St. 4 – 73

OCT 15 1998

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 621379

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
Distribution	Numatec Hanford Corporation/Special Analytical Support	N/A
5. Proj./Prog./Dept./Div.: Hanford Tank Initiative/Tank Waste Remediation System (HTI/TWRS)	6. Design Authority/ Design Agent/Cog. Engr.: W. S. Callaway WSC	7. Purchase Order No.: N/A
8. Originator Remarks: This document is for approval and release.		9. Equip./Component No.: N/A
		10. System/Bldg./Facility:
11. Receiver Remarks: 11A. Design Baseline Document? [ ] Yes [X] No		12. Major Assm. Dwg. No.: N/A
		13. Permit/Permit Application No.: N/A
		14. Required Response Date:

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	TWR-3524	N/A	0	Qualification Test Plan: HTI CP Stand Alone Gouting Module	Q	2	1	1

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION
(See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN
		Design Authority			
		Design Agent			
2	1	Cog.Eng. D. D. Wanner		10/15/98	R2-12
2	1	Cog. Mgr. D. F. Iwatate		10.15.98	R2-89
2	1	QA L.R.HALL	FOR JTH	10/13/98	R2-89
		Safety			
2	1	W. S. Callaway	W.S.Callaway	10/15/98	S3-90
2	1	K. D. Reynolds		10/15/98	R1-12
2	1	A. F. Noonan		10/15/98	K9-91
2	1	D. B. Hagmann		10/13/98	R2-89
6	6	SAS Files			S3-90
6	1	Central Files			A3-88
6	6	HTI Files - F. E. Wickstrand			R1-29
3	4	SAS Manager - L. L. Lockrem	W.S.Callaway FOR L.L.L. OKEON	10/14/98	S3-90

18.	19.	20.	21. DOE APPROVAL (if required)
W. S. Callaway W.S.Callaway 10/15/98 Signature of EDT Originator Date	N/A Authorized Representative for Receiving Organization Date	D. F. Iwatate 10.13.98 Design Authority/ Cognizant Manager Date	Ctrl. No. N/A [ ] Approved [ ] Approved w/comments [ ] Disapproved w/comments

BD-7400-172-2 (05/96) GEF097

BD-7400-172-1

Hanford Tank Initiative Cone Penetrometer Stand Alone Grouting Module

W. S. Callaway
Numatec Hanford Corporation/Special Analytical Support,
Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

EDT: 621379 UC: 2070
Org Code: 82300 Charge Code: 103256/EI00
B&R Code: EW3130030 Total Pages: 18

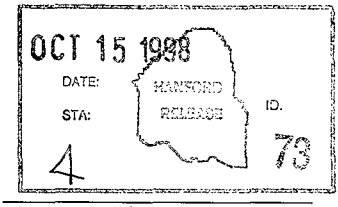
Key Words:

Qualification Test Plan: Hanford Tanks Initiative (HTI) Cone Penetrometer (CP) Hole Closure

Abstract:

The HTI subsurface characterization task will use the Hanford Cone Penetrometer platform (CPP) to deploy contaminant sensor and soil sampling probes into the vadose zone surrounding SST 241-AX-104. Closure of the resulting penetration holes may be stipulated by WAC requirements. A stand alone grouting capability deployable by the CPP has been developed. This qualification test plan defines testing of this capability to be performed at the Immobilized Low Activity Waste Disposal Complex.

10/5/98
Release Approval Date



Release Stamp

Approved for Public Release

QUALIFICATION TEST PLAN

Hanford Tank Initiative Cone Penetrometer Stand Alone Grouting Module

1.0 Purpose

This qualification test plan (QTP) defines the steps required to carry out qualification testing of the stand alone grouting hardware, support systems and procedures prepared to provide hole closure capability for the Hanford Tanks Initiative (HTI) Cone Penetrometer (CP) demonstration task.

2.0 Scope

This plan applies to qualification testing of the hole closure capabilities of the cone penetrometer platform (CPP), stand alone grouting module, support equipment, and required procedures and work instructions.

This qualification testing of HTI CP hole closure (grouting) capability fulfills a requirement of PHMC contract MJG-SLB-A52807 as specified in the associated Statement of Work (HNF-2881, Rev. 1) issued to Applied Research Associates, Inc. (ARA).

The qualification testing of the required CP hole closure capability will be considered complete when ARA has:

1. Provided or made arrangements for all hardware, support systems and materials required to close CP penetrations of 46 m depth made by the 51 mm (2.0 in. OD) diameter probes deployed by the HTI CP platform (CPP).

2. Demonstrated successful closure of a 15 m CP penetration at the Immobilized Low Activity Waste (ILAW) disposal complex.

3.0 Responsibilities

3.01 Hanford Tanks Initiative: Prepares QTP and issues for release as a PHMC supporting document. Inspects vendor supplied hardware and documentation for completeness prior to initiation of testing. Witnesses execution of QTP. Maintains test change control by reviewing all proposed deviations of actual operations from the QTP and documenting all actual deviations per QTP Instruction 5.25. Signs off on completion of individual and overall QTP activities. Maintains control of all documentation associated with planning, execution and reporting of these QTP activities.

3.02 Applied Research Associates, Inc: Delivers all engineered systems and components required to perform stand alone CP push hole closure. Ensures all other material and supplies required for hole closure are acquired. Operates CPP during grouting operations. Executes grouting QTP as defined.

3.03 Waste Management Federal Services, Inc., Northwest Operations (WMFS): Provides a Washington State Liscensed Driller who will observe CP penetration and hole closure activities as required by WAC 173-160. Provides platform support to ARA in performance of grouting operations.

4.0 Safety

4.01 All personnel involved with the performance or witnessing of the hole closure qualification testing will be briefed on hazards unique to the cone penetrometer equipment prior to initiation of test activities.

4.02 All personnel must read, meet all training requirements, meet all dosimetry requirements, and sign the Job Safety Analysis (JSA) and Radiological Work Permit (RWP) covering operation of HTI CP systems at the ILAW site.

4.03 All personnel shall wear substantial foot wear, a hard hat, and safety goggles.

Personnel working with dry bentonite and cement powder will wear approved respiratory protection. Coveralls and work gloves are recommended for personnel working with wet grout.

4.04 Material Safety Data Sheets (MSDS) for materials used in preparation of the grout mixture will be available in the CPP support trailer. These materials include Portland cement, bentonite, and CFR-3 Cement Friction Reducer (Haliburton Energy Services, Duncan, Oklahoma).

5.0 QTP Instructions

5.01 Equipment Requirements

.01 Dedicated 51 mm (2.0 in.) OD CP Push Pipe String: 50, 1 m joints
.02 Stand Alone Grouting Module
.03 Adapter to 51 mm OD CP Push Pipe
.04 Sacrificial Grout Mini Tips with O-rings
.05 61 m (200 ft) length of 12.7 mm (1/2 in.) OD by 7.9 mm (5/16 in.) ID Grout Tube
.06 Diaphragm Pump: ARO Model 666053-388 or equivalent
.07 Air Compressor with Pressure Regulator: 150 psi capacity

.08 1.5 m length of 12.7 mm OD by 7.9 mm ID grout tubing
.09 Grout Supply Bucket: 19 l capacity with hose barb installed near bottom
.10 60 l Grout Mixing Bucket
.11 Screen for Filtering Grout Mix
.12 12 l Grout Transfer Bucket
.13 Electric Drill with Grout Mixing Paddle

5.02 Material Requirements

.01 Water Supply: 200 l minimum
.02 Graduated Bucket for measuring water in gallons
.03 Scale or container marked for 227 g (1/2 lb) of bentonite.
.04 Ash Grove Portland Cement: Sufficient for grout mixture.
.05 Western Bentonite Powder: Sufficient to fill 15 m CP push hole with dry powder. Sufficient for grout mixture.
.06 CFR-3 Cement Friction Reducer: Sufficient for grout mixture

5.03 Inspect all grouting equipment supplied and verify supplied equipment and materials are sufficient to allow hole closure of a 46 m, below surface, CP penetration. Record results on Qualification Testing Log Sheet (QT Log) on pages 6-9.

5.04 Verify stand alone grouting system assembled for qualification testing could emplace grout in a 46 m CP push hole. Record results on QT Log.

5.05 Confirm presence of drawings for all engineered, stand alone grouting equipment. Document on QT Log.

5.06 Push a 15 m CP penetration with 51 mm diameter CP push string. With use of expanders on one CP push pipe segment, the final diameter of this push hole will be ≈ 58 mm (2.25 in.).

5.07 Record Bore Hole ID#, depth of penetration, and date of penetration on QT Log.

5.08 Fill the test CP push hole with dry bentonite powder by pouring bentonite down the hole after removal of the CP push pipe string until full.

5.09 Record date dry fill was emplaced and volume of dry bentonite poured in CP push hole on QT Log.

5.10 Assemble Stand Alone Grouting equipment and systems as described in ARA hole closure procedure (Attachment A).

.01 CP push pipe string with grout tube, grout pump, and the grout supply bucket will be deployed on the CP platform.

.02 Air compressor, grout mixing equipment, and grout materials will be deployed on the ground near the CP platform.

5.11 Push assembled, stand alone, grouting push string to bottom of dry filled CP push hole. Record depth on QT Log.

5.12 Document any indications that the grouting push string is not tracking the initial CP push hole or that the CP push hole has collapsed on QT Log.

5.13 Blow-off sacrificial mini-tip following steps described in ARA hole closure procedure.

5.14 Calculate estimated volume of grout required to fill CP push hole using formula provided in ARA procdure. Record calculation on QT Log.

5.15 Record hole closure start time on QT Log.

5.16 Mix one 23 liter (6 gal) batch of grout following ARA hole closure procedure.

5.17 Begin withdrawing push pipe and emplacing grout following ARA hole closure procedure.

5.18 When initial volume of grout has been emplaced, note time and length of push pipe withdrawn on QT Log.

5.19 Discontinue grout emplacement for 30 minutes.

NOTE: The 30 minute pause of steps 5.18 and 5.19 may be initiated at removal of closest pipe joint proceding exhaustion of initial batch of grout mixture.

NOTE: Mixing of the next batch of grout to be emplaced may be carried out during this pause.

5.20 Record time of resumption of withdrawal of CP push pipe and grout emplacement on QT Log.

5.21 Continue withdrawal of CP push pipe and emplacement of grout until grout module is seen at ground surface.

5.22 Record time of completion of grout emplacement and total volume of grout emplaced on QT Log.

5.23 Record general observations of grout emplacement on QT Log.

5.24 Clean grouting equipment and dispose of excess grout per direction of WMFS personnel.

5.25 Document all test plan deviations, any exceptions noted in tested systems, and any anomalous test results on the QT Log.

6.0 Qualification Testing Sign-Off

The following representatives of the Hanford Tank Initiative-Characterization project and Applied Research Associates, Inc. have performed and witnessed the qualification testing of the HTI CP Stand Alone Grouting capability as described in this qualification test plan.

Applied Research Associates, Inc.

Print Name	Signature	Date
Print Name	Signature	Date

Waste Management Federal Services, Inc., Northwest Operations

Washington State Liscensed Driller	Signature	Date
Print Name	Signature	Date

Hanford Tank Initiative-Characterization

Print Name	Signature	Date
Print Name	Signature	Date

7.0 References

Hanford Tank Initiative, *Preparation and Testing of Cone Penetrometer Deployable Soil Multi-Sensor and Multi-Sample Soil Sampling Probes: Phase II (HNF-2881, Rev. 1)*, August 13, 1998.

Applied Research Associates, Inc., *ARA Hanford CPT Procedure for Hole Closure, Rev. 0*, October 5, 1998. [Attachment A]

HTI CP STAND ALONE HOLE CLOSURE QUALIFICATION TESTING LOG SHEET

5.03 Inspection of Grouting Equipment:

Comments: _____

_____

_____

_____

_____

Initials: _____ _____
HTI ARA

5.04 Verification of Tested Grouting System Capability:

Comments: _____

_____

_____

_____

Initials: _____ _____
HTI ARA

5.05 Inspection of Stand Alone Grouting Systems Engineering Drawings:

Comments: _____

_____

_____

_____

Initials: _____ _____
HTI ARA

5.07 Grouting Test CP Push Hole:

Bore Hole #: _____ Depth: _____ Date: _____

Comments: _____

_____

_____

_____

_____

Initials: _____ _____
HTI ARA

HTI CP STAND ALONE HOLE CLOSURE QUALIFICATION TESTING LOG SHEET

5.09 Dry Fill of Test CP Push Hole:

Date Filled: _____ Volume of Bentonite: _____

Comments: _____

_____

_____

Initials: _____ HTI _____ ARA _____ WMFS

5.11 Initial Deployment Depth of CP Grouting Module:

Depth of Grout Module Deployment: _____

Initials: _____ HTI _____ ARA

5.12 Initial Condition of Test Push Hole:

Observations: _____

_____

_____

_____

_____

Initials: _____ HTI _____ ARA

5.14 Calculated Volume of Grout Required to Fill Test 57 mm CP Push Hole:

_____ Feet depth X 0.2065 Gal / Foot = _____ Gallons

Comments: _____

_____

_____

_____

Initials: _____ HTI _____ ARA _____ WMFS

HTI CP STAND ALONE HOLE CLOSURE QUALIFICATION TESTING LOG SHEET

GROUT EMPLACEMENT

5.15 Grouting Start Time: _____ : _____ / 98

5.18 Time at Emplacement of 6 Gallons of Grout: _____ :
Length of Push Pipe Withdrawn: _____

5.20 Time of Grouting Restart: _____ :

5.22 Time of Completion of Grout Emplacement: _____ :

5.22 Volume of Grout Emplaced: _____

Initials: _____ HTI _____ ARA _____ WMFS

5.23 General Observations on Grout Emplacement:

Observations: _____

Initials: _____ HTI _____ ARA _____ WMFS

5.25 Qualification Testing Change Control:

QTP Deviations, Exceptions or Anomalies: _____

HTI CP STAND ALONE HOLE CLOSURE QUALIFICATION TESTING LOG SHEET

5.25 Qualification Testing Change Control (Continued):

Initials:

HTI	ARA	WMFS

ATTACHMENT A

QUALIFICATION TEST PLAN

Hanford Tank Initiative Cone Penetrometer
Stand Alone Grouting Module

Containing

ARA Hanford CPT Procedure for Hole Closure
Revision 0

Prepared by

Applied Research Associates, Inc.

October 5, 1998

Consisting of 7 pages

APPLIED RESEARCH ASSOCIATES, INC.
Engineering and Applied Science

HANFORD TANK INITIATIVE CONE PENETROMETER VADOSE ZONE CHARACTERIZATION PROJECT

ARA Hanford CPT Procedure

For

HOLE CLOSURE

Revision 0.0

Approved by: Applied Research Associates, Inc. Wesley L. Bratton, Ph.D., P.E. 10/5/98 Date

3250 PORT OF BENTON BLVD ■ RICHLAND, WA 99352
(509) 371-9600 ■ FAX (509) 371-9037

1. Purpose

The purpose of this document is to explain the procedure for hole closure as per regulatory requirements. All holes will be dry filled with bentonite at the completion of a cone penetrometer (CP) test unless immediately filled with wet grout. Holes will be wet filled (grouted) at the discretion of the project geologist based on the data from the multi-sensor probe.

2. Scope

This document covers the use of two wet grouting modules developed by Waterways Experiment Station (WES) to be used during CPT pushes for the HTI project. Figure 1 shows the two grout modules. The first WES grouting module is a standalone unit which attaches directly to the end of a typical CP rod string. Grout is pumped down tubing strung through the rod string as the rods are withdrawn. This method uses a sacrificial mini tip that fits in the end of the module and is held in place by an o-ring. The pressure of an initial flow of water (1-2 gallons typical) expels the tip and allows grout to be pushed into the hole as the rods are withdrawn.

The second unit is designed for use with the Soil Sampler Probe (SSP). This unit fits within the SSP housing in place of the SSP sampler insert following the completion of sampling activities. It allows grout to be pumped down the grouting tube and directly out an opening at the bottom of the rod string. It is not designed to be pushed and does not have a tip.

3. Safety

Material Safety Data Sheets are available in the CPP support trailer located near the CPP. These include Ash Grove Portland Cement (MSDS #11987), Western Bentonite (MSDS #2762), and CFR-3 Cement Friction Reducer.

The only personal protective clothing required is a hard hat and safety goggles. A jumpsuit and work gloves are recommended for working with wet grout.

4. Equipment/Material Requirements:

- Standalone Grouting Module or SSP Grouting Module
- Adapter to 2.0 O. D. rods

- Sacrificial Grout mini tips with O-Rings
- 200' 3/8" Grout tube (150' push depth plus extra for uphole connections)
- 5' 3/8" Grout tube (Uphole grout setup)
- 1/2" Diaphragm Pump (ARO Model 666053-388 or equal)
- 5 Gallon Bucket with hose barb installed near bottom for connection to pump inlet
- 16 Gallon Pail (for mixing grout)
- 3 Gallon Bucket for transferring grout from mix pail to pump
- Screen for filtering grout mix
- Graduated Bucket for measuring water in gallons
- Scale or container marked for 1/2 pounds of bentonite
- 1/2" Electric Drill
- Grout Mixing Paddle for Electric Drill
- 110VAC power for drill
- Air compressor (to Supply Diaphragm Pump) with pressure regulator
- Water Supply
- Portland Cement
- Bentonite Powder
- CFR-3 Cement Friction Reducer

5. Responsibilities

The CPP and the grouting equipment will be operated by ARA operators. Grout volume calculations will be performed and recorded in the Daily Field log sheet and Field Notebook located on the CPP.

6. Procedure

6.1 Assembly uphole grout equipment.

a) Attach grout supply bucket to inlet of grout pump with 5ft section of grout tubing.

b) Attach uphole end of the 200ft grout tube to outlet of grout pump.

c) Attach air compressor to grout pump. Keep valve between compressor and pump closed.

d) Start air compressor and build pressure to 150psi.

6.2 Assembly of Standalone Grout Module.

a) Thread grout tubing through push rods.

b) Place o-ring in o-ring groove of sacrificial tip.

c) Insert sacrificial tip in end of standalone grout module.

> CAUTION: Ensure grout tube is securely attached to barb. A failure of the connection will result in the module and rod string filling with grout.

d) Attach the grout tube to the barb in the grout module. Push the grout tube completely onto the barb until the barb is completely covered.

e) Attach standalone grout module to push rod with expanders.

f) Push the stand alone grout module to the bottom of the hole to be grouted.

g) Remove sacrificial tip.

i. Pour 3 gallons of water (NOT GROUT) into grout supply bucket.

ii. Open valve between compressor and pump to pump water to the grout module. Allow pressure to build until pump stops.

iii. Slowly retract the push rods (<1cm/sec). The pressure from the water will force the tip out of the module. The pump will start to cycle once the when tip is clear. Close valve on compressor to stop pump.

iv. If pump will not start pumping after 6 inches of retracting, the tip is stuck. Retract rod string, inspect tip, and repeat step 5.2.

6.3 Assembly of SSP Grout Module.

a) Thread grout tubing through SSP inner poles.

b) Assemble the SSP grout unit as shown in Figure 1b.

> CAUTION: Ensure grout tube is securely attached to barb. A failure of the connection will result in the module and rod string filling with grout.

c) Attach the grout tube to the barb in the grout module. Push the grout tube completely onto the barb until the barb is completely covered.

d) Lower the SSP grouting module through the rod sting and seat in the bottom of the SSP housing. The rod string will already be at depth following sampling activities.

6.4 Calculate the volume of the hole as shown in the equation below. Show calculations and record value in Field Notebook located on CPP.

Grout Vol. (Gallons) = 0.2065 * Penetration Depth in Feet

$$0.2065 = \pi(D/2)^2(7.48 gal/ft^3) \quad D = 2.25 in$$

6.5 Mix grout using the mixture procedure defined in Section 7. Mix grout in batches of 6 gallons.

NOTE: Deep holes will require mixing multiple batches of grout during the grouting procedure. If this is the case, mix additional batches just prior to needing them. Grout will harden if allowed to sit for long periods (approximately 90 minutes).

6.6 Retracting Rods and Grouting.

a) Pour grout through screen into grout supply bucket.

b) Turn on the pump. Pump enough grout to fill grout tube. Pump will stop when grout tube is full and it is unable to force any more grout out the tip of the grout module. (Approximately 1.5 gallons.)

c) Start retracting rods at a rate of about 1cm/sec and monitor the grout supply bucket to make sure an adequate supply is always available. Add grout to bucket as needed.

NOTE: The pressure on the pump should be set to allow hole to fill with minimal settling, but not so high as to create void areas in loose materials outside of the area disturbed by rods during penetration. Previous field experience shows the grout in 150ft of tubing typically produces a grout flow rate of approximately 1liter per minute. Based upon the 2.25-inch diameter of penetration hole, a pull rate of approximately 1.28 feet/min (0.7cm/sec) will ensure that the hole is filled without voids. Ideal pressure settings will allow the pressure of the grout to build up to the point where the pump does not continue when the rods are not moving. The pump should run approximately 26 strokes/min.

d) Continue retracting rods and pumping grout. Listen for variations in the speed of the pump. Slow the rate of retraction should the pump speed increase, increase the rate of retract should the pump speed decrease. Pump should maintain a cycle rate close to 26 strokes/minute.

e) Continue grouting the hole unit the grout module is seen at the surface of the ground. Turn off pump by closing valve from the compressor.

f) Record the amount of grout pumped into hole in the Field Notebook located on CPP.

6.7 Cleaning Equipment and Disposing of Excess Grout.

Cleaning the grouting equipment and disposing of excess grout will be performed by CPO personal following "Cone Penetrometer Cleaning Work Instructions CP-5".

7. Grout Mixing Procedure:

The grout shall be mixed in 6 gallon batches. Multiple batches may be needed for deep holes.

Recipe for 6 gallons of grout:

46 pounds of Portland Cement

1 pounds Bentonite powder

3.5 gallons of clean, potable water

0.5 pounds of CFR-3 Friction Reducer

a) Measure water and pour in mixing bucket.

b) Slowly add dispersant and thoroughly mix with drill mixer.

c) Add Bentonite slowly and continue mixing.

d) Add Portland Cement and continue mixing until all cement has been added.

e) Place screen over pump pail.

f) Transfer grout from mixing pail by pouring through screen.

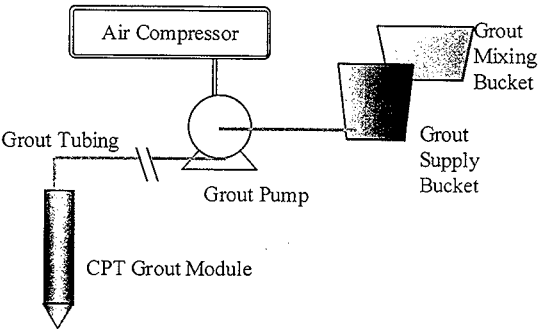


Figure 1a. Grout Setup.

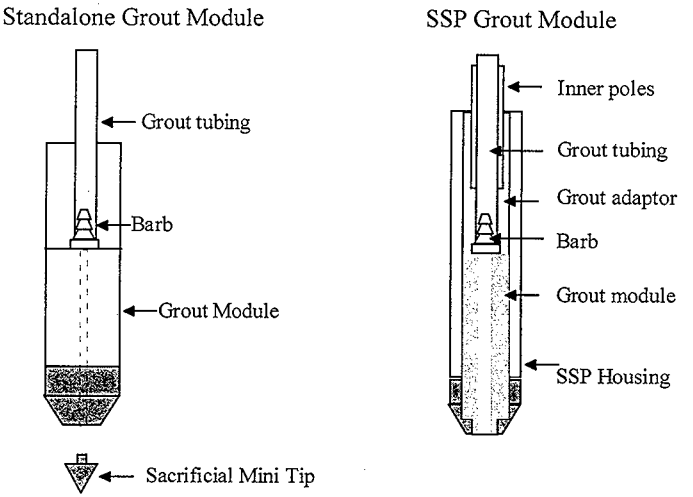


Figure 1b. Stand Alone Grout Module and SSP Grout Module.
Ensure grout tubing is properly connected to barb.

DISTRIBUTION SHEET

To	From	Page 1 of 1
DISTRIBUTION	W. S. Callaway	Date 10-15-98
Project Title/Work Order		EDT No. 621379
Hanford Tanks Initiative/Tank Waste Remediation System TWR-3524, Rev. 0		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach. / Appendix Only	EDT/ECN Only
CENTRAL FILES	B1-07	X			
PROJECT FILES - HTI	R1-41	X			
SAS FILES	S3-90	X			
DOE/RL READING ROOM	H2-53	X			
W. S. Callaway	S3-90	X			
D. B. Hagmann	R2-89	X			
L. R. Hall	S2-47	X			
J. J. Huston	R2-89	X			
D. F. Iwatate	R2-89	X			
L. L. Lockrem	S3-90	X			
A. F. Noonan	K9-91	X			
K. D. Reynolds	H1-12	X			
D. D. Wanner	S7-12	X			