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- [ ] Other

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If "Yes", has disclosure been submitted by WHC or other company?
[ ] No [X] Yes Disclosure No(s). Geotechnical Soil Probe submitted 2/13/91.

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Responsible Manager (Printed/Signature) Date: J. C. Sonnichsen J C Sonnichsen 9/15/93

INFORMATION RELEASE ADMINISTRATION APPROVAL STAMP

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WHC-S-0222 Rev. 0

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WHC-S-0222-
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## LEGAL DISCLAIMER

Westinghouse
Hanford Company

P.O. Box 1970
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WHC-S-0222

Revision No. 0

Total Pages 18

Hanford Operations and Engineering Contractor
for the U.S. Department of Energy
under Contract No. DE-AC06-87RL10930.

W25320/E25003

# SPECIFICATION FOR
## In Situ Characterization Probe Specification

System No.

Equipment No.

Building: Hanford Site

Project: Engineered Applications

Impact Level: 3 Q

OFFICIAL RELEASE BY WHC
DATE SEP 14 1993
Sta. 21 (20)

Prepared By:

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Approved By: Date

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W.R. Thackaberry — 9-14-93
W. R. Thackaberry, Quality Assurance

## TABLE OF CONTENTS

# 1.0 SCOPE

These specifications provide requirements for the materials and installation of in situ characterization probes within the Hanford Site for the determination of lithology and the characterization of radiological and chemical contamination. Included are site preparation, probe design and selection, decontamination, probe installation, characterization with geophysical logging techniques, and surveying the completed probe installation for elevation and location. The characterization activities include, but are not limited to, site characterization work performed to satisfy the requirements of the *Resource Conservation and Recovery Act* of 1976 (RCRA) and the *Comprehensive Environmental Response Compensation and Liability Act* of 1980 (CERCLA). The in situ characterization probe is constructed from steel pipe that has a drive point on the leading end and is driven into the soil by diesel, hydraulic, pneumatic, or vibratory driving tools. Geophysical logging tools are then placed down the inside of the hollow probe and the logging tools are used to characterize the soils surrounding the probe.

## 1.1 APPLICABILITY

This specification delineates the requirements for materials and installation of in situ characterization probes by the onsite construction contractor or a subcontractor. The prerequisites and requirements for execution, inspection, and documentation of the installation are included. The installation of in situ characterization probes is applicable to contaminated cribs, ponds, ditches, underground storage tanks and surrounding soils, spills, unplanned releases, and solid waste disposal facilities on the Hanford Site.

## 1.2 DEFINITIONS

The Environmental Division of Westinghouse Hanford Company (WHC) has primary responsibility for conducting site characterization activities. In situ characterization probe installations shall be conducted and documented according to applicable Environmental Investigation and Site Characterization Instructions (EIIs) contained in WHC-CM-7-7.

### 1.2.1 Westinghouse Hanford Company Remedial Investigation Coordinator

The Remedial Investigation (RI) Coordinator is responsible for applicable Remedial Investigation/Feasibility Study (RI/FS) work plans. The RI Coordinator has technical responsibility for the implementation of the work plan and governing documents to accomplish the data collection objectives.

### 1.2.2 Westinghouse Hanford Company Field Team Leader

The Field Team Leader (FTL) is responsible for the coordination of all onsite activities and personnel. The FTL provides technical direction and oversight

to ensure work is conducted in accordance with this specification and approved work plans and procedures.

### 1.2.3 Westinghouse Hanford Company Cognizant Engineer

The Cognizant (COG) Engineer is responsible for in situ characterization activities not within the scope of an RI/FS work plan. The COG Engineer is responsible for accomplishing the data collection activities contained in applicable work packages and governing documents, including technical responsibility for implementing the data collection objectives.

### 1.2.4 Westinghouse Hanford Company Site Geologist

The assigned Site Geologist is responsible for proper lithology description based on interpretation of probe performance and existing knowledge of lithology in the area of probe installation.

### 1.2.5 Onsite Construction Contractor

The Onsite Construction Contractor shall provide construction and construction management services, including quality assurance, quality control receiving inspection of Government furnished material, safety, scheduling, estimating, and cost control during construction in accordance with DOE-RLIP-4700.1A for in situ characterization probe installations that are determined to be work covered by the *Davis-Bacon Act*.

## 2.0 REFERENCED CODES, STANDARDS, AND SPECIFICATIONS

The standards and specifications listed below form a part of this specification to the extent indicated by subsequent references.

The following are material standards:

- **American Society for Testing and Materials (ASTM)**
  - ASTM A29-88 — Standard specification for general requirements for carbon and alloy, hot-wrought and cold finished, steel bars
  - ASTM A53-88a — Standard specification for black and hot-dipped zinc-coated, welded and seamless, steel pipe
  - ASTM A106-88a — Standard specification for seamless carbon steel pipe for high-temperature service
  - ASTM C150-89 — Standard specification for portland cement.

- **American National Standards Institute (ANSI)**
  - ANSI Z53.1-1979 Safety color code for marking physical hazards.
- **American Welding Society (AWS)**
  - AWS D1.1-90 Structural welding code (steel)
  - AWS A2.4-86 Standard symbols for welding, brazing, and nondestructive examination.
- **Washington Administrative Code (WAC)**
  - WAC 173-160 Minimum standards for construction and maintenance of wells
  - WAC 173-162 Regulations and licensing of contractors and operators
  - WAC-173-303 Dangerous waste regulations.
- **Occupational Safety and Health Administration (OSHA)**
  - 29 CFR 1910.120 Hazardous waste operations and emergency response (Section 0).
- **Federal Regulations and Guidance**
  - RCRA/40 CFR 264/265 Subpart F
  - CERCLA/*Superfund Amendments and Reauthorization Act*
  - *Technical Enforcement Guidance Document* (OSWER -9950.1)
  - DOE-RLIP 4700.1A.
- **Westinghouse Hanford Company**
  - WHC-CM-7-7 *Environmental Investigations and Site Characterization Manual*
  - WHC-CM-4-2 *Quality Assurance Manual*
  - WHC-CM-6-1 *Standard Engineering Practices.*
- **American Petroleum Institute (API)**
  - Specification 5A- Casing, tubing, and drill pipe.

# 3.0 REQUIREMENTS

## 3.1 DAILY DRIVING LOG

The contractor shall maintain a continuous, chronological driving log for each in situ characterization probe on furnished drilling log forms. The licensed driller driving the probes will be responsible for maintaining the driving log. This information is not intended to be a Quality Assurance record. This information will be used by the FTL, RI Coordinator, COG Engineer, and other technical staff to evaluate probe performance and recommend improvements in the installation of in situ characterization probes. The minimum driving information to be recorded shall be as follows:

- Date, well, or site characterization borehole number, contract number, and driller's name
- The depth from the ground surface, thickness, general characteristics (clay, silt, sand, gravel), and driving characteristics (easy or hard to drive, easy or difficult to keep straight) based on interpretation of known lithology from previous characterization
- The time work starts and stops each day, and hours spent at each type of work
- Time and duration of all shutdown and standby periods, with the reasons therefor
- Record of all difficulties encountered during drilling operations
- Method of driving used, diesel, hydraulic, pneumatic, or vibratory driver
- Type, grade, size, and amount of casing used, (measurement to nearest 0.01 ft for each section of pipe), including depth to bottom of casing within 0.1 ft (Tally sheet)
- Changes in driving method and equipment
- Power setting on driver, number of strokes per minute, and advancement rate for each lithology.

## 3.2 GENERAL REQUIREMENTS FOR RECORDING DRIVING INFORMATION

The log shall be kept complete, legible, and accurate with entries made in sequence so that each can be correlated with the depth of the hole at the time. The log shall be completed, at a minimum, at the end of each driving day and shall be available on call at any time during the day. If directed to standby or shutdown, an order shall be noted on the log. A complete legible copy of all completed logs for each probe installation shall be signed by the

driller and shall be submitted to the FTL at the completion of each probe installation. The FTL shall submit the completed driving logs to the RI Coordinator or the COG Engineer.

### 3.3 RECORDS REQUIRED BY WAC 173-160

The construction contractor shall comply with applicable sections of WAC 173-160, "Minimum Standards for the Construction and Maintenance of Wells."

### 3.4 WELL SURVEY

All survey work shall be performed by experienced survey personnel, supervised by a licensed land surveyor. The survey marker (brass cap), and center line at the top of any probe installation shall be surveyed. Surveys shall utilize the Washington State Plane Coordinates (south zone) of the North American Datum of 1983. A survey data report must be provided that includes the Hanford Site coordinates as location references only. Each survey data report must indicate the horizontal and vertical data used.

### 3.5 DATA SHEETS

A tabulation of probe locations, driving priorities, probe depths, probe diameter, and pipe material specifications shall be provided to the FTL by the RI Coordinator or COG Engineer for characterization probes to be driven in accordance with these specifications. The information provided in the data sheet reflects the anticipated driving conditions for a specific project, and provides guidelines for the site characterization activities for work planning purposes. This is not regarded as inspection criteria. Data sheet deviations may be encountered during drilling operations and will be approved by the RI Coordinator or COG Engineer before proceeding with work, and the deviations will be documented in the field activity report or other approved documentation. All changes in the requirements for this specification must be approved via an Engineering Change Notice (ECN) per WHC-CM-6-1, EP-2.2, all deviations from the requirements in this specification as the in situ characterization probe is used must be resolved via a Nonconformance Report (NCR) per WHC-CM-4-2 (Section 15.0) or other approved documentation.

### 3.6 PERMITS

The FTL shall be responsible for obtaining permits necessary for construction including excavation, cutting/welding, cultural reviews, and Radiation Work Permits (RWP).

# 4.0 MATERIALS

## 4.1 IN SITU CHARACTERIZATION PROBE PIPE

The in situ characterization probe shall be either weld-on or threaded carbon steel pipe or casing. Weld-on pipe shall be ASTM A53, Type S or E, Grade B, carbon steel or equivalent (ASTM A106, Grade B also is acceptable). Threaded casing shall conform to API Specification 5A, Grade N-80. The minimum diameter of the in situ characterization probe shall be specified for each individual characterization probe on the Data Sheet. The in situ characterization probe internal diameter shall be selected to provide adequate clearance for the geophysical logging tool which will be used to characterize the subsurface soils. The schedule (wall thickness) of the pipe for the in situ characterization probe is selected based on the required internal diameter of the probe required for the geophysical logging tool being used and the anticipated geologic conditions and driving difficulty. Schedule 40 pipe with a nominal 4-in. diameter and Schedule 80 pipe with a nominal 5-in. diameter have been used for an in situ characterization probe to deploy a 3.6-in.-dia radiological logging tool.

## 4.2 IN SITU CHARACTERIZATION PROBE DRIVE POINTS

The in situ characterization probe drive points shall be fabricated from 4140 grade, steel bar stock, ASTM A29-88, and must be heat treated to a Rockwell hardness of 30 to 35 after fabrication. Other grades of steel may be used for the fabrication of the drive points with the approval of the RI Coordinator or the COG Engineer. The drive points are welded on, and may be permanently attached with a continuous weld or stitch (tack) welded as directed by the FTL if the drive point is to be knocked off when the probe is removed and the hole is abandoned. See Figure 1 for dimensions and tolerances on the drive point. The drive points can be modified for use with threaded casing through the appropriate ECN.

## 4.3 PROBE INSTALLATION COMPLETION MATERIALS

### 4.3.1 Bentonite Annular Seal Materials

Granular and powder bentonite shall be a sodium bentonite and shall have a specific gravity of 2.5, a dry bulk density of 55 $lb/ft^3$ or greater, and a pH of 9 to 10.5. Granular bentonite shall be coarse bentonite crumbles with a particle size of 8-20 mesh.

### 4.3.2 Concrete for Surface Pad

Refer to the latest revision of WHC-S-014, *Groundwater Monitoring Wells*, for concrete surface pad specifications.

## 4.4 SURFACE PROTECTION

All in situ characterization probe installations will have a surface annular seal a minimum of 2 ft deep and at least 4 in. in diameter bigger than the diameter of the probe and filled with granular or powder bentonite. The RI Coordinator or COG Engineer, with the approval of the appropriate regulatory authority, shall determine if the in situ characterization probe installation is temporary or will be in place long enough to require surface protection. In situ characterization probe installations that require surface protection shall be protected from damage by using the specifications for surface protection in the latest revision of WHC-S-014 *Groundwater Monitoring Wells*. The requirement for surface protection will be contained in the Letter of Instruction (LOI) to the onsite construction contractor. In situ characterization probes do not require a protective casing around the probe. The locking cap is placed directly on the probe itself.

# In Situ Characterization Probe Drive Point

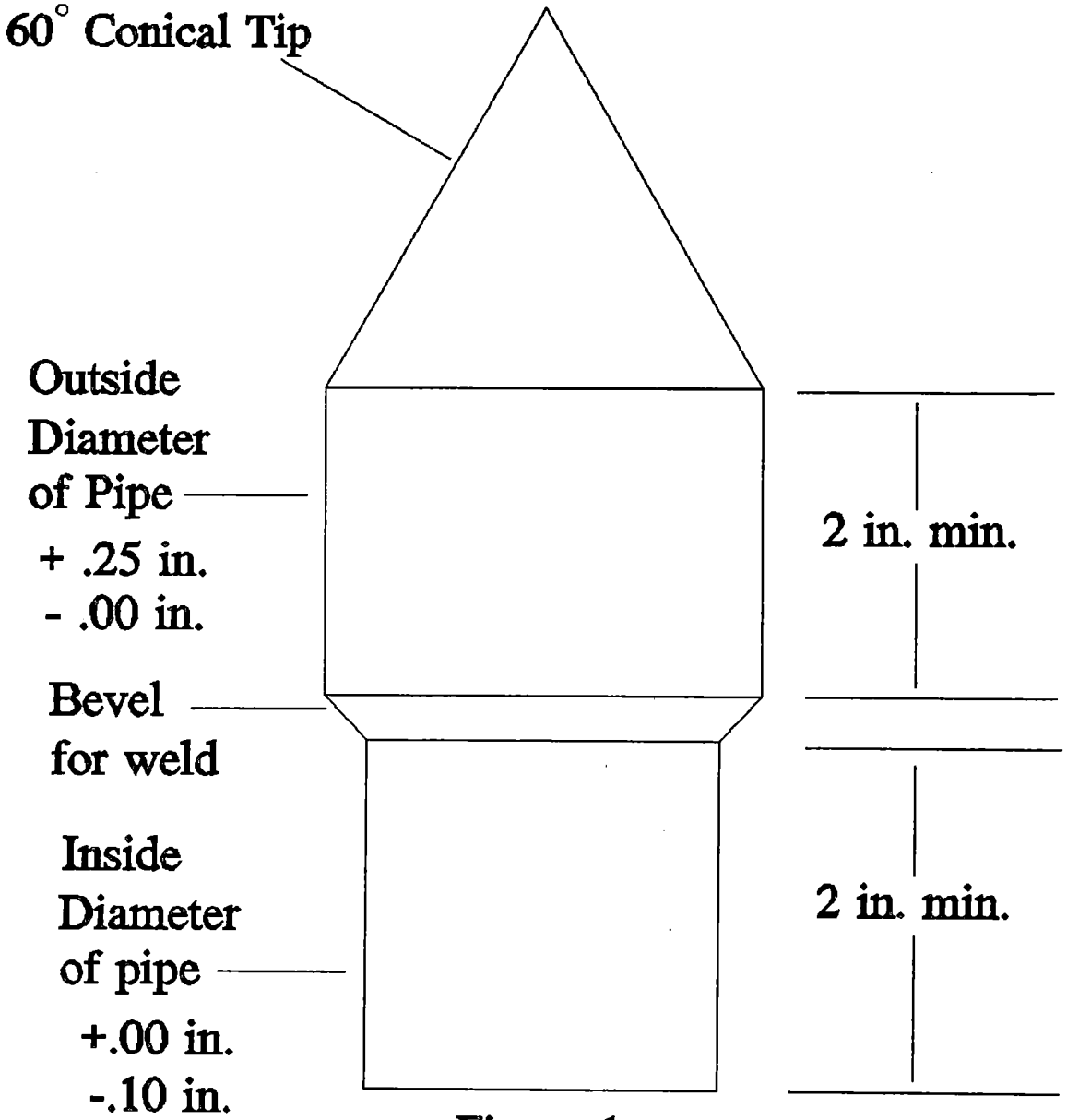


Figure 1

# 5.0 DRIVING THE IN SITU CHARACTERIZATION PROBE

## 5.1 GENERAL

The probes are designed to be driven into unconsolidated silt, sand, gravel, cobbles, and boulders of the Hanford formation to provide access for in situ characterization of contaminated soils within approximately 150 ft of the surface.

## 5.2 METHOD OF DRIVING

The in situ characterization probes can be driven by diesel, hydraulic, pneumatic, or vibratory drivers (hammers). A Link Belt (Model 180) diesel pile driver rated for 8100 ft-lbs of energy and 90 to 95 strokes per minute is recommended for the installation of in situ characterization probes. The hammer should be used with fair-leads that can be solidly mounted on a crane, or a Drill Systems AP 1000 dual-wall percussion hammer drill rig should be used to drive the probes. A freely suspended fair-lead can be used but makes driving the probes more difficult. Other driving tools with similar capacity and rating can be used to drive the in situ characterization probes with the approval of the RI Coordinator or the COG Engineer.

## 5.3 INSTRUCTIONS FOR INSTALLATION OF IN SITU CHARACTERIZATION PROBES

Specific instructions for the location, driving priorities, probe depths, probe diameter, and pipe material specifications will be contained in a data sheet that will be given to the FTL by the RI Coordinator or COG Engineer. This direction also will be provided to the onsite construction contractor as a part of the LOI. The drive points, pipe, fair lead, and the parts of the driver which come in contact with the probe shall be decontaminated in accordance with EII 5.4 before the driving of the in situ characterization probe. The drive point will be welded onto the pipe and the pipe sections shall be welded together using a fully penetrating v-groove weld as the probe is driven into the ground (the sections of pipe for the in situ characterization probe are typically 10 ft long). Welder qualifications and welding procedures shall be in accordance with AWS D1.1-90. The drive point is welded onto the first section of pipe and driving of the probe commences. Special attention must be paid to the driving of the first 3 or 4 ft of the probe to keep the probe plumb as it is being driven. Stop periodically and check the probe for being plumb and make the required adjustments. The probe may need to be realigned and held in place to get the probe started in a vertical (plumb) direction. The first few feet of driving are critical for starting a probe installation that will be plumb. Driving continues until approximately 1 to 2 ft of probe remains above ground level and then the next section of pipe is welded onto the probe. The driving rate of the probe should be adjusted so that the probe is driven at approximately 1 ft/minute. Previous experience has shown that a minimum amount of energy must be applied to get the probe to penetrate the soil at a reasonable rate and that applying too much energy beyond this level can cause the probe to bend and not penetrate the ground straight. Close attention should be paid to the

lithology of the soils being penetrated so layers that are difficult to drive through, such as layers containing large cobbles and boulders, can be anticipated. If the probe is refused while driving, the operation manual for the driver should be consulted to determine how long the driver can be operated at high power settings without advancement of the probe. If the driving of the probe is exceeding the capabilities of the driver, the decision to terminate the driving of the probe shall be made by the onsite construction contractor with the concurrence of the FTL. The driving of the probe should continue, adding sections of pipe as required until the desired depth is reached.

Probe installations shall be abandoned in accordance with the requirements of WAC-173-160 and EII 6-7, WHC-CM-7-7. The requirements for abandonment are negotiated on a case by case basis with the Washington State Department of Ecology.

## 5.4 STRAIGHTNESS TESTING

After the probe has been driven into the soil to the required depth a straightness test will be conducted. The probe shall be tested for straightness and interior smoothness with a bailer or similar device, which has the same or larger diameter and the same or longer length, as the geophysical logging tools that are going to be used to perform the in situ characterization. The bailer or similar device shall be lowered to the bottom of the probe and must descend freely of its own weight and then be withdrawn without binding. The test for straightness shall be made in the presence of the FTL. A good straightness test is essential in avoiding the loss of expensive geophysical logging tools in a probe that may not have the necessary internal diameter or that has not been driven as straight as required. Intermediate straightness testing shall be conducted at the direction of the FTL.

## 5.5 INSTALLATION OF SURFACE PROTECTION

Install surface protection around the probe at the surface as specified in Section 4.4. See Figure 2 for typical installation with surface protection.

# In Situ Characterization Probe Typical Installation

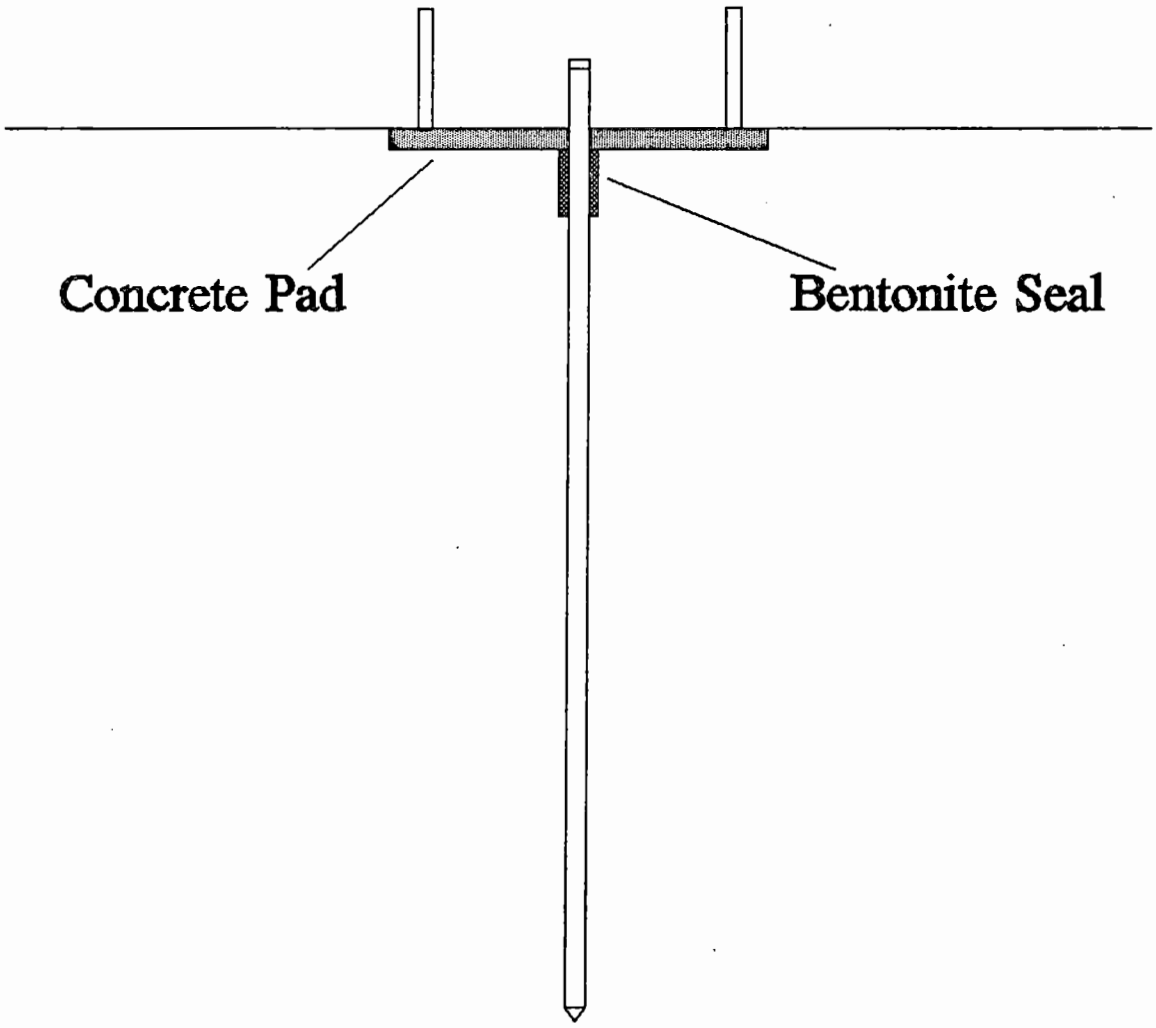


Figure 2

# 6.0 GEOPHYSICAL LOGGING - IN SITU CHARACTERIZATION

## 6.1 BOREHOLE GEOPHYSICAL LOGGING

Borehole geophysical logging will be performed in each probe as directed by the RI Coordinator or the COG Engineer in accordance with the Borehole Geophysical Logging Procedure WHC-CM-7-7, EII 11.1.

# 7.0 PRECAUTIONS AGAINST CONTAMINATION

## 7.1 GENERAL

The drive points, pipe, fair lead, and driver for the in situ characterization probe shall be decontaminated in accordance with EII 5.4 before driving the in situ characterization probe.

## 7.2 HANDLING AND STORAGE OF MATERIALS

The Contractor shall use all means necessary to protect probe pipe and casing before, during, and after installation. All materials shall be kept off the ground on pallets, stands, racks, dunnage, or sawhorses. All materials shall be stored in their original containers until needed for construction or, if steam-cleaned, the materials shall be stored off the ground and covered until needed for construction.

## 7.3 PERCHED WATER CONDITIONS

In areas of known or anticipated perched water, the probe shall not be driven through the entire thickness of the perched water's confining layer without the written approval of the RI Coordinator or the COG Engineer.

## 7.4 DECONTAMINATION OF CONTAMINATED DRILLING AND SAMPLING EQUIPMENT

Driving equipment shall be decontaminated using WHC procedures (WHC-CM-7-7, EII 5.4). The contractor shall supply the personnel and equipment necessary for decontamination. Potentially contaminated rinsate fluids and other decontamination products shall be handled and stored by the contractor per WHC procedure WHC-CM-7-7, EII 4.2, pending final designation and disposition.

## 7.5 CONTROL OF INSTALLATION WASTE

The solid waste and garbage (clothes, wipes, foil, paper, gloves, etc.) that are generated during drilling activities shall be drummed and stored as directed by the FTL. In general, drums shall be placed in roped-off restricted-access areas on pallets, and signs will be placed on the perimeter of the rope stating "Restricted Access Area."

## 8.0 PROBE AVAILABILITY

When requested by the FTL or Site Geologist, the probe shall be cleared of all tools to permit measurement and examination of the probe advancement. When driving or construction is not ongoing, the probe shall be covered to prevent tampering.

## 9.0 WELL DEPTH

The final total depth of the probes will be directed by the RI Coordinator or the COG Engineer. During the driving operation, the RI Coordinator or the COG Engineer may change the actual required depth of the probe depending upon the driving and geological conditions encountered.

## 10.0 SITE CLEANUP

All lumber, scrap materials, dunnage, and other debris shall be removed from the site upon completion of the probe installation.

## 11.0 QUALITY ASSURANCE

### 11.1 GENERAL

The construction and material specifications set forth in this document must be followed by the construction contractor. The construction contractor shall monitor and supervise the drilling activities so as to ensure that the probes are installed according to these specifications.

Construction contractor documentation of conformance with these specifications shall be identified through the Kaiser Engineers Hanford Quality Assurance Program Plan for Drilling Construction Activities No. 27. The FTL shall document conformance with these specifications in conjunction with documentation of probe fitness for use in accordance with WHC-CM-7-7. Deviation from the specification without proper documentation shall be documented on an NCR or other approved documentation.

### 11.2 INSPECTION VERIFICATION

Inspection and verification shall be performed on materials and driving activities as defined in this section. The contractor shall be aware of hold points (verification must be performed before proceeding) as identified in the following sections. The contractor shall notify the verifier before proceeding.

### 11.2.1 Receiving Inspection and Field Verification

Receiving Inspection shall be performed on all permanent probe construction materials to ensure compliance with the applicable standards in Section 2.0. Materials or material containers listed in paragraph A shall be physically tagged or marked during Receiving Inspection.

All material will be accepted for fitness for use by the FTL by verification of the receiving report or green tags before probe installation. This is a **HOLD POINT.** Material specifications will be checked and documented by inspecting the following materials listed in this section after delivery to the well site and verifying that the materials specified are used for the installation of these probes:

- Drive points, pipe, casing, and locking caps
- Granular and powder bentonite, cement, and guard posts.

### 11.2.2 Construction Specification Verification

Construction specification verification activities will be documented by the FTL to verify that the following items meet requirements:

- Driving method, probe depth requirement, document final probe well depth per geology log
- Material properly packaged, stored, and installed
- Driving equipment and materials cleanliness (see section 7.5 and 7.6 for driving equipment and material decontamination/steam cleaning hold points)
- Concrete installation (if required)
- Guard posts installation (if required)
- Hasp and locking cap installation
- Correct probe identification stamp
- Probe straightness at final depth
- Survey and records complete
- Site restoration.

## 11.3 SUBMITTAL

The construction contractor shall submit the following to the WHC FTL:

- Current Washington State drillers licenses for the contractor and for each of his employees who will be installing the probes (These licenses shall be submitted before work starts.)
- Resumes of each driller (Each driller shall have a total of 2 years minimum applicable [cable tool, pile driving, etc.] drilling experience and shall have had experience performing RCRA/CERCLA site characterization activities. Resumes shall be submitted before start of work.)
- Washington State Department of Ecology well completion report as specified in Section 3.3
- Surveillance and audit reports concerning the project
- Non-conformance Report
- Certificate of Conformance for material and cleaning
- Well survey report of probe locations and probe designation number
- Records of personnel exposure to radiological and nonradiological constituents (at the end of the project)
- Health and Safety Plan (if required).

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