, state project # if available, and cost per project.
2. Total units of each bid item completed and accepted during the invoice period, together with the bid price per unit for each bid and an extension of the total cost for each, i.e. the amount of payment request.
3. A cumulative total of the completed and accepted units for each of the bid items.
4. A cumulative total of the amount of payment.

105.05 PAYMENT OF RETAINAGE – Delete

SECTION 200 TECHNICAL PROVISIONS

SECTION 201 - MOBILIZATION

201.01 DESCRIPTION –

(a) General – This work consists of moving from the driller's equipment yard to the drilling site with all necessary equipment, tools and materials necessary to move to and between borings and complete work required under the Contract, and removal of equipment, tools, and excess materials from the drilling site at the completion of work.
(b) Movement between borings at the job site are not considered mobilization, but is to be included in the per foot price for advancing the boring.
(c) Mobilization will be paid as "Each", within District 12-0
(d) Mobilization will be paid as "Each", from one job site to another.

201.02 MEASUREMENT AND PAYMENT

Mobilization.	Each

SECTION 202 - STANDARD SOIL BORING, SAMPLING AND TESTING

Major Changes for Publication 222

202.01 DESCRIPTION - This work consists of making soil borings to determine the true nature, arrangement and thickness of soil strata and any other materials as they exist in the ground; obtaining from each boring representative disturbed samples of the soil coming from each stratum as it exists in the ground; and performing standard penetration tests (SPT) at the depth of each representative disturbed sample; and advancing unsampled borings through soil. This work may require drilling and sampling in rock embankments

202.02 PROCEDURES FOR ADVANCING BORINGS IN SOIL

(a) Standard Procedure -

The standard procedure of advancing casing or hollow-stem augers defined herein is presented to illustrate the general soil boring sequence and the importance of minimizing soil disturbance and maintaining a clean boring. The actual procedure to be considered "standard" for a given Contract or boring will be specified in the Instructions to Bidders.

Advance an NX minimum diameter hole using steel casing, hollow-stem augers, or other means approved by the Engineer as required to maintain a minimum 3 3/16-inch diameter open hole for field testing and sampling operations. It is not permissible to advance the boring for subsequent insertion of the sampler solely by means of previous sampling with the SPT sampler, unless authorized by the Engineer. Advance other sizes of casing or hollow-stem augers to maintain open holes of other sizes as specified in the Bid Proposal. Do not advance the casing or hollow-stem augers to a depth greater than the depth at which field testing or sampling is to be undertaken.

Advance the casing or hollow-stem augers without washing, between samples or to the depths directed by the Engineer. Advance hollow-stem augers with the center bit assembly in place, unless permission is granted by the Engineer. Force drill water, as necessary, down through the drill pipe and out through ports in the chopping bit to carry cuttings up and out of the boring. Water ports in the bit must be arranged so that there is no jetting action on the drill water ahead of the bit. Do not extend the cleaning operation beyond the lower limit of the casing or hollow-stem auger unless directed by the Engineer. Use the minimum amount of water necessary to carry away the cuttings to avoid disturbance to the bottom of the boring. Omit casing or hollow-stem augers only at the direction or with the permission of the Engineer, where sampling operations without the casing or hollow-stem augers will not entrain soils from an elevation higher than the depth at which field testing or sampling is to be made.

Maintain all drilling equipment in good working order at all times throughout the duration of the work. If, in the opinion of the Engineer, the equipment supplied is inadequate for proper completion of filed boring, sampling and testing operations or installation of field instrumentation, replaces the inadequate equipment immediately with suitable equipment at no additional cost to the Engineer or the Department.

When very soft, cohesive or water-bearing granular soils are encountered below the water table, maintain the hole full with water or at a level higher than the ground water level at all times before, between and after sampling and testing operations to reduce the possibility of solid flowing upward into the casing. During the removal of the wash pipe, chopping bit and assembly, and insertion of the sampling barrel for standard penetration testing, maintain a positive inflow of water at the top of the casing. When necessary, increase the density of the drill water in the casing by adding bentonite or driller's mud to the drill water, but only with prior approval of the Engineer. After completing each soil boring, backfill in accordance with Section 210. Do not backfill borings in a mine fire area until after completion of the temperature monitoring program.

(b) Optional Procedures.

An alternate method of advancing the boring (such as with solid-flight augers or oversize sampling spoons) or of maintaining an open borehole (such as driller's mud) may be required or permitted if it can be shown that a clean hole will be maintained for the field testing and sampling operations and that the samples obtained are truly representative of the soil in place. Before proceeding with an alternate method of advancing the boring, obtain the written permission of the Engineer.

Where extremely compact material, boulders or other obstructions prevent further advance of the boring by driving casing, use boulder busters, augers, cutting bits, fish tails, or other under reaming bits to drill ahead of the drive casing to continue the boring if directed or authorized by the Engineer. Do not advance the under-reaming operation below the next scheduled sampling depth. Use drilled casing as an alternative to drive casing to continue the boring, if authorized by the Engineer. Perform blasting with small explosive charges to facilitate advancing the boring through boulders and other small obstructions only after obtaining written approval by the Engineer. Blasting must be performed by a licensed blaster in accordance with the regulations of the Pennsylvania Department of Environmental Protection and other applicable laws or ordinances. Pull casing up to an elevation at least 5 feet above the elevation of the

charge before detonation to avoid damage to the casing. Note the size of charge and time of detonation on the boring logs. After completing each soil boring, backfill in accordance with Section 210.

(c) Procedure for unsampled boring.

Where it is necessary to advance a soil boring without sampling, such as for installing piezometers, slope indicator casing or other filed installations, or for boring of the diameter requested by the Engineer by methods described in Section 202.02, or by using a tricone roller bit. In all cases, maintain an open hole to the depth required. Do not use driller's mud to support and unsampled boring without written permission of the Engineer. After completing each unsampled soil boring, backfill in accordance with Section 210.

202.03 PROCEDURES FOR STANDARD SOIL SAMPLING AND TESTING

(a) General. Conduct standard penetration tests and obtain split-barrel samples in accordance with *ASTM D 1586, "Standard Test Method for Standard Penetration Test (SPT)" and " Split-Barrel Sampling of Soils",* at every change of strata within a continuous stratum at intervals to be specified by the Engineer, with the top of the first sample at the ground (soil) surface in the boring.

(b) Equipment. For equipment not specified herein, meet the requirements of *ASTM D- 1586*.

(1) Split-Barrel Sampling Device. Provide, for each drill rig, at least two, 2 inch outside diameter split-barrel samplers with inside diameters of 1-3/8 inch at least 24 inch long. Provide other diameter split-barrel samplers if requested by the Engineer. The inside of each split-barrel must be flush with the inside of the drive shoe. Other split-barrel samplers are permitted only with the prior written approval of the PGM.
The shoe of the sampler must be sharpened to form a cutting edge at its inside circumference. Maintain the beveled edge of the drive shoe in good condition and, if worn, reshape the edge to the satisfaction of the Engineer. Replace the drive shoe of the sampler if damaged in such a manner as to cause projections within the interior surface of the shoe. Provide a minimum of two drive shoes in good condition for each sampling device.
Furnish on the boring log a complete description of the sampler, giving inside and outside diameters and length of barrel.
Fasten the sampler to its drive pipe by a connection embodying a check valve arranged so as to permit the ready escape of water entrapped above the soil sample as the spoon is driven down into the soil, but which will close as the soil sample and sampler are withdrawn, thus preventing the development of hydraulic pressure on top of the soil sample. Confirm a check valve is used as required.
Install a spring-type sample retainer in the tip of the sampler when necessary to prevent loss of the sample. If the standard split-barrel sampler fails to recover a soil sample on the second trial, as in granular soils, use a sampler with a flap valve or sand trap, or other approved device, to recover the sample. Do not use trap doors of the flap type protruding at any point into the inside diameter of the sampler without prior approval of the PGM.

(2) Hammer. Provide a solid rigid metallic hammer having a mass of 140 pounds + or– 2 pounds, with a hammer drop system meeting the requirements of
ASTM D1586, Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils, which can apply blows at a rate of 20 to 40 blows/minute. Automatic, Safety, and Donut hammers are permitted. Automatic and Safety hammers are expected to have an efficiency rating (ER) of not less than 60%. If a Donut hammer is to be used, the Contractor shall provide a hammer efficiency calibration of

the hammer performed within the previous 12 months. Hammer efficiency calibration is to be measured as specified in *ASTM D4633, Standard Test Method for Energy Measurement for Dynamic Penetrometers*.

(c) Procedure. After cleaning the boring to remove all loose materials, remove the center bit assembly from the hollow stem auger. Gently lower the splitbarrel sampler to the bottom of the hole. If, due to insufficient cleaning, the sampler remains more than six (6) inches above the specified sampling depth, remove the sampler and provide additional cleaning. Drive the sampler with the guided hammer into undisturbed soil below the bottom of the boring. Permit the hammer to fall freely through a height of 30 inches. The guide must be marked to facilitate easy measurement of the hammer drop. Observe and record the number of blows required to drive the sampler each 6 inch increment for a total penetration of 18 inches. **Do not overdrive the sampler.** Clearly record the number of blows for each 6 inches of penetration. Cumulative blows will not be accepted. Record the actual amount of penetration to the nearest 0.1 ft. Remove the sampler and advance the casing to the next scheduled sampling depth, or as directed by the PGM.

Drive the sampler with blows from the 140 pound hammer following the refusal criteria in *Figure 24*.

If a soil sample is lost or is found unsatisfactory as to size or condition, make a second attempt to obtain a satisfactory soil sample before advancing the boring to a lower elevation. Wash samples will not be accepted.

Immediately upon removal from the hole, carefully disassemble the sampler and record the soil description and amount of sample recovery. Remove the most representative and least disturbed portion of the sample, measuring 5 inches in length, and place into an air-tight glass jar of the dimensions specified in *Section 215*. Do not push or wedge additional material into the sample jar. Where a change in strata occurs within the spoon sampler, place a sample of each material in a separate jar. Record the depth of the change. Securely fasten the lid of each jar. If the length of sample recovered is insufficient to provide a sample 5 inches long, place the entire sample in the sample jar.

Describe soil samples and record borings, sampling and testing data in accordance with *Section 214*.

Package, ship, and store the samples in accordance with the requirements of *Section 215*.

SPT Refusal Criteria and Action			
Condition	**Primary Action**	**Results**	**Consequential Action**
Condition "A": SPT results of N = 50/0.1 ft. for one interval **OR** N ≥ 50/0.3 ft. for two consecutive intervals **(see Note 4)**	Attempt 2 ft. core run	Encounter rock with REC ≥ 80%	Begin continuous coring at 5 ft. runs
		Encounter rock with REC < 80% but ≥ 20%	Continue continuous coring at 3 ft. runs (**see Note 1**)
		Rock REC < 20%	Go to Condition "B" **(see Notes 2 and 3)**
Condition "B"	Attempt auger to next SPT elevation. Describe cuttings. Attempt SPT. **(see Note 4)**	Auger Refusal	Go to Primary Action in Condition "A"
		N = 50/0.1 ft. for one interval **OR** N ≥ 50/0.3 ft. for two consecutive SPT intervals	Go to Primary Action in Condition "A"
		N < 50/0.3 ft.	Continue SPT

Notes:

1) If recoveries remain below 80% and encountering softer or weaker rock (e.g., claystone, shale, weak siltstone) or highly weathered rock, maintain continuous coring at 3 ft. runs. If harder and/or un-weathered or slightly weathered stronger rock is encountered, may switch to continuous 5 ft. core runs after two consecutive 3 ft. core runs.
2) When drilling conditions indicate the recovered material was encountered at the bottom of the core run, or there is clear indication that conditions are improving, a second 2 ft. core run may be attempted.
3) Unless site or project specific conditions or subsurface conditions indicate otherwise, if after a second cycle through Condition "A", rock core recoveries continue to remain less than 20%, switch to continuous coring at 3 ft. runs.
4) Do not describe SPT or auger cuttings recovered from weathered or weak rock as a soil or provide a soil classification. Describe consistent with the material encountered (e.g., shale fragments, highly weathered sandstone).
5) Whenever results from subsurface investigations (whether SPT or rock coring) indicate a change in subsurface conditions, follow the appropriate consequential action indicated above.
6) SPT = standard penetration test, N = SPT blow count, REC = Recovery

Figure 24 - SPT Refusal Criteria

202.04 MEASUREMENT AND PAYMENT

(d) Borings on land
Linear Foot

(e) Unsampled borings
Linear Foot

(f) Slide borings
Linear Foot

Payment will be made per foot for each boring satisfactorily completed, regardless of diameter of sampling interval. The payment per lineal foot will be considered full payment for all costs associated with the boring and standard sampling and testing including all required labor, equipment, and materials, and all logging, labeling, shipping and storage of samples, and site restoration.

SECTION 203 - UNDISTURBED SOIL SAMPLING

Minor Changes for Publication 222

203.01 DESCRIPTION - This work consists of recovering undisturbed soil samples from soil borings.

203.02 EQUIPMENT –

Use equipment specified in *ASTM D 1587, Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes*, as directed by the Engineer. Provide thin-walled tubes of 16-gauge seamless brass or hard aluminum, or 16- or 18-gauge seamless steel, with a minimum total length of 30 inches and with outside diameter of 3 inches, unless otherwise indicated by the PGM. Use only new, clean, un-corroded tubes removed from the manufactures' packaging at the job site. Used sample tubes are not permitted. All equipment will be subject to inspection and approval. Provide all sample tubes with a machine-prepared, sharp cutting edge having a flat bevel to the outside wall of the tube and drawn in to provide an inside clearance beyond the cutting edge of 0.015 inch ± 0.005 inch.

203.03 PROCEDURE - Obtain samples in accordance with the procedures of *ASTM D 1587*, unless otherwise specified herein or by the PGM.

(a) Location - Complete borings as directed by the Engineer. Do not attempt undisturbed samples in these borings. Drill an unsampled soil boring in accordance with *Section 202.02(b)* approximately 3 to 5 feet away from the standard soil boring to a depth specified by the PGM.

(b) Method. Recover undisturbed soil samples by means of thin-walled tube samplers. When the sampling depth is reached, remove all loose and disturbed materials. Clean out, in such a manner, that the soil immediately above the top of the sample is as nearly undisturbed as possible. Advance and clean out hole as per *Section 202*. Connect the sampling device to the drilling rod, lower slowly to the bottom of the hole, and advance into the soil for a distance of 6 inches less than the total length of the sampling tube. If obstructions, such as gravel particles, prevent the full penetration of the sampler, obtain undisturbed soil samples of a lesser length with approval of the PGM.

Advance thin-walled tubes in a continuous downward motion at a rate of 3 to 5 seconds/ft. using the rig hydraulics without rotation, or otherwise as specified, approved or directed by the PGM. Do not drive the

sampler unless the character of the soil is such that driving with the hammer is absolutely necessary and is approved by the PGM.

Permit the sample tube with its contained soil sample to remain in place for a minimum of 15 minutes. After this time period, rotate the drill rod through two complete revolutions to shear the soil immediately below the sample. Carefully remove the sample from the boring and detach from the sample rods. Do not extrude the sample from the tube.

Remove any disturbed material in the upper end of the tube and measure the sample recovery. Remove ½-inch to 2 inches of material from the lower end of the tube for use in sample description. Completely fill the lower end of the tube, and at least 2 inches in the upper end of the tube immediately above the sample with a hot (melted) sealing wax consisting of paraffin wax, beeswax, microcrystalline wax, or some combination of these wax types. Tightly pack the remaining space in the upper end of the tube with paper, cloth or other approved material. Close the ends of the tube with snug-fitting plastic caps and secure caps in place with adhesive or friction tape. Dip the ends of the tube in hot wax several times to provide an air-tight seal. During sampling in very soft soils, if directed by the PGM, use a weighted drilling mud, to maintain a pressure on the soil as nearly equal as possible to that existing before the drilling operations.

(c) Records. Record each undisturbed sampling tube in accordance with *Section 214*. The boring number for the sample shall be the standard soil boring number with the addition of the suffix "A". A separate, complete boring log shall be prepared for each boring made for obtaining samples, whether or not samples are successfully obtained. Package, ship, and store samples in accordance with *Section 103*.

203.04 MEASUREMENT AND PAYMENT - Delete

SECTION 204 - ROCK CORE DRILLING

Major Changes for Publication 222

204.01 DESCRIPTION - This work consists of securing intact samples of rock from borings by diamond core drilling to determine the true nature, arrangement and thickness of rock strata and discontinuities as they exist in the ground, and of advancing unsampled borings through rock.

204.02 PROCEDURES FOR ADVANCING BORINGS IN ROCK

(a) Perform rock coring in accordance with *ASTM D 2113, Standard Practice for Rock Core Drilling and Sampling of Rock for Site Investigation*, except as modified by these specifications, to obtain rock core of the size NX or NQ where the soil boring has refused further penetration by split-barrel sampling. Drill each boring to the final boring depth indicated, or to the depths directed by the PGM. Sample soft or decomposed rock with a driven sampler in accordance with *Section 202* when possible.

(b) Equipment. If not specified herein, meet the requirements of *ASTM D 2113*.

(1) Drill. Use a drill having hydraulic feed type or similar mechanism having the capability of drilling vertical and angle holes. Maintain the drill in efficient operating condition. Must be a combination type drill, which is capable of thel auguring and coring.

(2) Core Barrel. Use a Series "M" swivel-type, double-tube core barrel with a diamond bit and a reaming shell, or a wire-line core barrel with a diamond

bit. If approved by the CGE, triple tube core barrels may be used. Maintain the core barrel and bit in efficient operating condition, and replace if damaged or worn. A split inner barrel must be used in all borings, unless otherwise directed by the Engineer.

(3) Drill Rods. Provide drill rods having an inside diameter that will permit flow of drilling fluid through the rods in a quantity sufficient to provide an upward velocity of the fluid between the rod and the hole wall so as to remove the cuttings effectively. Do not drill with drill rods that are not straight.

(4) All drilling water is to be recycled unless otherwise directed by the Engineer.

(5) Disposal of drill water must be conducted in an environmentally appropriate manner as directed by the PGM. Ensure that any potentially damaging or harmful materials are collected and disposed of in a manner that result in any impact to local environmental conditions.

(c) Procedure for Rock Coring. Make all test borings through appropriate size casing or hollow-stem augers installed to the bottom of soil borings. Advance the casing or hollow-stem augers to rock and seal into the rock surface to prevent seepage from or sloughing of soil overburden into the bore hole to be cored. Follow length of core runs as prescribed in *Figure 24*.

When coring rock, including shale, claystone and coal, control the speed of the drill and the drilling pressure, amount and pressure of water, and length of run to give the maximum possible recovery from the rock being drilled. Maximum length of first coring run is two (2) feet. Do not permit grinding of core. Maintain and observe pressure gauges to detect any blocking of core in the barrel, and at any suspicion that such is occurring, immediately cease drilling, remove the barrel from the hole and remove the core. Do not continue coring until care has been taken to see that the core barrel, bit and other equipment are in satisfactory operating condition. If poor recovery is experienced due to failure to consider the above factors, redrill and core the hole at no additional cost.

If soft or broken rock is encountered that cause broken pieces of rock to fall into the hole and cause unsatisfactory coring, or if voids of any type including mined-out coal seams or limestone caverns are encountered that endanger the continued downward progress of the boring, ream and case the hole with flush-joint casing to a point below the broken or open zone. Use a size of flush-joint casing which will permit securing of the specified core size. Repeat this procedure as many times as necessary to keep the hole clean. The use of standard wire line tools of the specified size is a preferred alternative procedure.

Make individual drill runs in the coring operation of not more than 5 ft. Where soft or broken rocks are encountered or anticipated, reduce the length of runs as indicated in *Figure 24*, or less as directed by the PGM, to reduce the core loss and keep core disturbance to a minimum. Make every effort to obtain maximum core recovery and record in the boring log all significant actions of the drill tools and reasons for loss of core.

Discontinue core drilling if, in the opinion of the PGM, observations of the drill tool indicate that softer materials have been encountered, and standard split-barrel sampling may be resumed. When drilling in carbonate formations, if soil filled voids are encountered, attempt a split-barrel sample to determine the nature of the material contained in the void.

Failure to comply with the foregoing procedures when ample warning of unusual subsurface conditions has been received in advance, will constitute justification for the PGM or DGE to require redrilling of any boring from which core recovery is unsatisfactory, at no additional cost. When, in the opinion of the PGM, the rock is in either a soft or broken condition, take precautions to keep the core intact as much as possible. Dismantle the split inner barrel horizontally and remove the core with care.

Exercise particular care in recording water losses, artesian pressures, rod jerks, changes in rate of advancement or any other unusual coring experiences which will supplement the core record and further document the nature and extent of fracturing or voids. Mark fractures and their estimated widths in the core boxes and clearly indicate the location of voids.

Immediately upon removal of the core barrel from the hole, carefully remove the rock core sample from the barrel, place the rock in core boxes in accordance with *Section 215*. Describe the rock samples, measure the rock recovery, and prepare the driller's log of each rock boring in accordance with *Section 214*.

After completing each rock boring, install groundwater monitoring according to *Section 209*. After completion of groundwater monitoring, and when the hole is not required for long-term groundwater monitoring or instrumentation, backfill in accordance with *Section 210.*

Package, ship, and prepare the rock core for storage in accordance with *Section 213* and *Section 215.*

(d) Procedure for Unsampled Rock Drilling. Where it is necessary to advance a rock boring without securing rock core, such as for installing piezometers, slope indicator casing or other field installations, or for performing field tests at a predetermined depth, advance the boring by methods described in *Section 204.02(c),* air rotary methods, or by using a tricone roller bit. When the hole is not required for long-term groundwater monitoring or instrumentation, backfill in accordance with *Section 210.*

204.03 MEASUREMENT AND PAYMENT

(a)	Borings on Land	Linear Foot.
(b)	Unsampled Borings	Linear Foot
(c)	Slide Borings	Linear Foot.

Payment will be made per foot after satisfactory completion of the following: (a) Backfilling – In accordance with Section 210

(b) Site Restoration – In accordance with Sections 104.09 and 104.10

(c) Delivery of legible handwritten Driller's Logs and Core Boxes as directed by the District Geotech Engineer – In accordance with Sections 214 and 215.

(d) Rock coring along with bituminous and concrete pavements will be cored NQ/NX or HQ and will be paid at the same price per lineal foot as borings on land, unless otherwise directed by the Engineer, Section 202.04(a).

(e) Unsampled rock drilling will be paid at the same price per lineal foot as unsampled borings, Section 202.04(b).

SECTION 205 - CONCRETE/MASONRY DRILLING AND CORING

Payment will be made in accordance with Section 204.03

Scetion 206 - STANDPIPE PIEZOMETERS

Delete

SECTION 207 - INCLINOMETER CASINGS

Major Changes for Publication 222

207.01 DESCRIPTION - This work consists of installing inclinometer casing in a boring to permit monitoring of lateral movement of the ground.

207.02 PROCEDURE AND MATERIALS – For procedures and/or materials not specified herein, meet the requirements of AASHTO T-254, "Standard Method for Installing, Monitoring and Processing Data of the Traveling Type Slope Inclinometer." Inclinometer installation details are shown in Figures 207(a) and 207 (b).

Drill the boring to the depth indicated by the Engineer in the specified manner in accordance with Sections 202, 204 and/or 205

For standard NX diameter borings, using NW (3 in. inside diameter) drive casing, provide ABS plastic inclinometer casing having dimensions of 2.75 inches maximum outside diameter and 2.32 inches inside diameter, having four (4) machined longitudinal grooves equally spaced around the inside circumference, with standard self-aligning ABS plastic couplings, and ABS plastic top and bottom plugs.

Cement each casing joint and bottom plug with ABS cement, and rivet each joint at the quarter points around the casing, between grooves, with pop rivets to guarantee against separation and to maintain the alignment of the longitudinal grooves throughout the entire length of the installation. If quick connect type couplings are used, use the provided shear wires to connect casings; do not use cement or rivets.

Install the casing to a minimum of 10 feet into rock or 20 feet below the zone of suspected movement. Where the bottom of the inclinometer casing is higher than the bottom of the boring, backfill the lower portion of the boring by tremieing a grout mixture, through a pipe placed at the bottom of the boring, or, with the prior direction or written approval of the Engineer, by placing and tamping bentonite pellets. To prevent premature compression when using telescoping casing and couplings, do not allow the casing to rest on the bottom of the borehole. If placing casing in a water-filled hole, it may be necessary to load the casing with clean water to provide the necessary ballast to lower the casing. Backfill that annular space surrounding the inclinometer casing using methods and materials as directed by the Engineer for each particular installation, to position the casing and prevent any lateral shifting. Whenever possible, backfill the installation before or during removal of the casing or hollow stem augers. The use of fabricated grout valves placed at the bottom of the casing will be permitted. Flushing of the casing may be required if the ball-check type valve is used. When grout backfill is used, tape all joints prior to casing installation. When ground water measurements are required, do not use grout backfill.

Backfill with a cement bentonite mix, as specified in Section 210.02 (b) or if directed, with dry, vibrated sand.

Figure 207 (a) Inclinometer Installation
See page 5-62

Figure 207 (b) Inclinometer Installation (Plan and Detail)
See page 5-63

Figure 207 (c) Inclinometer Above Ground; (d) Flush Installation
See page 5-64

Install a protective steel or cast-iron protective casing over the completed inclinometer casing. Set the protective casing in a cement grout mix as specified under Section 210.02 (c), and extend to a depth of at least 2 feet below the ground surface. For above ground installations [Figure 201 (c)], extend the protective casing (4 inch minimum diameter) 2 feet above the surrounding ground surface, provide a lockable lid with lock and key. Installations above the ground surface must have the inclinometer casing extend a minimum of 2.75 inches below the top of the protective casing

207.03 MEASUREMENT AND PAYMENT

(a) Inclinometer Casing	Linear Foot.
(b) Protective Casing, Above-ground	Each.
(c) Borings on land	Linear Foot
(d) Unsampled Borings	Linear Foot
(e) Backfill Borings	Linear Foot

Masterlock Pro Series or equivalent padlocks keyed alike will be supplied with protective casings and be considered incidental to this item. Labeled keys will be supplied to the Engineer and others, as needed. Payment per linear foot for inclinometer casing installed will be considered full payment for all costs associated with installation of inclinometer casing in borings including all labor, equipment, and backfill materials. Inclinometer casing will be measured inside the casing from the top of the casing to the top of the bottom cap.

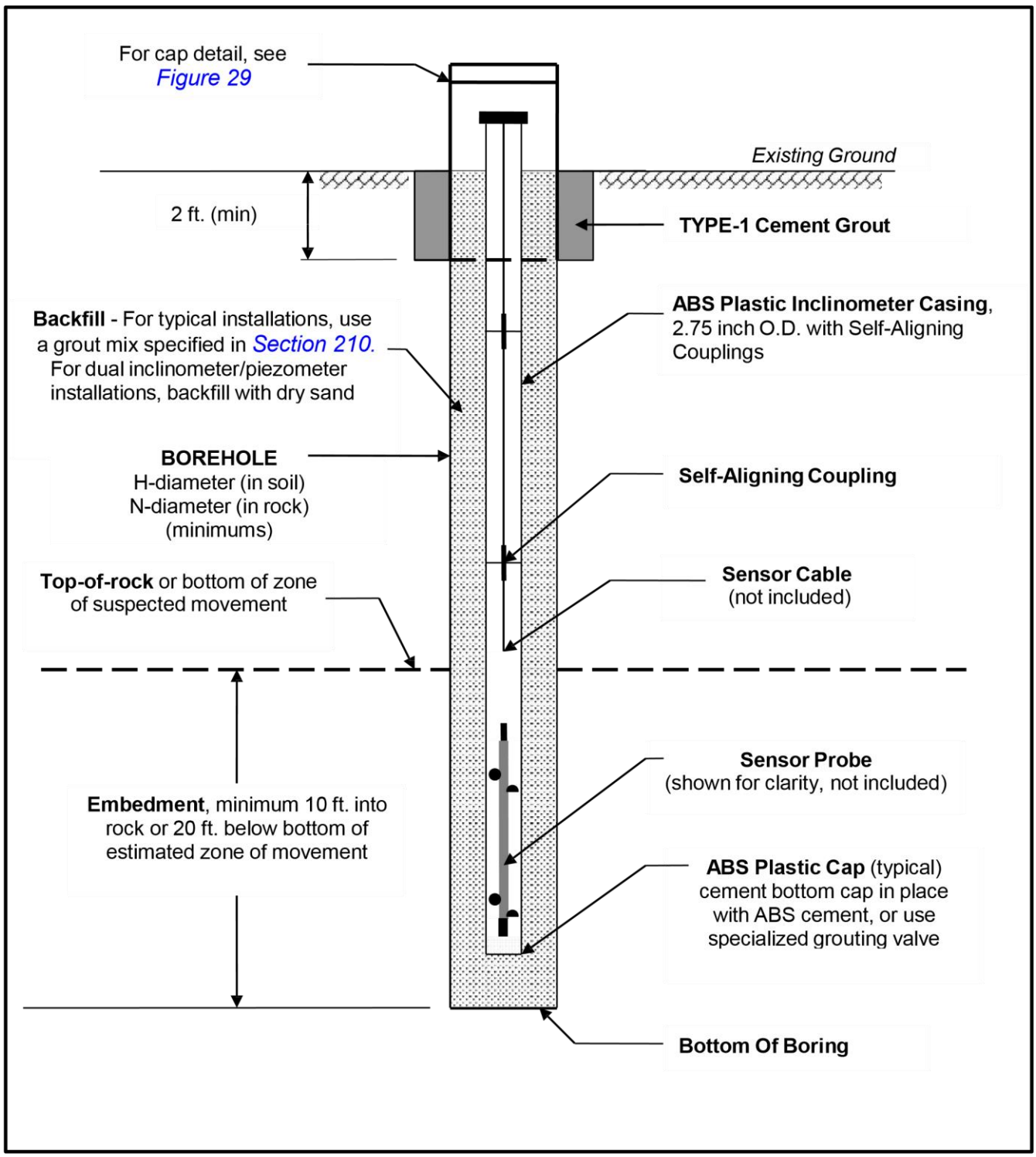


Figure 27 - Inclinometer Installation (Typical) N.T.S.

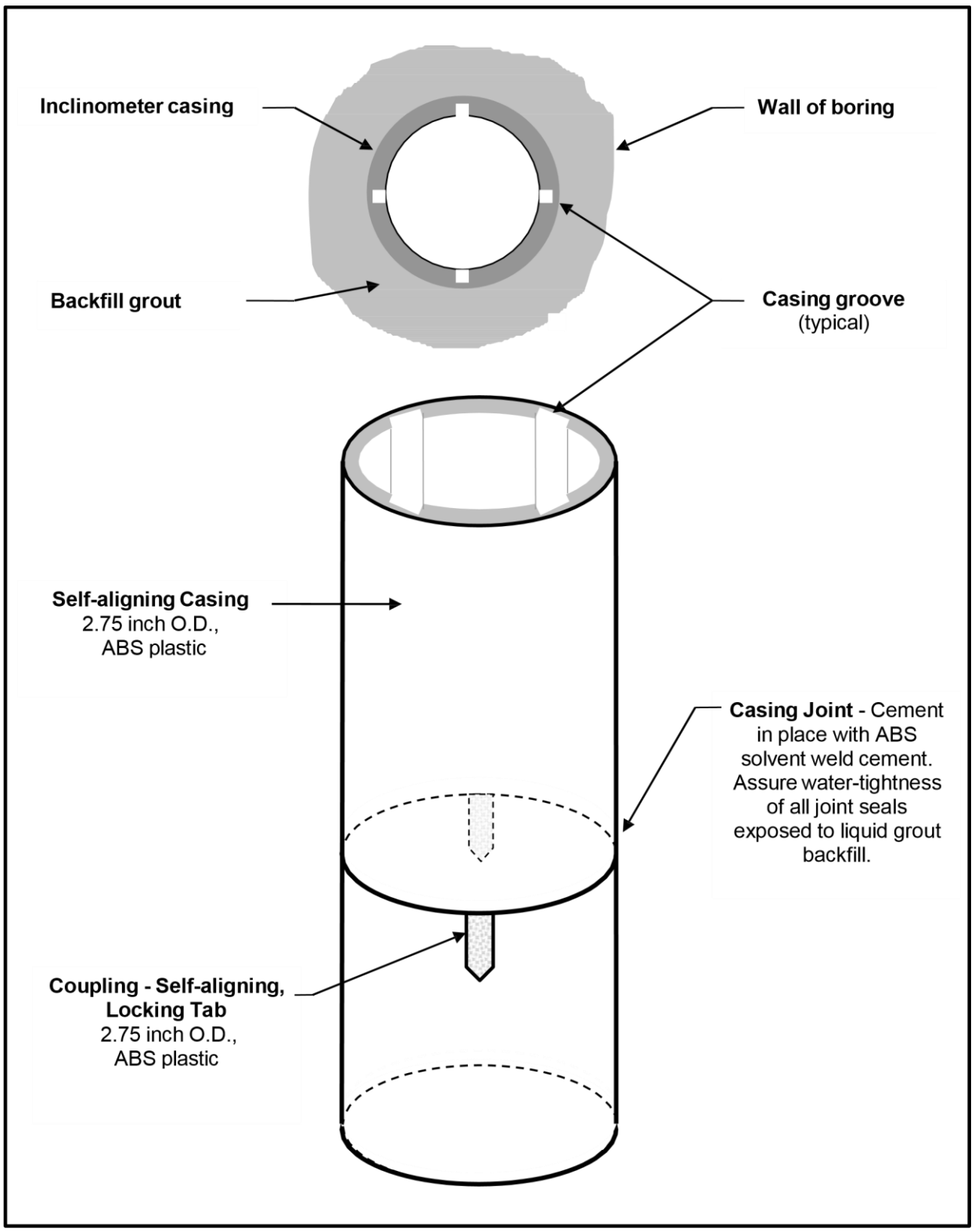


Figure 28 - General Inclinometer Coupling Installation N.T.S.

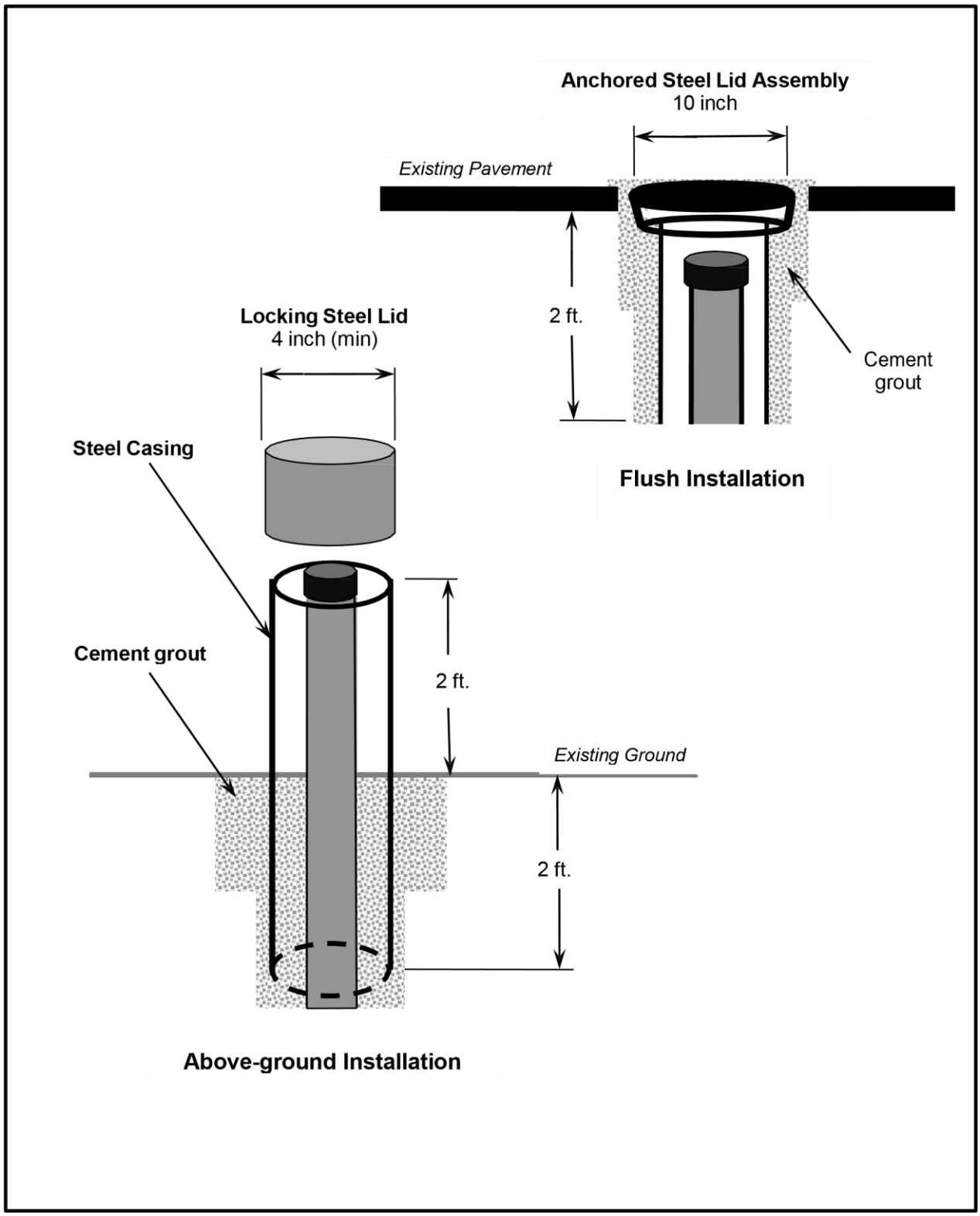


Figure 29 - Inclinometer Protective Casing (Typical) N.T.S.

This section has been deleted. Specifications for special installations or testing should be added on a project-specific basis as a Contract Special Provision.

SECTION 209 - GROUNDWATER OBSERVATIONS

209.01 **DESCRIPTION**- This work consists of observing and measuring groundwater during the subsurface boring, sampling, and testing operations.

209.02 **PROCEDURES** - Measure groundwater levels and record on the field logs for all completed borings. Measure groundwater levels to the nearest 0.1 ft. using an electronic water level indicator with an audible or visual signal. Record completely in the boring logs any unusual water conditions and depths at which there is a gain or loss of water, or return of water after a loss during boring operations. Record the depths at which water under excess pressure is observed. When water under excess pressure is observed, stop the drilling operation and extend the casing above the ground surface so as to contain the flow of water, or temporarily attach a low-pressure gauge at the top of the boring to permit measurement of water pressure. Measure and record the height of water above the ground surface or the water pressure at the top of the boring. Measure and record groundwater levels immediately after pulling casing or removing hollow-stem augers (0-hr reading); and twenty-four hours later (24-hr reading). Set temporary 1 inch PVC pipe from the existing ground surface to the bottom of each vertical boring to facilitate acquisition of 24 hour water readings. Install the temporary pipe with slotted end section into the boring prior to extracting casing or hollow stem augers.

Before pulling casing or removing hollow stem augers, install temporary 1-inch ID (minimum or larger if required for sampling purposes) PVC pipe to permit the measurement of groundwater levels. Provide a sensing section in the bottom 5 ft. consisting of PVC pipe having staggered 1/8-inch wide slots or 3/8-inch diameter holes that are cut at maximum 6-inch center- to-center spacing. This pipe will also be used to tremie grout the hole when closing the boring in accordance with *Section 210*. Accordingly, do not place a permanent cap or plug on the bottom of the pipe.

If more than one (1) day is required to complete a boring, take groundwater readings at the end of each days operation and immediately prior to the resuming of drilling operations and record on the drilling log in the remarks section.

If drilling mud was used to advance the boring, install temporary PVC casing at the completion of drilling. After installation of temporary casing, flush the hole with clean water to remove the drilling mud from the boring. Inject water at the bottom of the boring and continuing flushing until only clean water exits at the top of the boring to ensure all drilling mud is displaced. After flushing, record 0-hour and 24-hour groundwater levels. Note that drilling mud is not permitted to be used if any water sampling for testing, including electrochemical or environmental, is to be performed in the boring.

209.01 **MEASUREMENT AND PAYMENT** - No separate measurement or payment for this work.

SECTION 210 - BACKFILLING AND PLUGGING BORINGS

210.01 **DESCRIPTION** – This work consists of backfilling all completed borings which do not contain instruments (such as piezometers or inclinometer casing) and backfilling below the bottom of instruments.

210.02 **PROCEDURES AND MATERIALS**

(a) General. Temporarily plug or cap each boring immediately upon completion of the boring. Remove comvers and permanently backfill with grout and plug each boring flush with the ground surface after all information and data is obtained from the hole and recorded, as directed by the Engineer. The backfilling and plugging of borings will be in accordance with the appropriate procedure specified under *Section 210.02(b), Section 210.02(c), Section 210.02(d), or Section 210.02(e).*

(b) Boring Through Soil and Rock. Backfill the boring to the ground surface using a grout mix of 80L water, 1 bag cement (42.6kg) and 9Kg bentonite. All borings will be backfilled with grout pumped to the bottom of the boring through a grout pipe, unless otherwise directed by the Engineer. Raise the grout pipe periodically during grouting, but maintain the tip of the pipe at a minimum depth of 5 feet below the top of grout in

the boring or at the bottom of the boring, whichever is shallower, until grouting is complete.

(c) Grouting of Protective Casing. Backfill around the outside of the protective casing with a TYPE-1 grout mix as shown in *Table 38,* or an alternative grout mix approved by the DGE.

(d) Boring Through Mine Voids(s) or Limestone Cavern(s). Install a grouting basket or plug in the boring immediately above the top of the mine or cavern, and place a 5 foot plug of Type-A fine aggregate meeting *Publication 408, Section 703.1* on top of the basket or plug. Backfill the boring as described in *Section 210 (a) and (b)*

In the event multiple voids (mines or caverns) are penetrated by a boring, backfill the boring with grout in stages. In the first stage, backfill from the bottom of the boring to the bottom of the lowest void as described above. In the second stage, backfill the rock strata between the lowest void and the void above it by supporting a grout basket on a 1-1/4 inch (minimum) diameter pipe with the bottom of the pipe on the bottom of the lowest void and the grout basket located in the rock strata above the lowest void. With the grout basket in place, grout the portion of the boring between the two lowest voids as described above. If NX standard wire line equipment is used to core the rock, extract the NX casing to the top of the zone being backfilled in the second stage and maintain in place until the second stage of grouting is completed.

Allow each stage of grouting to set a minimum of twelve (12) hours before proceeding with the next stage. Perform the third and subsequent stages of grouting as specified for the second stage. Perform the final stage of grouting to the ground surface as specified above for a boring penetrating one mine or cavern.

(e) Boring Through Pavement, Sidewalk, Bridge Deck, Floor Slab or Wall. Backfill the boring with grout as described in *Section 210 (a) and (b)* to the bottom or back of the pavement, sidewalk, floor slab or wall.

In concrete or asphalt, pavements or slabs, plug the boring at the top with a non- ferrous, non-shrink, fast-setting cement-based grout of a strength and thickness equal to the original structure, pavement or slab. Use grout which exhibits no shrinkage when tested in accordance with *ASTM C 827/C 827M, Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.*

In plugging borings through bridge decks, provide temporary support or forming for the plug, acceptable to the DGE.

In concrete structures, grout the boring for the full depth of the boring with a non- ferrous, non-shrink, fast setting cement based grout of a strength equal to the original structure, but not less than 3,000 pounds per square inch.

(f) Temporary backfill in roadway and sidewalk areas. If it is determined by the contractor that a boring in a roadway or sidewalk area cannot be completed by the end of the workday, cease advancement of the boring. The contractor will utilize flush joint casing with flush joint end plug or hollow stem augers to maintain borehole overnight or approved equivalent method. The flush joint end plug, hollow stem auger cap, or plywood covering must not be within 6 inches of the pavement surface and the top 6 inches will be temporarily plugged flush with the pavement surface with “cold patch” or equivalent material approved by the engineer. On the next workday, remove the surface plug and complete boring to the required depth. Backfill the completed boring as specified. Refer to Figure 210 (a) “Temporary Backfill Detail for

Borings in Roadway", located in SECTION K-1, ATTACHMENT II of the SPECIAL PROVISIONS

In no case will augers, or casing remain in borehole within 0.15 meters of pavement surface metal plates, metal or wooden plugs will not be used to temporarily plug or cover borings left overnight in roadway areas. See Figure No. 210 (a)

(g) Additional backfilling operations requiring cement as backfill will be as directed by the Engineer.

210.03 MEASUREMENT AND PAYMENT

(a)	Backfilling Borings through Soil and Rock	Linear Foot
(b)	Grouting Basket or Plug.	Each
(c)	Fast Setting Non-Shrink Cement Grout 22.7kg, bag.	Each
(d)	Temporary backfill in Roadway and Sidewalk areas.	Each

No additional payment for placement or removal of temporary plug or backfill.

Payment for each listed item, completed and accepted, will be considered full payment for all labor, equipment and materials associated with backfilling and plugging borings.

SECTION 211 - TEST PITS

Delete

SECTION 212 - STANDBY FOR BORINGS

DELETE

SECTION 213 - STORAGE AND PROTECTION OF CORE BOXES

213.01 DESCRIPTION - This work is the installation of durable coverings for core boxes to protect from the weather.

213.02 PROCEDURE

Once core boxes are delivered to the storage site indicated in the Contract, stack boxes on pallets in layers of alternating directional pattern. Stack boxes four wide and eight high on each pallet. Unless otherwise directed, limit stacking of pallets to a maximum of two high.

Cover stacks with tarp to protect the top and all four sides, if directed. Secure the tarp with minimum 3/16 inch diameter polypropylene rope, laced through the grommets and fastened tightly.

Label the contents of the pallet(s) on the top and all four sides of the tarp. Print directly on the tarp with a permanent, waterproof, black marker. Print legibly and provide at a minimum the project SR and Section, boring numbers and box numbers as indicated below:

SR _____, Section _____.

Boring No._____Boxes _____through _____.

Boring No._____Boxes _____through _____.

Boring No._____Boxes _____through _____.

213.03 MEASUREMENT AND PAYMENT

(a) Incidental to Contract

SECTION 214 - RECORDS AND REPORTS

214.01 DESCRITION – This work consists of maintaining and confirming detailed records of the subsurface boring, sampling, and testing operations.

214.02 SYSTEM FOR DESCRIBING SOIL AND ROCK

(a) Soil Description. Describe the following characteristics of each soil stratum encountered:

- Texture – For coarse-grained soil, describe the primary or predominant texture of a as either a gravel size or a sand. For fine-grained soil, describe the primary or predominant texture as either silt or clay. Describe supplementary textures by the use of the adjectives (e.g., gravelly, sandy, silty, clayey). Use all that apply, with the most prominent first and the least prominent last.

- Color - Describe the basic color of each soil, such as yellow, brown, tan, red, gray or black and modify, if necessary, by adjectives such as light, dark, mottled, banded or mixed.
- Moisture - Describe the amount of moisture present in each soil sample in terms of wet, moist, damp or dry.

(b) Rock Description. Describe the following characteristics of each rock stratum encountered.

- Type - Identify the basic rock type encountered such as limestone, dolomite, calcite, shale, sandstone, siltstone, claystone, coal, conglomerate, chert, marble, slate, phyllite, quartzite, quartz schist, gneiss, diabase, and granite.
- Color - Describe the basic color of each rock type, such as brown, red, tan, gray, pink or black, and modify, if necessary, by adjectives such as light, dark, banded or mixed
- Unusual Conditions or Difficulties – Note any additional information (such as changes in the color of drill return water, tool drops, drilling advancement rate, obstructions, caving, boulder, etc.).

214.03 **BORING LOGS** - Keep a continuous and current field record of the operation of each boring. Use the *Driller's Boring Log* , or an equivalent form approved by the PGM. Make the boring log available to the PGM at all times for review. Upon the completion of each boring, submit the original driller's log to the PGM. Typed copies of the driller's boring log will be submitted to the Engineer within two (2) days of the completion of the boring, if directed by the engineer. In all other cases, typed driller's boring logs will be submitted to the Engineer prior to payment of the driller's monthly invoice. As a minimum, record the following information on each boring log:

General Information:

1. The project identification, including route, section and county.
2. The test boring identification number.
3. The date on which the boring was begun and the date on which the boring was completed.
4. The name of the Contractor, driller and helper.
5. The name of the PGM's field representative (Inspector).
6. The elevation of the top of the test boring (if available).
7. The location of the test boring relative to project reference line (e.g., segment, offset and offset from centerline) or other suitable reference points.
8. The type of drill rig used.
9. The drilling method used to advance the boring in soil.
10. The inside and outside diameter and depth of any casing used.
11. The type and weight of hammer and free fall used to advance the split-barrel sampler, the number of rope turns on the cathead (1-3/4 or 2-1/4), and the diameter of the sampler. Note whether the hammer is automatic (high efficiency) or manual (standard, low efficiency).
12. Hammer Efficiency Rating (ER), if known.
13. The length of the split-barrel sampler.

14. The drilling method used to advance the boring in rock.
15. The type and size of core barrel used and bit designation.

Specific Boring, Sampling and Testing Information:

1. The depth, type, number and recovery of each soil sample. Number soil samples sequentially with an “S-” prefix.
2. The blows per 6 inches or less to advance the split-barrel sampler.
3. The length of core run and length of recovered core for each run of rock core. Number rock core runs sequentially with an “R-” prefix.
4. A description of each soil and rock strata encountered, the depth to the top and bottom of each stratum, and discontinuities in each strata.
5. Depth to groundwater level, elapsed time after completion of drilling and date on which observation was made.
6. Depths at which undisturbed samples are taken.
7. Difficulties in drilling (obstructions, caving, boulders, rising of sand into bottom of boring, etc.) including the basis for any loss of soil sample or rock core.
8. Depth of loss and/or return of circulating water and increase in usage of drilling water.
9. Any additional information (such as changes in the color of drill return water, tool drops, drilling advancement rate, etc.) which may be of assistance in defining the presence of strata changes, boulders, voids or other subsurface conditions.

DRILLER’S BORING LOG

PUB 222 **BORING No.** _____

Sheet 1 of _____

LOCATION: County:

SR: SEGMENT: OFFSET: _____

Station: Offset from CL:

DATE STARTED: **DATE & TIME COMPLETED:** _____

DRILLING COMPANY: _____

DRILLER:_____ **HELPER:**

ENGINEER REP (Inspector): _____

DRILLING METHODS: Drill Rig Type: _____

Casing Diameter OD/ID (inches):

SOIL SAMPLING: Hammer Type: ☐ Donut ☐ Safety ☐ Automatic

Hammer Efficiency Rating % (if known): Weight (lbs): _____ Drop (inches):_____

No. Rope Turns: Sample Diameter (inches): _____

ROCK SAMPLING: Core Barrel Type: Size: _____

WATER LEVEL DEPTH: Feet: _____ Time: Date: _____

Feet: _____ Time: Date: _____

Feet: _____ Time: Date: _____

DEPTH (ft.)	**SAMPLE NO./TYPE or RUN NO.**	**SPT** (blows /0.5 ft. on soil sampler)	**RECOVERY** (in)	**DESCRIPTION** (SOIL TEXTURE/ROCK TYPE, COLOR, MOISTURE)	**REMARKS**

Notes: _____

_____

Signatures (acknowledging the review of the completed Driller's Log for this boring)**:**

DRILLER: _____ DATE: _____ ENGINEER REP. _____ DATE: _____

BORING No. _____

Sheet _____ _____ of

LOCATION: SR: _____ SEGMENT: _____ OFFSET: _____

Station:_____Offset from CL:_____COUNTY: _____

DRILLER: _____

DEPTH (ft.)	**SAMPLE NO./TYPE or RUN NO.**	**SPT** (blows /0.5 ft. on soil sampler)	**RECOVERY** (in)	**DESCRIPTION** (MATERIAL TYPE, COLOR, MOISTURE)	**REMARKS**

214.04 DAILY DRILLING QUANTITY SUMMARIES - The Contractor may maintain and update daily a record for each drill rig of the work completed including footage of drilling in soil and rock. The record will

document the quantity of each pay item listed in the Bid Proposal completed during the day, and will be summarized weekly. The record will also indicate, for each day, the driller's name, the helper's name and the hours worked. The Driller and Inspector shall review and sign the record daily to indicate agreement with the quantities listed as complete, and note any disagreement with the listed quantities. Provide data to the Inspector/PGM as needed to facilitate accurate documentation of the work on the record. If prepared, one copy of the record will be made available to the Inspector/PGM at the end of each work day.

214.05 MEASUREMENT AND PAYMENT - No separate measurement or payment for this work.

SECTION 215 - PACKAGING, PROTECTING AND SHIPPING SAMPLES

Minor Changes for Publication 222

215.01 DESCRIPTION - This work consists of packaging, protecting and shipping soil and rock samples in a manner that will facilitate sample identification and minimize the potential for sample disturbance or damage.

215.02 PACKAGING OF SAMPLES

(a) Samples Boxes. Provide new or refurbished wooden core boxes as shown in *Figure 30* for packaging, shipping and storing of split-barrel soil samples and rock core samples. Boxes must be stenciled in black paint according to **Publication 222**, *Figure 20.* Construct the core boxes and partitions so as to restrain the sample jars and rock cores against shifting during transport. Assist as necessary to properly place core samples in the core boxes. Also, construct wooden core boxes capable of storing 6" to 8" diameter size samples, as directed, using materials specified in *Figure 30 with boxes no longer than 4' in length.*

Unless the PGE or DGE directs otherwise, when two borings have minor amounts of recovered sample (such as very shallow and/or low recovery borings) it is permissible to place samples from both borings in a single core box.

(b) Sample Jars. Provide new glass sample jars approximately 5 inches high and approximately 2 inches inside diameter at the mouth, and with an inside diameter of not more than ¼-inch larger than that at the mouth. Provide the jars with a metal screw cap containing a rubber or waxed paper gasket. Provide self-adhesive, printed labels placed on the side of each jar to record the required information as shown in **Publication 222**, *Figure 21.*

215.03 PROTECTION AND SHIPMENT OF SAMPLES

(a) Split-Barrel Soil and Rock Core Samples. Provide suitable dry storage for all samples until completion of all required subsurface exploration sampling and testing Contract work items. At the completion of work, carefully ship all samples to the location indicated in the Instructions to Bidders, or as directed by the PGM. No payment will be made for boring and sampling operations associated with samples that are damaged or missing as a result of Contractor negligence.

(b) Undisturbed Soil Samples. Unless specified otherwise by Contract or directed by the PGM or DGE, undisturbed samples shall be packaged and transported according to "Group D" sample procedures given in *ASTM D 4220, Standard Practices for Preserving and Transporting Soil Samples.* These procedures include protecting the undisturbed soil samples from vibration, impact, bumping, dropping, rolling, etc. by proper packaging and cushioning. Samples are to be handled, stored and shipped in the same orientation in which they were taken. Protect samples from freezing or excessive heat. Metal or plastic tube caps shall be provided and used to seal the sample tubes. Provide wood, metal, or other suitable type of shipping container that adequately cushions and insulates the undisturbed samples. Deliver or ship the undisturbed samples in a timely manner to the location indicated in the Instructions to Bidders, or as directed by the PGM. For all modes of transporting samples, the loading, transport, and unloading of sample containers will be monitored by the Inspector or other qualified person such as the PGE, geologist, or soils technician. No payment will be made for boring and sampling operations associated with samples that are damaged or missing as a result of Contractor negligence.

215.04 **MEASUREMENT AND PAYMENT** - No separate measurement or payment for this work

BILL OF MATERIALS:

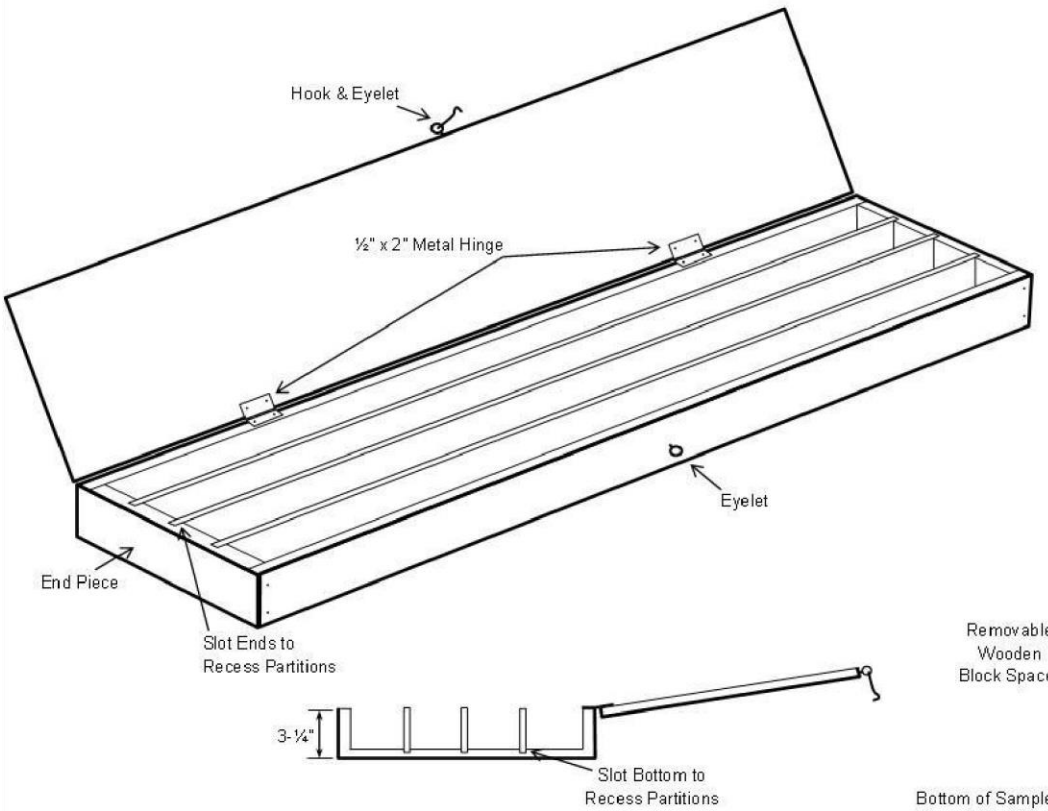
MEMBER	QTY	DIMENSIONS	TYPICAL LUMBER
Lid	1	¾" x 11-½" x 48"	Lumber No. 2 Pine, Exterior Plywood
Bottom	1	¾" x 11-½" x 48"	Lumber No. 2 Pine, Exterior Plywood
Sides	2	¾" x 2-½" x 48"	Lumber No. 2 Pine, Exterior Plywood
Ends	2	¾" x 2-¼" x 10"	Lumber No. 2 Pine, Exterior Plywood
Partitions	3	¼" x 2" x 46-¾"	Lumber, Spruce or Hardboard

HARDWARE	QTY
2" Hook & Eyelet	1
Eyelet	1
½" x 2" Metal Hinge	2
Screw-type Nails	(As needed)
Hinge Screws	(As needed)

Note: All dimensions above are neat measure.
Pine Block Spacers (5-¾" x 2-3/16") are to be included with each box.

Specfications:

All lumber is to be No. 2 Pine or approved equal (except partitions).
End pieces and bottom are to be slotted to permit recessing of ends and bottoms of partitions.
Slots are to be of sufficient dimensions to provide rigidity to partitions and easy removal.
All lumber members are to be firmly secured by appropriately sized screw-type nails.
Metal hinges are to be recessed sufficiently to insure closure of the lid and secured by appropriate sized wood screws.
Box dimensions must be sufficient to accommodate sample jars.



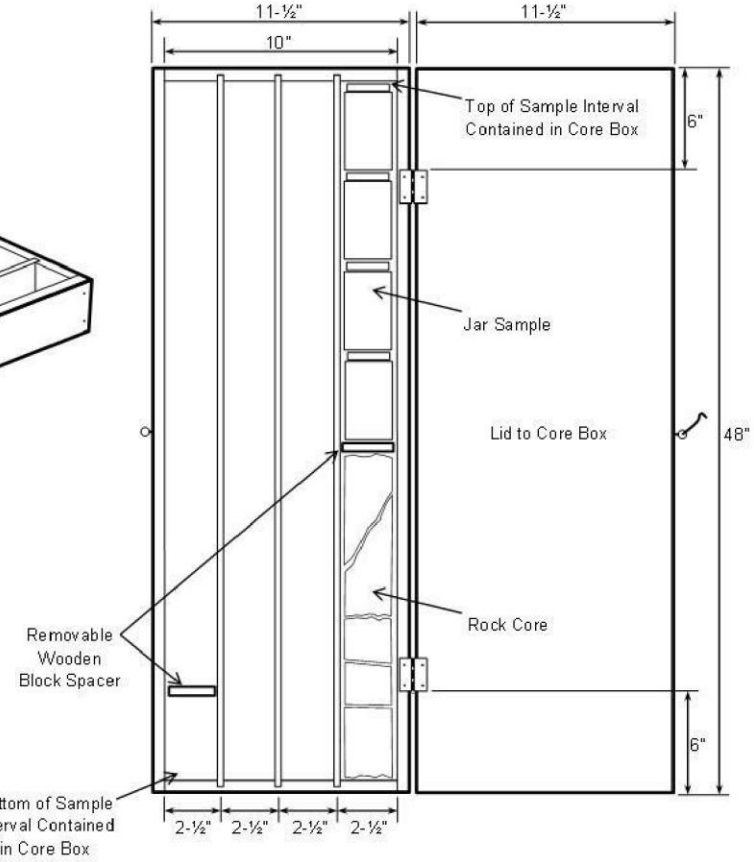


Figure 30 - NX Core Box Construction

SECTION 216 - MAINTENANCE AND PROTECTION OF TRAFFIC

216.01 DESCRITION - This work consists of maintain and protecting traffic in and adjacent to the area where subsurface exploration, sampling and testing operations are being performed

216.02 MATERIAL - Furnish material and traffic control devices necessary for the maintenance and protection of traffic, and conforming to the Traffic Control Plan, the National Manual on Uniform Traffic Control Devices (MUTCD), the *67 Pa. Code, Chapter 212*, and the Pennsylvania Department of Transportation *Publication 213 – Traffic Control Guidelines*.

216.03 PROCEDURES - Comply with the requirements of *Section 103.13* and *67 Pa. Code, Chapter 212.*

Install and maintain the traffic control devices as required or directed. Schedule operations to permit movement of traffic with minimum interference. If traffic interruptions become too frequent, cease operations in the area concerned, as directed. Take satisfactory remedial action to correct the situation before continuing operations.

Provide personnel, equipment, and material in accordance with the Pennsylvania Department of Transportation *Publication 408, the 67 Pa. Code, Chapter 212,* and the Pennsylvania Department of Transportation *Publication 213* to control traffic through work zones and to provide safety for the work force. Submit traffic control plan for approval.

Maintain a minimum of one (1) lane in each direction at all times on four (4) lane highways. Maintain a minimum of one (1) alternating lane of traffic on two (2) lane highways. The Department reserves the right to dictate hours and days of work when traffic restrictions are imposed.

216.04 MEASUREMENT AND PAYMENT

(a) Maintenance and Protection of Traffic with two (2) Flagman. Hourly.
(b) Flashing arrow panel and shadow vehicle with truck mounted attenuator. Hourly.
(c) Flashing arrow panel and shadow vehicle with truck Mounted attenuator at night. Hourly.

This item will be measured and paid for at the Contract unit price per hour. The payment per hour will be considered full payment for all costs associated with maintenance and protection of traffic including two (2) flagmen and all other labor, equipment and supplies according to Publication 213.

SECTION 217 - AUGER BORING FOR BULK SOIL SAMPLES

Delete

SECTION 218 - CONTRACTOR RECALL

DELETE

SECTION 219 – TEMPORARY WATER SUPPLY

DELETE