RFP No. DACW67-03-R-0001

US Army Corps of Engineers®

Seattle District

Fish Passage Facility Cofferdam and Excavation, Howard Hanson Dam, King County, Washington

Construction Solicitation and Specifications

September 2003

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THIS PROCUREMENT IS:

Open to both Large and Small Business

SITE VISIT:

A one time site visit for offerors is scheduled for Wednesday, October 8, 2003 at 1000 hr Local Time. Offerors wishing to visit the site should contact Jon Olson Telephone No. (206) 764-6975, Monday through Friday between 8:00 a.m. and 3:30 p.m.

Following the site visit, a pre-proposal conference shall be conducted on site.

FOR DIRECTIONS SEE NEXT PAGE FOR ATTACHED MAP TO HOWARD A. HANSON DAM.

OFFERORS ARE URGED and expected to inspect the site where construction is to be performed and to satisfy themselves as to all general and local conditions which may affect the cost of performance of the contract, to the extent, such information is reasonably obtainable. In no event, will a failure to inspect the site constitute grounds for withdrawal of an offer after closing or for a claim after award of the contract.

FOR INQUIRIES, CONTACT THE FOLLOWING INDIVIDUALS Monday through Friday between the hours of 8:00 a.m. and 3:30 p.m.:

TECHNICAL MATTERS: Technical inquiries are to be submitted through the **Bidder Inquiry Program** in **ProjNet/DrChecks** (www.projnet.org).

Bidders will need a password to access the program: click on **Bidder Inquiry**, fill out the form provided, click **Continue**.

On receipt of your password, login to ProjNet and click on **Bidder Inquiry**. Select **NWS Seattle District**, click **Continue**. Select project, click **Continue**. Select **Bidder Inquiry** phase, click **Continue**. Enter your question and click **Submit Inquiry**.

BIDDING DOCUMENTS: Register for solicitations at the Internet site: http://www.nws.usace.army.mil/ct/

PLANHOLDER'S LISTS: Lists may also be obtained from the same site

ADMINISTRATIVE MATTERS:

Alex Smith (206)764-6804 FAX: (206)764-6817 j.alex.smith@usace.army.mil

All individuals are at the following mailing and street addresses:
(Mail) Seattle District Corps of Engineers, P.O. Box 3755, Seattle, WA 98124-3755
(Street) 4735 E. Marginal Way S., Seattle, WA 98134-2385

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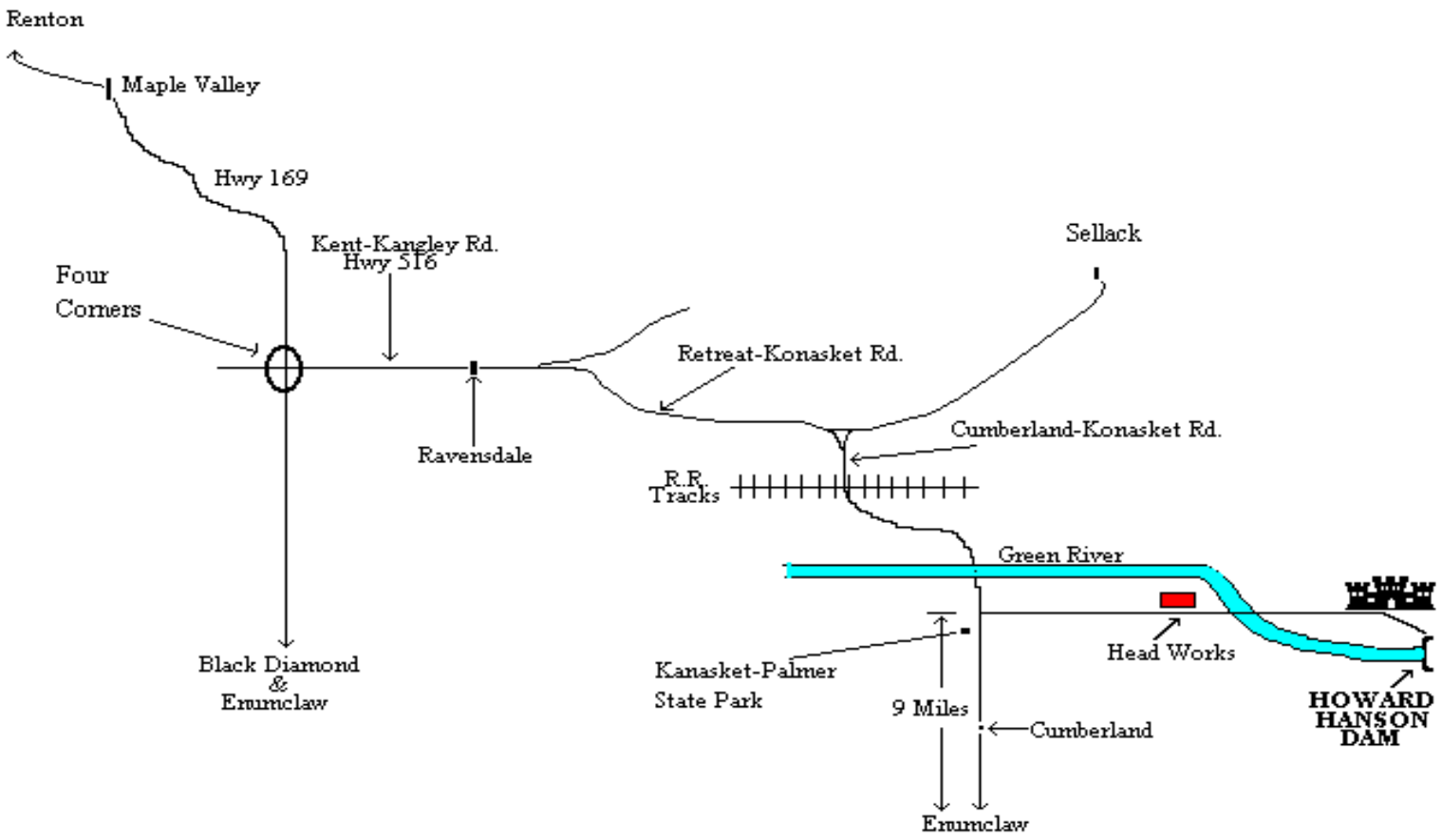
MAP TO HOWARD A. HANSON DAM



*** FROM ENUMCLAW**, FOLLOW SIGNS TO KANASKET-PALMER STATE PARK & LOOK FOR THE TACOMA HEADWORKS SIGN ON THE RIGHT

*** FROM I-5 SOUTHBOUND**, TAKE 405 TOWARDS RENTON

* FROM 405, TAKE ENUMCLAW / MAPLE VALLEY EXIT TO HWY 169

* HEAD TOWARDS MAPLE VALLEY, BLACK DIAMOND, ENUMCLAW ON HWY 169

* AT "FOUR CORNERS", TAKE A LEFT ONTO KENT-KANGLEY ROAD(SE 272nd)

* FOLLOW MAP FROM THERE(or signs to Palmer/Kanasket State Park) , TURNING RIGHT ON RETREAT-KANASKET RD., THEN RIGHT ON CUMBERLAND-KANASKET RD., THEN AFTER YOU CROSS THE BRIDGE OVER GREEN RIVER, TAKE THE FIRST LEFT ON TOP OF THE HILL TO THE TACOMA HEADWORKS FACILITY.

* STOP AT TACOMA HEADWORKS GATE & THEY WILL CALL US ON YOUR ARRIVAL.

DACW67-03-R-0001

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TABLE OF CONTENTS

CAUTION TO OFFERORS

RETURN THE FOLLOWING WITH YOUR OFFER:

SF1442 - Pages 00010-1 thru 00010-5 (00010-3 is reserved for use at a later time)

Section 00600 - Representations and Certifications and Pre-Award Information

20% Bid Bond

*Additionally, if a large business is the apparent low, it will be required to submit a "Small Business and Small Disadvantaged Business Subcontracting Plan," no later than 5 working days after offer closing.
** BONDS – Matter of All Seasons Construction, Inc. GAO Decision B-291166.2
Bid Bonds must be accompanied by a Power of Attorney containing an original signature from the surety, which must be affixed to the Power of Attorney after the Power of Attorney has been generated. Computer generated and signed Power's of Attorney will only be accepted if accompanied by an original certification from a current officer of the surety attesting to its authenticity and continuing validity.

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!!! CAUTION TO OFFERORS !!!

1. **TELEPHONES:** Limited telephone service is provided in the lobby. Only two public telephones may be used by bidders for completing bids.

2. **BUSINESS HOURS:** For the Seattle District Corps of Engineers are from 7:30 A.M. to 4:00 P.M., Monday through Friday.

BEFORE SIGNING AND MAILING THIS BID, PLEASE TAKE NOTE OF THE FOLLOWING, AS FAILURE TO PERFORM ANY ONE OF THESE ACTIONS MAY CAUSE YOUR BID TO BE REJECTED

3. **AMENDMENTS: Have you acknowledged receipt of ALL** amendments? If in doubt as to the number of amendments issued, please contact the representative listed on the Information Page.

4. **AMENDED BID PAGES: If any of the amendments furnished amended bid pages, the amended bid pages must be used** in submitting your bid.

5. **BID GUARANTEE:** Sufficient bid guarantee in proper form must be furnished **with your bid** (FOR JOBS EXCEEDING $25,000) See section 00700, FAR 52.228-1

6. **INDIVIDUAL SURETIES:** Please note requirements for Individual Sureties in Section 00100, FAR 52.228-4003.

7. **MISTAKE IN BID:** Have you reviewed your bid price for possible errors in calculation or work left out?

8. **TELEGRAPHIC MODIFICATIONS:** The Seattle District does not have the capability of receiving commercial telegrams directly. Bidders who wish to modify their bid by telegram are urged to ensure that telegrams are submitted within enough time to arrive at the bid opening room prior to the time specified for bid opening. Any doubt as to time should be resolved in favor of **EXTRA TIME.** Transmission by Fax to this office is **NOT ACCEPTABLE**.

9. **BID ACCEPTANCE PERIOD:** The minimum bid acceptance period is specified in block 13D of SF1442 (page 00010-1), Solicitation, Offer and Award. Please ensure that you allow at least the stated number of calendar days for the Government to accept your bid.

10. **BID RESULTS:** Bid results are usually available after 4:00 P.M., the day of the bid opening by accessing the Seattle District Contracting Home Page: http://www.nws.usace.army.mil/ct/

11. **CENTRAL CONTRACTOR REGISTRATION:** Per DFARS Clause 252.204-7004, REQUIRED CENTRAL CONTRACTOR REGISTRATION, in Section 00700, registration is required prior to award of any contract from a Solicitation issued after May 31, 1998. No Contract Award will be made to an unregistered contractor. Internet access allows contractors to register by completing an electronic on-line registration application from CCR homepage at http://www.ccr.gov/. For further assistance in completing your on-line registration, contact the nearest Procurement Technical Assistance Center (PTAC) near you. A list of the nearest PTAC is located at: http://www.rcacwv.com/ptac.htm.

12. **HUBZONE CERTIFICATION**: Per FAR Clause 52.219-4, NOTICE OF PRICE EVALUATION PREFERENCE FOR HUBZONE SMALL BUSINESS CONCERNS (JAN 1999) in Section 00700. A HUBZone small business concern, as used in this clause, means a small business concern that appears on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration Reference: https://el.sba.gov:90000/prodhubzone/hubzone/approval.st.

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SOLICITATION, OFFER, AND AWARD *(Construction, Alteration, or Repair)*	1. SOLICITATION NUMBER	2. TYPE OF SOLICITATION	3. DATE ISSUED	PAGE OF PAGES
	DACW67-03-R-0001	☐ SEALED BID *(IFB)* ☒ NEGOTIATED *(RFP)*	Sept 19, 2003	1

IMPORTANT - The "offer" section on the reverse must be fully completed by the offeror.

4. CONTRACT NUMBER	5. REQUISITION/PURCHASE REQUEST NUMBER	6. PROJECT NUMBER
	W68MD9-2183-1410	

7. ISSUED BY CODE	8. ADDRESS OFFER TO
W68MD9 Seattle District, Corps of Engineers ATTN: CENWS-CT-CB-CU PO Box 3755 Seattle, WA 98124-3755	Seattle District, Corps of Engineers PO Box 3755 ATTN: CENWS-CT-CB-CU Seattle, WA 98124-3755 HAND CARRY: Preston Conference Room 4735 East Marginal Way South Seattle, WA 98134-2385 BID OPENING ROOM: Preston Conference Room

9. FOR INFORMATION CALL	A. NAME	B. TELEPHONE NUMBER *(Include area code) (NO COLLECT CALLS)*
	See Information Page inside Front Cover	See Information Page inside Front Cover

SOLICITATION

NOTE: In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder".

10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS *(Title, identifying number, date):*

Furnish all labor, materials and equipment and perform all work for Fish Passage Facility Cofferdam and Excavation, Howard Hanson Dam, King County, Washington in accordance with the attached Contract Clauses, Special Clauses, Technical Specifications and Drawings.

NOTE: Award will be made pursuant to the Small Business Competitive Demonstration Program.

11. The Contractor shall begin performance within 10 calendar days and complete it within * calendar days after receiving

☐ award, ☒ notice to proceed. This performance period is ☒ mandatory, ☐ negotiable. *(See* * Paragraph SC-1, 00800 *.)*

12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE PAYMENT BONDS? *(If "YES," indicate within how many calendar days after award in Item 12B.)*	12B. CALENDAR DAYS
☒ YES ☐ NO	10

13. ADDITIONAL SOLICITATION REQUIREMENTS:

A. Sealed offers in original and _____ copies to perform the work required are due at the place specified in Item 8 by 2:00 p.m. *(hour)* local time November 3, 2003 *(date).* If this is a sealed bid solicitation, offers will be publicly opened at that time. Sealed envelo containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.

B. An offer guarantee ☒ is, ☐ is not required.

C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by referenc

D. Offers providing less than 90 calendar days for Government acceptance after the date offers are due will not be considered and w be rejected.

OFFER *(Must be fully completed by offeror)*

14. NAME AND ADDRESS OF OFFEROR *(Include ZIP Code)*	15. TELEPHONE NUMBER *(Include area code)*
	FAX:
	16. REMITTANCE ADDRESS *(Include only if different than Item 14)*
Tax ID No:_____DUNS No: _____ eMail:_____	
CODE FACILITY CODE	

17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer accepted by the Government in writing within _____ calendar days after the date offers are due. *(Insert any number equal or greater than th minimum requirement stated in 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.)*

AMOUNTS ▶ See page 00010-5 thru 00010-6

18. The offeror agrees to furnish any required performance and payment bonds.

19. ACKNOWLEDGEMENT OF AMENDMENTS
(The offeror acknowledges receipt of amendments to the solicitation - give number and date of each)

AMENDMENT NO.										
DATE										

20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER *(Type or print)*	20B. SIGNATURE	20C. OFFER DATE

AWARD *(To be completed by Government)*

21. ITEMS ACCEPTED

22. AMOUNT	23. ACCOUNTING AND APPROPRIATION DATA

24.SUBMIT INVOICES TO ADDRESS SHOWN IN ▶ *(4 copies unless otherwise specified)*	ITEM 26	25. OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO ☐ 10 U.S.C. 2304(c) ( ) ☐ 41 U.S.C. 253(c) ( )
26. ADMINISTERED BY CODE		27. PAYMENT WILL BE MADE BY
United States Army Corps of Engineers Seattle District Northwest Area Office PO Box 92146 Tillicum, WA 98492-0146		US Army Corps of Engineers Finance Center CEFC-AO-P 5722 Integrity Drive Millington, TN 38054-5005

CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE

☐ 28. NEGOTIATED AGREEMENT *(Contractor is required to sign this document and return _____ copies to the issuing office.)* Contractor agrees to furnish and deliver all items or perform all work requirements identified on this form and any continuation sheets for the consideration stated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications incorporated by reference in or attached to this contract.

☐ 29. AWARD. *(Contractor is not required to sign this document.)* Your offer on this solicitation is hereby accepted as to the items listed. This award consummates the contract, which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is necessary.

30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN *(Type or print)*		31A. NAME OF CONTRACTING OFFICER *(Type or print)*	
		CONTRACTING OFFICER	
30B. SIGNATURE	30C. DATE	31B. UNITED STATES OF AMERICA BY	31C. AWARD DATE

STANDARD FORM 1442 BACK (REV. 4-85

IF THE CONTRACTOR IS A CORPORATION OR PARTNERSHIP, THE **APPLICABLE PORTION** OF THE FORM LISTED BELOW MUST BE COMPLETED. IN THE ALTERNATIVE, OTHER EVIDENCE MUST BE SUBMITTED TO SUBSTANTIATE THE AUTHORITY OF THE PERSON SIGNING THE CONTRACT. IF A CORPORATION, **THE SAME OFFICER SHALL NOT EXECUTE BOTH THE CONTRACT AND THE CERTIFICATE.**

CORPORATE CERTIFICATE

I, _____, certify that I am the _____
Secretary of the Corporation named as Contractor herein; that _____, who signed this contract on behalf of the Contractor was then _____of said corporation; that said contract was duly signed for and on behalf of said corporation by authority of its governing body and is within the scope of its corporate powers.

_____ (CORPORATE
(Secretary) SEAL)

AUTHORITY TO BIND PARTNERSHIP

This is to certify that the names, signatures and Social Security Numbers of all partners are listed below and that the person signing the contract has authority actually to bind the partnership pursuant to its partnership agreements. Each of the partners individually has full authority to enter into and execute contractual instruments on behalf of said partnership with the United States of America, except as follows: (state "none" or describe limitations, if any)

_____

This authority shall remain in full force and effect until such time as the revocation of authority by any cause whatsoever has been furnished in writing to, and acknowledged by, the Contracting Officer.

(Names, Signatures and Social Security Numbers of all Partners)

NAME	SIGNATURE	SOCIAL SECURITY NO.
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

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SCHEDULE

Item No.	Description of Item	Quantity	Unit	Unit Price	Amount
0001	All Work for Fish Passage Facility Cofferdam and Excavation, Except for Items 0002 Through 0020	1	JOB	L.S.	$_____
0002	Mobilization And Demobilization	1	JOB	L.S.	$_____
0003	Reservoir Excavation & Debris Removal From Trash Racks				
0003AA	First 400 Tons	400	Tons	$_____	$_____
0003AB	All Over 400 Tons	200	Tons	$_____	$_____
0004	All Work for Multi-Point Borehole Extensometers	1	JOB	L.S.	$_____
0005	All Work for Piezometers	1	JOB	L.S.	$_____
0006	All Work for Inclinometers	1	JOB	L.S.	$_____
0007	All Work for Load Cells	1	JOB	L.S.	$_____
0008	All Work for Passive Relief Wells	2260	LF	$_____	$_____
0009	All Work for Dewatering Wells	3000	LF	$_____	$_____
0010	Hookups To Grout Holes for Hydraulic Pressure Tests and Placement of Cement Grout Curtains				
0010AA	First 60	60	EA	$_____	$_____
0010AB	All Over 60	40	EA	$_____	$_____
0011	Portland Cement in Grout Curtains				
0011AA	First 1450 94-lb Bags	1450	BAG	$_____	$_____
0011AB	All Over 1450 94-lb bags	500	BAG	$_____	$_____
0012	Bentonite in Grout Curtains				
0012AA	First 75 94-lb Bags	75	BAG	$_____	$_____
0012AB	All Over 75 94-lb Bags	75	BAG	$_____	$_____

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Item No.	Description of Item	Quantity	Unit	Unit Price	Amount
0013	HRWR Water Reducing Admixture in Grout Curtains				
0013AA	First 50 Gallons	50	GAL	$_____	$_____
0013AB	All Over 50 Gallons	100	GAL	$_____	$_____
0014	Tie Back Anchors for Permanent Retaining Wall				
0014AA	First 3650 LF	3650	LF	$_____	$_____
0014AB	All Over 3650 LF	900	LF	$_____	$_____
0015	Emergency Mobilization & Demobilization For When Water Elevation Is Above Elevation 1150	2	EA	$_____	$_____
0016	Emergency Mobilization & Demobilization For When Water Elevation Is Above Elevation 1165	2	EA	$_____	$_____
0017	Emergency Mobilization & Demobilization For When Water Elevation Is Above Cofferdam Elevation 1169	2	EA	$_____	$_____
0018	All Work for As-Built Drawings as specified in Section 01702 from preparation to final approval	1	JOB	LS	$25,000.00
	TOTAL BASE ITEMS				$_____
	OPTIONAL ITEMS:				
0019	Horizontal Trash Rack Seismic Reinforcement	1	JOB	LS	$_____
0020	Excavation, Phase 1C, Below Elevation 1074 to 1021	1	JOB	LS	$_____
	TOTAL BASE AND OPTIONAL ITEMS				$_____

NOTES:

1. The dollar amounts established in Item No. 0018 shall not be revised by bidder.

2. Contract Clause “Variation in Estimated Quantity” in Section 0700 does not apply to Bid Items 0015, 0016 and 0017. If Emergency Demobilization and Remobilization and Standby of Equipment and Crew is used, the Contractor will be paid the unit price for the actual number of moves out of the work demobilization and remobilization and for number of standby days of equipment and crew as described in Section 01025 of the specifications. If Emergency Demobilization and Remobilization and Standby of Equipment and Crew do not occur, the Bid Items will not be used and the government will issue a credit modification for each unused bid item in its entirety.

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DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-3755

REPLY TO
ATTENTION OF

Contracting Division REV Nov 19, 2002

SUBJECT: DACW67-03-R-0001, Fish Passage Facility Cofferdam and Excavation, Howard Hanson Dam, King County, Washington

NOTICE TO LARGE BUSINESS FIRMS: (RFP)

Your attention is directed to the contract clauses entitled "Utilization of Small Business Concerns (Oct 2000) (52.219-8) and "Small Business Subcontracting Plan" (Jan 2002) (52.219-9II), which are included in this solicitation. If you are a large business, and your offer is $500,000 ($1,000,000 for construction**)** or more you are required to submit a subcontracting plan **with** your proposal. Award will not be made under this solicitation without a subcontracting plan approved by the Contracting Officer.

For your information, we consider the following goals reasonable and achievable during the performance of the contract resulting from this solicitation. However, final goals will be negotiated prior to contract award. The Subcontracting Plan will then become a material part of your contract.

a. 70% of planned subcontracting dollars can be placed with all small business concerns.

b. 10% of planned subcontracting dollars can be placed with those small business concerns owned and controlled by socially and economically disadvantaged individuals or Historically Black Colleges and Universities or Minority Institutions. NOTE: b. is a subset of a.

c. 5% of planned subcontracting dollars for small women-owned businesses. NOTE: c. is a subset of a. Also, the women-owned business may meet the definition of a small disadvantaged business. If so, c. will also be a subset of a. (Count firm in all applicable areas.)

d. 3% of planned subcontracting dollars may be placed with HUBZone small business concerns. NOTE: d. is a subset of a. Note: A HUBZone firm may also SDB, women-owned and/or veteran-owned. Count firm in all applicable areas).

e. 3% of planned subcontracting dollars for veteran-owned small business. NOTE: e. is a subset of a. Go to http:///www.va.gov/osdbu/vetctr.htm or http://www.sba.gov/VETS/ for questions concerning the Veterans Business Development program.

. f. 3% of planned subcontracting dollars may be placed with service-disabled veteran-owned small business. NOTE: f. is a subset of a. and e.

Goals included in any proposed plan submitted by you should be at least equal to the ones we are recommending. If lesser goals are proposed, you will have to explain how those goals and your plan represent your best efforts to comply with the policy outlined in the contract clauses. There are a number of equally important aspects of the plan. You should familiarize yourself with the requirements set forth in the contract clauses relating to the subcontracting plan *before* submitting a proposal.

Your plan will be reviewed and scored in accordance with AFARS Appendix D to ensure it clearly represents your firm's ability to carry out the terms and conditions set forth in the contract clauses. A Subcontracting Plan with a score of less than 70 may not be accepted. It is recommended that you use the enclosed example **as a guide** to assist you in developing your own subcontracting plan/program. The example is intended to assist you in developing your own subcontracting plan/program. Delete the instructions shown in parenthesis or your plan for subcontracting to small business will not be approved. If discussions during the evaluation of your subcontracting

program raises doubts as to your intentions or ability to comply with FAR clause 52.219-9 it could result in your ineligibility for award.

Your plan must address how you will maximize subcontracting opportunities with the small business communities to be found within the project location. Demonstrated outreach efforts through conference attendance, use of ProNet, Corporate support of your Small Business Program Liaison Officer and Small Business Program must be addressed in your subcontracting plan.

Your Small Business Program Managers' attendance at DOD Regional Council Meetings for Small Business Education and Advocacy will be a contract requirement. **DOD Policy Guidance:** In accordance with the Small Business Act, it is the policy of the federal government to aid, assist, and counsel small business to ensure that a fair share of contracts are awarded to small business. Consistent with this, it is the policy of DOD to sponsor regional councils as one significant way to aid, assist, and counsel large business through education and advocacy *of its members who are charged with the responsibility of fulfilling this federal policy*. Therefore, be advised that the individual listed in paragraph 7 of the example will be required to attend these regional council meetings and that attendance must be addressed in your subcontracting plan. Your plan must be submitted with your price proposal.

Should you have any questions or need assistance in DEVELOPING YOUR SUBCONTRACTING PLAN please call the undersigned at (206) 764-6807. If you need TECHNICAL ASSISTANCE call Tom DeGonia at (206) 766-6449.

Sincerely,

Enclosure

Susan C. Price
Deputy for Small Business

NOTE: This is an example plan. You may use this example as a guide in developing your own small business program. Delete all the instructions (parenthesis), including this message, or your plan will be returned.

SMALL BUSINESS SUBCONTRACTING PLAN

DATE:

CONTRACTOR:
ADDRESS:
PHONE NO:

PROJECT TITLE:
SOLICITATION NO:

1. In accordance with the contract clauses at 52.219-8 and 52.219-9, (name of contractor) submits the following Subcontracting Plan for Small, Small Disadvantaged, and Women-owned Business Concerns.

2. Corresponding dollar values for percentages cited in para. 3 for the base period only:

a. Total contract amount is $_____.
b. Total dollars planned to be subcontracted (to all types of businesses): $_____.
c. Total dollars planned to be subcontracted to small business concerns (including 2d, 2e, 2f, 2g, and 2h below): $_____.
d. Total dollars planned to be subcontracted to small disadvantaged business concerns: $_____.
e. Total dollars planned to be subcontracted to small woman-owned business concerns: $_____.
f. Total dollars planned to be subcontracted to HUBZone small business: $_____.

g. Total dollars planned to be subcontracted to veteran-owned small business concerns $_____.
h. Total dollars planned to be subcontracted to service-disabled veteran-owned small business concerns. $_____.

3. The following percentage goals (expressed in terms of a percentage of total planned subcontracting dollars) are applicable to the contract awarded under the solicitation cited above.

a. Small Business Concerns (2c divided by 2b): _____% of total planned subcontracting dollars under this contract will go to subcontractors who are small business concerns including 3c through 3e.

b. Small Disadvantaged Business Concerns (2d divided by 2b): _____% of total planned subcontracting dollars under this contract will go to subcontractors who are small disadvantaged individuals. **(NOTE: SDB firms must be certified by SBA** and meet the definition under clause 52.219-8(c)(3)).

c. Small Woman-Owned Business Concerns (2e divided by 2b):_____% of total planned subcontracting dollars under this contract will go to subcontractors who are small woman-owned businesses

d. Small HUBZone Business Concerns (2f divided by 2b): _____% of total planned subcontracting dollars under this contract will go to subcontractors who are HUBZone small business contractors. (SEE the definition in contract clause 52.219-8(c) or use the internet: http://www.sba.gov/hubzone/ for further information.)

e. Veteran-owned small business concerns (2g divided by 2b):_____% of total planned subcontracting dollars under this contract will go to subcontractors who are veteran-owned small business.

f. Service-disabled veteran-owned small business concerns (2h divided by 2b): _____% of total planned subcontracting dollars under this contract will go to subcontractors who are service-disabled veteran-owned small business.

4. The principal items or areas we will subcontract under this contract are:

a. Of the items or areas stated in 4; the following are planned to be subcontracted to Small Businesses (LIST THE NAME AND RESPONSIBILITY OF FIRM):

b. Of the items or areas stated in 4.a; the following are planned to be subcontracted to Small Disadvantaged Businesses (LIST THE NAME AND RESPONSIBILITY OF FIRM):

c. Of the items or areas stated in 4.a; the following are planned to be subcontracted to Small Women-Owned Businesses (LIST THE NAME AND RESPONSIBILITY OF FIRM):

d. Of the items or areas stated in 4.a; the following are planned to be subcontracted to HUBZone small business concerns (LIST THE NAME AND RESPONSIBILITY OF FIRM):

e. Of the items or areas stated in 4.a; the following are planned to be subcontracted to Veteran-owned Small Business concerns (LIST THE NAME AND RESPONSIBILITY OF FIRM):

f. Of the items or areas stated in 4.a; the following are planned to be subcontracted to Service-disabled veteran-owned small business concerns (LIST THE NAME AND RESPONSIBILITY OF FIRM):

****NOTE: SEE LAST PAGE IF THIS SOLICITATION HAS OPTION YEARS OR PERIODS** (DELETE THIS STATEMENT FROM YOUR PLAN)******

5. Provide a description of the method your firm used to develop the subcontracting goals in paragraph 3:

6. Indirect costs were ( ) were not ( ) used in establishing subcontracting goals. **If indirect costs are included in your goals, furnish a description of the method used to determine the proportionate share of indirect costs to be incurred with (i) small business concerns (ii) small disadvantaged business concerns (iii) women-owned small business concerns (iv) HUBZone small business concerns (v) Veteran-owned small business concerns and (vi) Service-disabled veteran-owned concerns **

7. The following individual will administer (name of contractor) Subcontracting Program:
(**NOTE TO OFFERORS: The individual named here will be expected to perform and manage your plan and contract clause 52.219-9). Site Construction project managers may not be acceptable as your small business advocate that manages your Corporate Small Business Program).**

Name:_____ Job Title:_____
Address and Telephone Number: _____

This individual's specific duties with regard to the conduct of our firm's Subcontracting Plan will include, but will not be limited to, the following:

a. Developing and maintaining bidders lists of small business, HUBZone small business, small disadvantaged business and women-owned small business concerns using sources such as the Small Business Administration's ProNet (http://pro-net.sba.gov/) Washington State Office of Minority and Women-owned Business Enterprises (http://www.wsdot.wa.gov/omwbe/) Minority Business Development Agency, US Department of Commerce, Local Minority Business Development Centers, Economic Development Centers, and National Center for American Indian Enterprise Development.

b. Assuring the inclusion of small business concerns, small disadvantaged business concerns, women-owned small business concerns, HUBZone small business concerns, veteran-owned small business concerns and service-disabled veteran-owned small business concerns in all solicitations for products or services which they are capable of providing; and ensuring that all solicitations are structured to permit the maximum possible participation by small business concerns, small disadvantaged business concerns, women-owned small business concerns, HUBZone small business concerns, veteran-owned small business concerns and service-disabled veteran-owned small business concerns.

c. Establishing and maintaining records of all solicitations and subcontract awards to ensure that the members of the firm who review bidders proposals documents their reasons for selecting or not selecting a bid submitted by a small business concerns, small disadvantaged business concerns, women-owned small business concerns, HUBZone small business concerns, veteran-owned small business concerns and service-disabled veteran-owned small business concerns.

d. Preparing and submitting the Subcontracting Report for Individual Contracts (SF 294) and the Summary Subcontract Report (SF 295) in accordance with instructions provided, and coordinating and preparing for all compliance reviews by Federal agencies.

e. Attendance at DOD sponsored training programs in order to develop guidance and training to firm personnel on the policy of the federal government to aid, assist, and counsel small business under this and other government contracts.

f. Conducting or arranging for all other activities necessary to further the intent and attainment of the goals in the Plan to include motivational training of the firm's purchasing personnel, attendance at workshops, seminars and trade fairs conducted by or on behalf of small business concerns, small disadvantaged business concerns, women-owned small business concerns, HUBZone small business concerns, veteran-owned small business concerns and service-disabled veteran-owned small business concerns.

8. The following steps will be taken to ensure that small business concerns, small disadvantaged business concerns, women-owned small business concerns, HUBZone small business concerns, veteran-owned small business concerns and service-disabled veteran-owned small business concerns receive notice of and have an equitable opportunity to compete for intended awards of subcontracts and/or purchase orders for the products and/or services describe in paragraph 4 above:

a. Sources will be requested through SBA's ProNet system, business development organizations, minority and small business trade associations and at small, minority, veteran small business and women-owned small business procurement conferences; sources will be contacted; and bidding materials will be provided to all responding parties expressing an interest.

b. Internally, motivational training will be conducted to guide and encourage purchasing personnel; source lists and guides to small business concerns, small disadvantaged business concerns, women-owned small business concerns, HUBZone small business concerns, veteran-owned small business concerns and service-disabled veteran-owned small business concerns will be maintained and utilized by purchasing personnel while soliciting subcontracts and purchase orders; activities will be monitored to ensure sufficient time is allowed for interested bidders to prepare their proposals and to evaluate continuing compliance with the Subcontracting Plan.

9. [Name of contractor] agrees that the clause entitled "Utilization of Small Business Concerns" (Oct 2000) will be included in all subcontracts that offer further subcontracting opportunities. All subcontractors, except small business concerns, who receive subcontracts in excess of $500,000 ($1,000,000 in the case of construction) will be required to adopt a subcontracting plan that complies with the requirements of this clause. Such plans will be reviewed to assure that all minimum requirements of an acceptable subcontracting plan have been satisfied.

10. (Name of contractor) agrees to submit such periodic reports and cooperate in any studies or surveys as may be required by the Contracting agency or Small Business Administration in order to determine the extent of compliance by the offeror with the subcontracting plan and with the clause entitled "Utilization of Small Business Concerns" contained in the contract.

11. (Name of Contractor) agrees to maintain at least the following types of records to document compliance with the Subcontracting Plan:

a. The names of all organizations, agencies, and associations contacted for small business concerns, small disadvantaged business concerns, women-owned small business concerns, HUBZone small business concerns,

veteran-owned small business concerns and service-disabled veteran-owned small business concerns along with records of attendance at conferences, seminars and trade fairs where additional sources were developed.

b. Source lists, guides, and other data identifying small business concerns, small disadvantaged business concerns, women-owned small business concerns, HUBZone small business concerns, veteran-owned small business concerns and service-disabled veteran-owned small business concerns.

c. Records on all subcontract solicitations resulting in an award of more than $100,000 on a contract-by-contract basis, indicating (1) whether small business concerns were solicited, and if not, why not; (2) whether veteran-owned small business concerns were solicited, and if not, why not; (3) whether service-disable veteran-owned small business concerns were solicited, and if not, why not; (4) whether HUBZone small business were solicited, and if not, why not; (5) whether small disadvantaged business concerns were solicited, and if not, why not; and (6) whether small women-owned business concerns were solicited, and if not, why not; and (7) reasons for the failure of solicited small business concerns, veteran-owned small business concerns, service-disabled veteran-owned small business concerns, HUBzone small business concerns, small disadvantaged business concerns, and women-owned small business concerns to receive a subcontract award.

d. Records of all subcontract award data to include subcontractor's name and address, to be kept on a contract-by-contract basis.

e. Minutes of internal motivational and training meetings held for the guidance and encouragement of purchasing personnel, and records of all monitoring activities performed for compliance evaluation.

f. Copies of SF 294 and SF 295 showing date and place of filing and copies of all other reports or results of reviews conducted by the contracting agency or other interested agencies of the Federal government to monitor our compliance with this Subcontracting Plan.

12. (Name of Contractor) will submit a SF 295, Summary Subcontract Report, on Corps of Engineers projects only. The SF 295 shall be completed and distributed in accordance with the Corps of Engineers Supplemental Instructions. (Name of Contractor) will not report Corps of Engineers projects through any other Agency unless authorized by the Contracting Officer.

13. In closing, (Name of contractor) states that it will be the policy of (Name of contractor) to afford every practicable opportunity for small business concerns, small disadvantaged business concerns, women-owned small business concerns, HUBZone small business concerns, veteran-owned small business concerns and service-disabled veteran-owned small business concerns to participate in contracts awarded to (Name of contractor) by the Federal Government, to ensure that equitable opportunity is provided small business concerns, small disadvantaged business concerns, women-owned small business concerns, HUBZone small business concerns, veteran-owned small business concerns and service-disabled veteran-owned small business concerns to compete for award of subcontracts and purchase orders, and to diligently pursue the achievement of our goals of participation by small business concerns, small disadvantaged business concerns, women-owned small business concerns, HUBZone small business concerns, veteran-owned small business concerns and service-disabled veteran-owned small business concerns in the dollars available for subcontract/purchase order awards under this contract.

BY: _____

_____ DATE: _____

Signature and Title of CEO
Company Name

NOTE: If this solicitation has options (or option periods) , the plan must contain separate goals for ***each*** option or option period (year). EXAMPLE:

	Dollars	Percentage
1. Optional Yr_____total:	$_____	_____
2. Total to be subcontracted to all types of businesses:	$_____	_____
a. Subcontracted to Small Business (including b, c, d, e, and f below):	$_____	_____
b. Subcontracted to Small Disadvantaged Businesses:	$_____	_____
c. Subcontracted to Women-Owned Small Businesses:	$_____	_____
d. Subcontracted to HUBzone concerns	$_____	_____
e. Subcontracted to Veteran-owned Small Business:	$_____	_____
f. Subcontracted to Service-disabled Small Business	$_____	_____

.

1. Optional Yr_____total:	$_____	_____
2. Total to be subcontracted to all types of businesses:	$_____	_____
a. Subcontracted to Small Business (including b, c, d, e, and f below):	$_____	_____
b. Subcontracted to Small Disadvantaged Businesses:	$_____	_____
c. Subcontracted to Women-Owned Small Businesses:	$_____	_____
d. Subcontracted to HUBzone concerns	$_____	_____
e. Subcontracted to Veteran-owned Small Business:	$_____	_____
f. Subcontracted to Service-disabled Small Business	$_____	_____

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CLAUSES INCORPORATED BY FULL TEXT

52.204-6 DATA UNIVERSAL NUMBERING SYSTEM (DUNS) NUMBER (JUN 99)

(a) The offeror shall enter, in the block with its name and address on the cover page of its offer, the annotation "DUNS" followed by the DUNS number that identifies the offeror's name and address exactly as stated in the offer.

(b) If the offeror does not have a DUNS number, it should contact Dun and Bradstreet directly to obtain one. A DUNS number will be provided immediately by telephone at no charge to the offeror. For information on obtaining a DUNS number, the offeror, if located within the United States, should call Dun and Bradstreet at 1-800-333-0505. The offeror should be prepared to provide the following information:

(1) Company name.

(2) Company address.

(3) Company telephone number.

(4) Line of business.

(5) Chief executive officer/key manager.

(6) Date the company was started.

(7) Number of people employed by the company.

(8) Company affiliation.

(c) Offerors located outside the United States may obtain the location and phone number of the local Dun and Bradstreet Information Services office from the Internet Home Page at http://www.customerservice@dnb.com. If an offeror is unable to locate a local service center, it may send an e-mail to Dun and Bradstreet at globalinfo@mail.dnb.com.

(End of provision)

52.213-1 FAST PAYMENT PROCEDURE (FEB 1998)

(a) General. The Government will pay invoices based on the Contractor's delivery to a post office or common carrier (or, if shipped by other means, to the point of first receipt by the Government).

(b) Responsibility for supplies. (1) Title to the supplies passes to the Government upon delivery to--

(i) A post office or common carrier for shipment to the specific destination; or

(ii) The point of first receipt by the Government, if shipment is by means other than Postal Service or common carrier.

(2) Notwithstanding any other provision of the contract, order, or blanket purchase agreement, the Contractor shall--

(i) Assume all responsibility and risk of loss for supplies not received at destination, damaged in transit, or not conforming to purchase requirements; and

(ii) Replace, repair, or correct those supplies promptly at the Contractor's expense, if instructed to do so by the Contracting Officer within 180 days from the date title to the supplies vests in the Government.

(c) Preparation of invoice. (1) Upon delivery to a post office or common carrier (or, if shipped by other means, the point of first receipt by the Government), the Contractor shall--

(i) Prepare an invoice as provided in this contract, order, or blanket purchase agreement; and

(ii) Display prominently on the invoice “FAST PAY.”

(2) If the purchase price excludes the cost of transportation, the Contractor shall enter the prepaid shipping cost on the invoice as a separate item. The Contractor shall not include the cost of parcel post insurance. If transportation charges are stated separately on the invoice, the Contractor shall retain related paid freight bills or other transportation billings paid separately for a period of 3 years and shall furnish the bills to the Government upon request.

(3) If this contract, order, or blanket purchase agreement requires the preparation of a receiving report, the Contractor shall prepare the receiving report on the prescribed form or, alternatively, shall include the following information on the invoice, in addition to that required in paragraph (c)(1) of this clause:

(i) A statement in prominent letters “NO RECEIVING REPORT PREPARED.”

(ii) Shipment number.

(iii) Mode of shipment.

(iv) At line item level--

(A) National stock number and/or manufacturer's part number;

(B) Unit of measure;

(C) Ship-To Point;

(D) Mark-For Point, if in the contract; and

(E) FEDSTRIP/MILSTRIP document number, if in the contract.

(4) If this contract, order, or blanket purchase agreement does not require preparation of a receiving report on a prescribed form, the Contractor shall include on the invoice the following information at the line item level, in addition to that required in paragraph (c)(1) of this clause:

(i) Ship-To Point.

(ii) Mark-For Point.

(iii) FEDSTRIP/MILSTRIP document number, if in the contract.

(5) Where a receiving report is not required, the Contractor shall include a copy of the invoice in each shipment.

(d) Certification of invoice. The Contractor certifies by submitting an invoice to the Government that the supplies being billed to the Government have been shipped or delivered in accordance with shipping instructions issued by the ordering officer, in the quantities shown on the invoice, and that the supplies are in the quantity and of the quality designated by the contract, order, or blanket purchase agreement.

(e) Fast pay container identification. The Contractor shall mark all outer shipping containers “FAST PAY.”

(End of clause)

52.213-3 NOTICE TO SUPPLIER (APR 1984)

This is a firm order ONLY if your price does not exceed the maximum line item or total price in the Schedule. Submit invoices to the Contracting Officer. If you cannot perform in exact accordance with this order, WITHHOLD PERFORMANCE and notify the Contracting Officer immediately, giving your quotation.

(End of clause)

52.214-18 PREPARATION OF BIDS--CONSTRUCTION (APR 1984)

(a) Bids must be (1) submitted on the forms furnished by the Government or on copies of those forms, and (2) manually signed. The person signing a bid must initial each erasure or change appearing on any bid form.

(b) The bid form may require bidders to submit bid prices for one or more items on various bases, including--

(1) Lump sum bidding;

(2) Alternate prices;

(3) Units of construction; or

(4) Any combination of subparagraphs (1) through (3) above.

(c) If the solicitation requires bidding on all items, failure to do so will disqualify the bid. If bidding on all items is not required, bidders should insert the words "no bid" in the space provided for any item on which no price is submitted.

(d) Alternate bids will not be considered unless this solicitation authorizes their submission.

(End of provision)

52.215-1 INSTRUCTIONS TO OFFERORS--COMPETITIVE ACQUISITION (MAY 2001)

(a) Definitions. As used in this provision--

“Discussions” are negotiations that occur after establishment of the competitive range that may, at the Contracting Officer's discretion, result in the offeror being allowed to revise its proposal.

“In writing or written” means any worded or numbered expression which can be read, reproduced, and later

communicated, and includes electronically transmitted and stored information.

“Proposal modification” is a change made to a proposal before the solicitation's closing date and time, or made in response to an amendment, or made to correct a mistake at any time before award.

“Proposal revision” is a change to a proposal made after the solicitation closing date, at the request of or as allowed by a Contracting Officer as the result of negotiations.

“Time”, if stated as a number of days, is calculated using calendar days, unless otherwise specified, and will include Saturdays, Sundays, and legal holidays. However, if the last day falls on a Saturday, Sunday, or legal holiday, then the period shall include the next working day.

(b) Amendments to solicitations. If this solicitation is amended, all terms and conditions that are not amended remain unchanged. Offerors shall acknowledge receipt of any amendment to this solicitation by the date and time specified in the amendment(s).

(c) Submission, modification, revision, and withdrawal of proposals. (1) Unless other methods (e.g., electronic commerce or facsimile) are permitted in the solicitation, proposals and modifications to proposals shall be submitted in paper media in sealed envelopes or packages (i) addressed to the office specified in the solicitation, and (ii) showing the time and date specified for receipt, the solicitation number, and the name and address of the offeror. Offerors using commercial carriers should ensure that the proposal is marked on the outermost wrapper with the information in paragraphs (c)(1)(i) and (c)(1)(ii) of this provision.

(2) The first page of the proposal must show--

(i) The solicitation number;

(ii) The name, address, and telephone and facsimile numbers of the offeror (and electronic address if available);

(iii) A statement specifying the extent of agreement with all terms, conditions, and provisions included in the solicitation and agreement to furnish any or all items upon which prices are offered at the price set opposite each item;

(iv) Names, titles, and telephone and facsimile numbers (and electronic addresses if available) of persons authorized to negotiate on the offeror's behalf with the Government in connection with this solicitation; and

(v) Name, title, and signature of person authorized to sign the proposal. Proposals signed by an agent shall be accompanied by evidence of that agent's authority, unless that evidence has been previously furnished to the issuing office.

(3) Submission, modification, or revision, of proposals.

(i) Offerors are responsible for submitting proposals, and any modifications, or revisions, so as to reach the Government office designated in the solicitation by the time specified in the solicitation. If no time is specified in the solicitation, the time for receipt is 4:30 p.m., local time, for the designated Government office on the date that proposal or revision is due.

(ii)(A) Any proposal, modification, or revision received at the Government office designated in the solicitation after the exact time specified for receipt of offers is “late” and will not be considered unless it is received before award is made, the Contracting Officer determines that accepting the late offer would not unduly delay the acquisition; and--

(1) If it was transmitted through an electronic commerce method authorized by the solicitation, it was received at the initial point of entry to the Government infrastructure not later than 5:00 p.m. one working day prior to the date specified for receipt of proposals; or

(2) There is acceptable evidence to establish that it was received at the Government installation designated for receipt of offers and was under the Government's control prior to the time set for receipt of offers; or

(3) It is the only proposal received.

(B) However, a late modification of an otherwise successful proposal that makes its terms more favorable to the Government, will be considered at any time it is received and may be accepted.

(iii) Acceptable evidence to establish the time of receipt at the Government installation includes the time/date stamp of that installation on the proposal wrapper, other documentary evidence of receipt maintained by the installation, or oral testimony or statements of Government personnel.

(iv) If an emergency or unanticipated event interrupts normal Government processes so that proposals cannot be received at the office designated for receipt of proposals by the exact time specified in the solicitation, and urgent Government requirements preclude amendment of the solicitation, the time specified for receipt of proposals will be deemed to be extended to the same time of day specified in the solicitation on the first work day on which normal Government processes resume.

(v) Proposals may be withdrawn by written notice received at any time before award. Oral proposals in response to oral solicitations may be withdrawn orally. If the solicitation authorizes facsimile proposals, proposals may be withdrawn via facsimile received at any time before award, subject to the conditions specified in the provision at 52.215-5, Facsimile Proposals. Proposals may be withdrawn in person by an offeror or an authorized representative, if the identity of the person requesting withdrawal is established and the person signs a receipt for the proposal before award.

(4) Unless otherwise specified in the solicitation, the offeror may propose to provide any item or combination of items.

(5) Offerors shall submit proposals in response to this solicitation in English, unless otherwise permitted by the solicitation, and in U.S. dollars, unless the provision at FAR 52.225-17, Evaluation of Foreign Currency Offers, is included in the solicitation.

(6) Offerors may submit modifications to their proposals at any time before the solicitation closing date and time, and may submit modifications in response to an amendment, or to correct a mistake at any time before award.

(7) Offerors may submit revised proposals only if requested or allowed by the Contracting Officer.

(8) Proposals may be withdrawn at any time before award. Withdrawals are effective upon receipt of notice by the Contracting Officer.

(d) Offer expiration date. Proposals in response to this solicitation will be valid for the number of days specified on the solicitation cover sheet (unless a different period is proposed by the offeror).

(e) Restriction on disclosure and use of data. Offerors that include in their proposals data that they do not want disclosed to the public for any purpose, or used by the Government except for evaluation purposes, shall--

(1) Mark the title page with the following legend: This proposal includes data that shall not be disclosed outside the Government and shall not be duplicated, used, or disclosed--in whole or in part--for any purpose other than to evaluate this proposal. If, however, a contract is awarded to this offeror as a result of--or in connection with-- the

submission of this data, the Government shall have the right to duplicate, use, or disclose the data to the extent provided in the resulting contract. This restriction does not limit the Government's right to use information contained in this data if it is obtained from another source without restriction. The data subject to this restriction are contained in sheets [insert numbers or other identification of sheets]; and

(2) Mark each sheet of data it wishes to restrict with the following legend: Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal.

(f) Contract award. (1) The Government intends to award a contract or contracts resulting from this solicitation to the responsible offeror(s) whose proposal(s) represents the best value after evaluation in accordance with the factors and subfactors in the solicitation.

(2) The Government may reject any or all proposals if such action is in the Government's interest.

(3) The Government may waive informalities and minor irregularities in proposals received.

(4) The Government intends to evaluate proposals and award a contract without discussions with offerors (except clarifications as described in FAR 15.306(a)). Therefore, the offeror's initial proposal should contain the offeror's best terms from a cost or price and technical standpoint. The Government reserves the right to conduct discussions if the Contracting Officer later determines them to be necessary. If the Contracting Officer determines that the number of proposals that would otherwise be in the competitive range exceeds the number at which an efficient competition can be conducted, the Contracting Officer may limit the number of proposals in the competitive range to the greatest number that will permit an efficient competition among the most highly rated proposals.

(5) The Government reserves the right to make an award on any item for a quantity less than the quantity offered, at the unit cost or prices offered, unless the offeror specifies otherwise in the proposal.

(6) The Government reserves the right to make multiple awards if, after considering the additional administrative costs, it is in the Government's best interest to do so.

(7) Exchanges with offerors after receipt of a proposal do not constitute a rejection or counteroffer by the Government.

(8) The Government may determine that a proposal is unacceptable if the prices proposed are materially unbalanced between line items or subline items. Unbalanced pricing exists when, despite an acceptable total evaluated price, the price of one or more contract line items is significantly overstated or understated as indicated by the application of cost or price analysis techniques. A proposal may be rejected if the Contracting Officer determines that the lack of balance poses an unacceptable risk to the Government.

(9) If a cost realism analysis is performed, cost realism may be considered by the source selection authority in evaluating performance or schedule risk.

(10) A written award or acceptance of proposal mailed or otherwise furnished to the successful offeror within the time specified in the proposal shall result in a binding contract without further action by either party.

(11) The Government may disclose the following information in postaward debriefings to other offerors:

(i) The overall evaluated cost or price and technical rating of the successful offeror;

(ii) The overall ranking of all offerors, when any ranking was developed by the agency during source selection;

(iii) A summary of the rationale for award; and

(iv) For acquisitions of commercial items, the make and model of the item to be delivered by the successful offeror.

(End of provision)

52.216-1 TYPE OF CONTRACT (APR 1984)

The Government contemplates award of a Firm Fix Price contract resulting from this solicitation.

(End of clause)

52.225-10 NOTICE OF BUY AMERICAN ACT REQUIREMENT--CONSTRUCTION MATERIALS (MAY 2002)

(a) Definitions. Construction material, domestic construction material, and foreign construction material, as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act--Construction Materials" (Federal Acquisition Regulation (FAR) clause 52.225-9).

(b) Requests for determinations of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required by paragraphs (c) and (d) of the clause at FAR 52.225-9 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

(c) Evaluation of offers. (1) The Government will evaluate an offer requesting exception to the requirements of the Buy American Act, based on claimed unreasonable cost of domestic construction material, by adding to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(3)(i) of the clause at FAR 52.225-9.

(2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.

(d) Alternate offers.

(1) When an offer includes foreign construction material not listed by the Government in this solicitation in paragraph (b)(2) of the clause at FAR 52.225-9, the offeror also may submit an alternate offer based on use of equivalent domestic construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of the clause at FAR 52.225-9 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of the clause at FAR 52.225-9 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic construction material, and the offeror shall be required to furnish such domestic construction material. An offer based on use of the foreign construction material for which an exception was requested--

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

(End of provision)

52.228-1 BID GUARANTEE (SEP 1996)

(a) Failure to furnish a bid guarantee in the proper form and amount, by the time set for opening of bids, may be cause for rejection of the bid.

(b) The bidder shall furnish a bid guarantee in the form of a firm commitment, e.g., bid bond supported by good and sufficient surety or sureties acceptable to the Government, postal money order, certified check, cashier's check, irrevocable letter of credit, or, under Treasury Department regulations, certain bonds or notes of the United States. The Contracting Officer will return bid guarantees, other than bid bonds, (1) to unsuccessful bidders as soon as practicable after the opening of bids, and (2) to the successful bidder upon execution of contractual documents and bonds (including any necessary coinsurance or reinsurance agreements), as required by the bid as accepted.-

(c) The amount of the bid guarantee shall be _____ percent of the bid price or $_____, whichever is less.-

(d) If the successful bidder, upon acceptance of its bid by the Government within the period specified for acceptance, fails to execute all contractual documents or furnish executed bond(s) within 10 days after receipt of the forms by the bidder, the Contracting Officer may terminate the contract for default.-

(e) In the event the contract is terminated for default, the bidder is liable for any cost of acquiring the work that exceeds the amount of its bid, and the bid guarantee is available to offset the difference.

(End of clause)

52.228-14 IRREVOCABLE LETTER OF CREDIT (DEC 1999)

(a) “Irrevocable letter of credit” (ILC), as used in this clause, means a written commitment by a federally insured financial institution to pay all or part of a stated amount of money, until the expiration date of the letter, upon presentation by the Government (the beneficiary) of a written demand therefor. Neither the financial institution nor the offeror/Contractor can revoke or condition the letter of credit.

(b) If the offeror intends to use an ILC in lieu of a bid bond, or to secure other types of bonds such as performance and payment bonds, the letter of credit and letter of confirmation formats in paragraphs (e) and (f) of this clause shall be used.

(c) The letter of credit shall be irrevocable, shall require presentation of no document other than a written demand and the ILC (including confirming letter, if any), shall be issued/confirmed by an acceptable federally insured financial institution as provided in paragraph (d) of this clause, and--

(1) If used as a bid guarantee, the ILC shall expire no earlier than 60 days after the close of the bid acceptance period;

(2) If used as an alternative to corporate or individual sureties as security for a performance or payment bond, the offeror/Contractor may submit an ILC with an initial expiration date estimated to cover the entire period for which financial security is required or may submit an ILC with an initial expiration date that is a minimum period of one year from the date of issuance. The ILC shall provide that, unless the issuer provides the beneficiary written notice of non-renewal at least 60 days in advance of the current expiration date, the ILC is automatically extended without

amendment for one year from the expiration date, or any future expiration date, until the period of required coverage is completed and the Contracting Officer provides the financial institution with a written statement waiving the right to payment. The period of required coverage shall be:

(i) For contracts subject to the Miller Act, the later of--

(A) One year following the expected date of final payment;

(B) For performance bonds only, until completion of any warranty period; or

(C) For payment bonds only, until resolution of all claims filed against the payment bond during the one-year period following final payment.

(ii) For contracts not subject to the Miller Act, the later of--

(A) 90 days following final payment; or

(B) For performance bonds only, until completion of any warranty period.

(d) Only federally insured financial institutions rated investment grade or higher shall issue or confirm the ILC. The offeror/Contractor shall provide the Contracting Officer a credit rating that indicates the financial institution has the required rating(s) as of the date of issuance of the ILC. Unless the financial institution issuing the ILC had letter of credit business of less than $25 million in the past year, ILCs over $5 million must be confirmed by another acceptable financial institution that had letter of credit business of less than $25 million in the past year.

(e) The following format shall be used by the issuing financial institution to create an ILC:

_____

[Issuing Financial Institution's Letterhead or Name and Address]

Issue Date _____

IRREVOCABLE LETTER OF CREDIT NO. _____

Account party's name _____

Account party's address _____

For Solicitation No. _____(for reference only)

TO: [U.S. Government agency]

[U.S. Government agency's address]

1. We hereby establish this irrevocable and transferable Letter of Credit in your favor for one or more drawings up to United States $_____. This Letter of Credit is payable at [issuing financial institution's and, if any, confirming financial institution's] office at [issuing financial institution's address and, if any, confirming financial institution's address] and expires with our close of business on _____, or any automatically extended expiration date.

2. We hereby undertake to honor your or the transferee's sight draft(s) drawn on the issuing or, if any, the confirming financial institution, for all or any part of this credit if presented with this Letter of Credit and confirmation, if any, at the office specified in paragraph 1 of this Letter of Credit on or before the expiration date or any automatically

extended expiration date.

3. [This paragraph is omitted if used as a bid guarantee, and subsequent paragraphs are renumbered.] It is a condition of this Letter of Credit that it is deemed to be automatically extended without amendment for one year from the expiration date hereof, or any future expiration date, unless at least 60 days prior to any expiration date, we notify you or the transferee by registered mail, or other receipted means of delivery, that we elect not to consider this Letter of Credit renewed for any such additional period. At the time we notify you, we also agree to notify the account party (and confirming financial institution, if any) by the same means of delivery.

4. This Letter of Credit is transferable. Transfers and assignments of proceeds are to be effected without charge to either the beneficiary or the transferee/assignee of proceeds. Such transfer or assignment shall be only at the written direction of the Government (the beneficiary) in a form satisfactory to the issuing financial institution and the confirming financial institution, if any.

5. This Letter of Credit is subject to the Uniform Customs and Practice (UCP) for Documentary Credits, 1993 Revision, International Chamber of Commerce Publication No. 500, and to the extent not inconsistent therewith, to the laws of _____ [state of confirming financial institution, if any, otherwise state of issuing financial institution].

6. If this credit expires during an interruption of business of this financial institution as described in Article 17 of the UCP, the financial institution specifically agrees to effect payment if this credit is drawn against within 30 days after the resumption of our business.

Sincerely,

_____

[Issuing financial institution]

(f) The following format shall be used by the financial institution to confirm an ILC:

_____
[Confirming Financial Institution's Letterhead or Name and Address]

(Date) _____

Our Letter of Credit Advice Number _____

Beneficiary: _____ [U.S. Government agency]

Issuing Financial Institution: _____

Issuing Financial Institution's LC No.: _____

Gentlemen:

1. We hereby confirm the above indicated Letter of Credit, the original of which is attached, issued by _____ [name of issuing financial institution] for drawings of up to United States dollars _____/U.S. $_____ and expiring with our close of business on _____ [the expiration date], or any automatically extended expiration date.

2. Draft(s) drawn under the Letter of Credit and this Confirmation are payable at our office located at _____.

3. We hereby undertake to honor sight draft(s) drawn under and presented with the Letter of Credit and this Confirmation at our offices as specified herein.

4. [This paragraph is omitted if used as a bid guarantee, and subsequent paragraphs are renumbered.] It is a condition of this confirmation that it be deemed automatically extended without amendment for one year from the expiration date hereof, or any automatically extended expiration date, unless:

(a) At least 60 days prior to any such expiration date, we shall notify the Contracting Officer, or the transferee and the issuing financial institution, by registered mail or other receipted means of delivery, that we elect not to consider this confirmation extended for any such additional period; or

(b) The issuing financial institution shall have exercised its right to notify you or the transferee, the account party, and ourselves, of its election not to extend the expiration date of the Letter of Credit.

5. This confirmation is subject to the Uniform Customs and Practice (UCP) for Documentary Credits, 1993 Revision, International Chamber of Commerce Publication No. 500, and to the extent not inconsistent therewith, to the laws of _____ [state of confirming financial institution].

6. If this confirmation expires during an interruption of business of this financial institution as described in Article 17 of the UCP, we specifically agree to effect payment if this credit is drawn against within 30 days after the resumption of our business.

Sincerely,

_____

[Confirming financial institution]

(g) The following format shall be used by the Contracting Officer for a sight draft to draw on the Letter of Credit:

SIGHT DRAFT

_____

[City, State]

(Date) _____

[Name and address of financial institution]

Pay to the order of _____ [Beneficiary Agency] _____ the sum of United States $_____. This draft is drawn under Irrevocable Letter of Credit No. _____.

_____

[Beneficiary Agency]

By: _____

(End of clause)

52.233-2 SERVICE OF PROTEST (AUG 1996)

(a) Protests, as defined in section 33.101 of the Federal Acquisition Regulation, that are filed directly with an agency, and copies of any protests that are filed with the General Accounting Office (GAO), shall be served on the Contracting Officer (addressed as follows) by obtaining written and dated acknowledgment of receipt from

Contracting Division
Seattle District Army Corps of Engineers
P.O. Box 3755
Seattle, WA 98124

(b) The copy of any protest shall be received in the office designated above within one day of filing a protest with the GAO.

(End of provision)

52.252-3 ALTERATIONS IN SOLICITATION (APR 1984)

Portions of this solicitation are altered as follows:

To be completed at time of award.

Section 00600 - Representations & Certifications

CLAUSES INCORPORATED BY FULL TEXT

52.203-2 CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (APR 1985)

(a) The offeror certifies that --

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to –

(i) Those prices,

(ii) The intention to submit an offer, or

(iii) The methods of factors used to calculate the prices offered:

(2) The prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a sealed bid solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

(3) No attempt has been made or will be made by the offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.

(b) Each signature on the offer is considered to be a certification by the signatory that the signatory --

(1) Is the person in the offeror's organization responsible for determining the prices offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision; or

(2) (i) Has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs (a)(1) through (a)(3) of this provison _____ (insert full name of person(s) in the offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the offeror's organization);

(ii) As an authorized agent, does certify that the principals named in subdivision (b)(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) above; and

(iii) As an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs (a)(1) through (a)(3) of this provision.

(c) If the offeror deletes or modifies subparagraph (a)(2) of this provision, the offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure.

(End of clause)

52.203-11 CERTIFICATION AND DISCLOSURE REGARDING PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (APR 1991)

(a) The definitions and prohibitions contained in the clause, at FAR 52.203-12, Limitation on Payments to Influence

Certain Federal Transactions, included in this solicitation, are hereby incorporated by reference in paragraph (b) of this Certification.

(b) The offeror, by signing its offer, hereby certifies to the best of his or her knowledge and belief that on or after December 23, 1989,--

(1) No Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress on his or her behalf in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any Federal contract, grant, loan, or cooperative agreement;

(2) If any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress or an employee of a Member of Congress on his or her behalf in connection with this solicitation, the offeror shall complete and submit, with its offer, OMB standard form LLL, Disclosure of Lobbying Activities, to the Contracting Officer; and

(3) He or she will include the language of this certification in all subcontract awards at any tier and require that all recipients of subcontract awards in excess of $100,000 shall certify and disclose accordingly.

(2) Submission of this certification and disclosure is a prerequisite for making or entering into this contract imposed by section 1352, title 31, United States Code. Any person who makes an expenditure prohibited under this provision, shall be subject to a civil penalty of not less than $10,000, and not more than $100,000, for each such failure.

(End of provision)

52.204-3 TAXPAYER IDENTIFICATION (OCT 1998)

(a) Definitions.

“Common parent,” as used in this provision, means that corporate entity that owns or controls an affiliated group of corporations that files its Federal income tax returns on a consolidated basis, and of which the offeror is a member.

“Taxpayer Identification Number (TIN),” as used in this provision, means the number required by the Internal Revenue Service (IRS) to be used by the offeror in reporting income tax and other returns. The TIN may be either a Social Security Number or an Employer Identification Number.

(b) All offerors must submit the information required in paragraphs (d) through (f) of this provision to comply with debt collection requirements of 31 U.S.C. 7701(c) and 3325(d), reporting requirements of 26 U.S.C. 6041, 6041A, and 6050M, and implementing regulations issued by the IRS. If the resulting contract is subject to the payment reporting requirements described in Federal Acquisition Regulation (FAR) 4.904, the failure or refusal by the offeror to furnish the information may result in a 31 percent reduction of payments otherwise due under the contract.

(c) The TIN may be used by the Government to collect and report on any delinquent amounts arising out of the offeror's relationship with the Government (31 U.S.C. 7701(c)(3)). If the resulting contract is subject to the payment reporting requirements described in FAR 4.904, the TIN provided hereunder may be matched with IRS records to verify the accuracy of the offeror's TIN.

(d) Taxpayer Identification Number (TIN).

___ TIN:._____

___ TIN has been applied for.

___ TIN is not required because:

___ Offeror is a nonresident alien, foreign corporation, or foreign partnership that does not have income effectively connected with the conduct of a trade or business in the United States and does not have an office or place of business or a fiscal paying agent in the United States;

___ Offeror is an agency or instrumentality of a foreign government;

___ Offeror is an agency or instrumentality of the Federal Government.

(e) Type of organization.

___ Sole proprietorship;

___ Partnership;

___ Corporate entity (not tax-exempt);

___ Corporate entity (tax-exempt);

___ Government entity (Federal, State, or local);

___ Foreign government;

___ International organization per 26 CFR 1.6049-4;

___ Other _____

(f) Common parent.

___ Offeror is not owned or controlled by a common parent as defined in paragraph (a) of this provision.

___ Name and TIN of common parent:

Name _____

TIN _____

(End of provision)

52.204-5 WOMEN-OWNED BUSINESS (OTHER THAN SMALL BUSINESS) (MAY 1999)

(a) Definition. Women-owned business concern, as used in this provision, means a concern that is at least 51 percent owned by one or more women; or in the case of any publicly owned business, at least 51 percent of its stock is owned by one or more women; and whose management and daily business operations are controlled by one or more women.

(b) Representation. [Complete only if the offeror is a women-owned business concern and has not represented itself as a small business concern in paragraph (b)(1) of FAR 52.219-1, Small Business Program Representations, of this solicitation.] The offeror represents that it ( ) is a women-owned business concern.

(End of provision)

52.219-1 SMALL BUSINESS PROGRAM REPRESENTATIONS (APR 2002) - ALTERNATE I (APR 2002)

(a)(1) The North American Industry Classification System (NAICS) code for this acquisition is 234990.

(2) The small business size standard is $27.5.

(3) The small business size standard for a concern which submits an offer in its own name, other than on a construction or service contract, but which proposes to furnish a product which it did not itself manufacture, is 500 employees.

(b) Representations. (1) The offeror represents as part of its offer that it ( ) is, ( ) is not a small business concern.

(2) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents, for general statistical purposes, that it ( ) is, ( ) is not a small disadvantaged business concern as defined in 13 CFR 124.1002.

(3) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents as part of its offer that it ( ) is, ( ) is not a women-owned small business concern.

(4) (Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.) The offeror represents as part of its offer that it ( ) is, ( ) is not a veteran-owned small business concern.

(5) (Complete only if the offeror represented itself as a veteran-owned small business concern in paragraph (b)(4) of this provision.) The offeror represents as part of its offer that it ( ) is, ( ) is not a service-disabled veteran-owned small business concern.

(6) [Complete only if the offeror represented itself as a small business concern in paragraph (b)(1) of this provision.] The offeror represents, as part of its offer, that--

(i) It ( ) is, ( ) is not a HUBZone small business concern listed, on the date of this representation, on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration, and no material change in ownership and control, principal office, or HUBZone employee percentage has occurred since it was certified by the Small Business Administration in accordance with 13 CFR part 126; and

(ii) It ( ) is, ( ) is not a joint venture that complies with the requirements of 13 CFR part 126, and the representation in paragraph (b)(6)(i) of this provision is accurate for the HUBZone small business concern or concerns that are participating in the joint venture. (The offeror shall enter the name or names of the HUBZone small business concern or concerns that are participating in the joint venture:_____.) Each HUBZone small business concern participating in the joint venture shall submit a separate signed copy of the HUBZone representation.

(7) (Complete if offeror represented itself as disadvantaged in paragraph (b)(2) of this provision.) The offeror shall check the category in which its ownership falls:

____ Black American.

____ Hispanic American.

____ Native American (American Indians, Eskimos, Aleuts, or Native Hawaiians).

____ Asian-Pacific American (persons with origins from Burma, Thailand, Malaysia, Indonesia, Singapore, Brunei, Japan, China, Taiwan, Laos, Cambodia (Kampuchea), Vietnam, Korea, The Philippines, U.S. Trust Territory of the Pacific Islands (Republic of Palau), Republic of the Marshall Islands, Federated States of Micronesia, the Commonwealth of the Northern Mariana Islands, Guam, Samoa, Macao, Hong Kong, Fiji, Tonga, Kiribati, Tuvalu, or Nauru).

____ Subcontinent Asian (Asian-Indian) American (persons with origins from India, Pakistan, Bangladesh, Sri Lanka, Bhutan, the Maldives Islands, or Nepal).

____ Individual/concern, other than one of the preceding.

(c) Definitions. As used in this provision--

Service-disabled veteran-owned small business concern--

(1) Means a small business concern--

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).

"Small business concern," means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria in 13 CFR Part 121 and the size standard in paragraph (a) of this provision.

Veteran-owned small business concern means a small business concern--

(1) Not less than 51 percent of which is owned by one or more veterans (as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and

(2) The management and daily business operations of which are controlled by one or more veterans.

"Women-owned small business concern," means a small business concern --

(1) That is at least 51 percent owned by one or more women or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; or

(2) Whose management and daily business operations are controlled by one or more women.

(d) Notice.

(1) If this solicitation is for supplies and has been set aside, in whole or in part, for small business concerns, then the clause in this solicitation providing notice of the set-aside contains restrictions on the source of the end items to be furnished.

(2) Under 15 U.S.C. 645(d), any person who misrepresents a firm's status as a small, HUBZone small, small disadvantaged, or women-owned small business concern in order to obtain a contract to be awarded under the preference programs established pursuant to section 8(a), 8(d), 9, or 15 of the Small Business Act or any other provision of Federal law that specifically references section 8(d) for a definition of program eligibility, shall--

(i) Be punished by imposition of fine, imprisonment, or both;

(ii) Be subject to administrative remedies, including suspension and debarment; and

(iii) Be ineligible for participation in programs conducted under the authority of the Act.

(End of provision)

52.219-2 EQUAL LOW BIDS. (OCT 1995)

(a) This provision applies to small business concerns only.

(b) The bidder's status as a labor surplus area (LSA) concern may affect entitlement to award in case of tie bids. If the bidder wishes to be considered for this priority, the bidder must identify, in the following space, the LSA in which the costs to be incurred on account of manufacturing or production (by the bidder or the first-tier subcontractors) amount to more than 50 percent of the contract price.

_____
_____

(c) Failure to identify the labor surplus area as specified in paragraph (b) of this provision will preclude the bidder from receiving priority consideration. If the bidder is awarded a contract as a result of receiving priority consideration under this provision and would not have otherwise received award, the bidder shall perform the contract or cause the contract to be performed in accordance with the obligations of an LSA concern.

52.219-19 SMALL BUSINESS CONCERN REPRESENTATION FOR THE SMALL BUSINESS COMPETITIVENESS DEMONSTRATION PROGRAM (OCT 2000)

(a) Definition.

"Emerging small business" as used in this solicitation, means a small business concern whose size is no greater than 50 percent of the numerical size standard applicable to the North American Industry Classification System (NAICS) code assigned to a contracting opportunity.

(b) [Complete only if the Offeror has represented itself under the provision at 52.219-1 as a small business concern under the size standards of this solicitation.] The Offeror [ ] is, [ ] is not an emerging small business.

(c) (Complete only if the Offeror is a small business or an emerging small business, indicating its size range.)

Offeror's number of employees for the past 12 months (check this column if size standard stated in solicitation is expressed in terms of number of employees) or Offeror's average annual gross revenue for the last 3 fiscal years (check this column if size standard stated in solicitation is expressed in terms of annual receipts). (Check one of the following.)

No. of Employees Avg. Annual Gross Revenues

____ 50 or fewer ____ $1 million or less

____ 51 - 100 ____ $1,000,001 - $2 million

____ 101 - 250 ____ $2,000,001 - $3.5 million

____ 251 - 500 ____ $3,500,001 - $5 million

____ 501 - 750 ____ $5,000,001 - $10 million

____ 751 - 1,000 ____ $10,000,001 - $17 million

____ Over 1,000 ____ Over $17 million

(End of provision)

52.222-21 PROHIBITION OF SEGREGATED FACILITIES (FEB 1999)

(a) Segregated facilities, as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees, that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.

(b) The Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this clause is a violation of the Equal Opportunity clause in this contract.

(c) The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Opportunity clause of this contract.

(End of clause)

52.222-22 PREVIOUS CONTRACTS AND COMPLIANCE REPORTS (FEB 1999)

The offeror represents that --

(a) ( ) It has, ( ) has not participated in a previous contract or subcontract subject to the Equal Opportunity clause of this solicitation;

(b) ( ) It has, ( ) has not, filed all required compliance reports; and

(c) Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards.

(End of provision)

52.222-25 AFFIRMATIVE ACTION COMPLIANCE (APR 1984)

The offeror represents that

(a) [ ] it has developed and has on file, [ ] has not developed and does not have on file, at each establishment, affirmative action programs required by the rules and regulations of the Secretary of Labor (41 CFR 60-1 and 60-2), or

(b) [ ] has not previously had contracts subject to the written affirmative action programs requirement of the rules and regulations of the Secretary of Labor.

(End of provision)

252.209-7001 DISCLOSURE OF OWNERSHIP OR CONTROL BY THE GOVERNMENT OF A TERRORIST COUNTRY (MAR 1998)

(a) "Definitions."

As used in this provis ion --

(a) "Government of a terrorist country" includes the state and the government of a terrorist country, as well as any political subdivision, agency, or instrumentality thereof.

(2) "Terrorist country" means a country determined by the Secretary of State, under section 6(j)(1)(A) of the Export Administration Act of 1979 (50 U.S.C. App. 2405(j)(i)(A)), to be a country the government of which has repeatedly provided support for such acts of international terrorism. As of the date of this provision, terrorist countries include: Cuba, Iran, Iraq, Libya, North Korea, Sudan, and Syria.

(3) "Significant interest" means --

(i) Ownership of or beneficial interest in 5 percent or more of the firm's or subsidiary's securities. Beneficial interest includes holding 5 percent or more of any class of the firm's securities in "nominee shares," "street names," or some other method of holding securities that does not disclose the beneficial owner;

(ii) Holding a management position in the firm, such as a director or officer;

(iii) Ability to control or influence the election, appointment, or tenure of directors or officers in the firm;

(iv) Ownership of 10 percent or more of the assets of a firm such as equipment, buildings, real estate, or other tangible assets of the firm; or

(v) Holding 50 percent or more of the indebtness of a firm.

(b) "Prohibition on award."

In accordance with 10 U.S.C. 2327, no contract may be awarded to a firm or a subsidiary of a firm if the government of

a terrorist country has a significant interest in the firm or subsidiary or, in the case of a subsidiary, the firm that owns the subsidiary, unless a waiver is granted by the Secretary of Defense.

(c) "Disclosure."

If the government of a terrorist country has a significant interest in the Offeror or a subsidiary of the Offeror, the Offeror shall disclosure such interest in an attachment to its offer. If the Offeror is a subsidiary, it shall also disclose any significant interest the government of a terrorist country has in any firm that owns or controls the subsidiary. The disclosure shall include --

(1) Identification of each government holding a significant interest; and

(2) A description of the significant interest held by each government.

(End of provision)

252.225-7031 SECONDARY ARAB BOYCOTT OF ISRAEL (JUN 1992)

(a) Definitions. As used in this clause--

(1) "Foreign person" means any person other than a United States person as defined in Section 16(2) of the Export Administration Act of 1979 (50 U.S.C. App. Sec 2415).

(2) "United States person" is defined in Section 16(2) of the Export Administration Act of 1979 and means any United States resident or national (other than an individual resident outside the United States and employed by other than a United States person), any domestic concern (including any permanent domestic establishment of any foreign concern), and any foreign subsidiary or affiliate (including any permanent foreign establishment) of any domestic concern which is controlled in fact by such domestic concerns, as determined under regulations of the President.

(b) Certification. By submitting this offer, the Offeror, if a foreign person, company or entity, certifies that it--

(1) Does not comply with the Secondary Arab Boycott of Israel; and

(2) Is not taking or knowingly agreeing to take any action, with respect to the Secondary Boycott of Israel by Arab countries, which 50 U.S.C. App. Sec 2407(a) prohibits a United States person from taking.

(End of clause)

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SUBMIT THE FOLLOWING INFORMATION WITH YOUR OFFER
NOTICE TO OFFERORS REGARDING PRE-AWARD INFORMATION

It is requested that the following information be provided with your bid:

1. Company Name and Address: _____

   _____

   _____

2. Point of Contact:

   Name:_____ Phone: (_____)_____

   Alt Phone: (_____) _____ Fax: (_____)_____

3. Electronic Transfer Payments will now be required for all new contracts. Do you currently receive Electronic Transfer Payments from this agency? (agency codes 00005524/00006482)

   Yes( ) NO( )

4. Name of Bank and Branch _____

   _____

   Personal Banker _____

   Telephone Number _____

   Fax Number _____

5. Name of Bonding Agent Company _____

   Agents Name _____

   Telephone _____

6. List three projects that are substantially complete or have been completed within the last two years that are similar to this project. Projects should be listed in the following order: Federal Projects, state projects, city and county projects, than commercial projects. Please provide in the following format:

   a) Title & Location of Project _____

      Agency/Company _____

      Award Amount _____

      Point of Contact (Name & Title) _____

      Telephone Number _____
      Year of Completion_____

b) Title & Location of Project _____

Agency/Company _____

Award Amount _____

Point of Contact (Name & Title) _____

Telephone Number _____
Year of Completion_____

c) Title & Location of Project _____

Agency/Company _____

Award Amount _____

Point of Contact (Name & Title) _____

Telephone Number _____
Year of Completion_____

7) List all outstanding uncompleted projects, in the following format:

a) Title of Project _____

Agency/Company _____

Est. Completion Date _____

Award Amount _____

b) Title of Project _____

Agency/Company _____

Est. Completion Date _____

Award Amount _____

c) Title of Project _____

Agency/Company _____

Est. Completion Date _____

Award Amount _____

END OF SECTION 00600

Section 00700 - Contract Clauses

CLAUSES INCORPORATED BY FULL TEXT

52.202-1 DEFINITIONS (DEC 2001)

(a) Agency head or head of the agency means the Secretary (Attorney General, Administrator, Governor, Chairperson, or other chief official, as appropriate) of the agency, unless otherwise indicated, including any deputy or assistant chief official of the executive agency.

(b) Commercial component means any component that is a commercial item.

(c) Commercial item means--

(1) Any item, other than real property, that is of a type customarily used by the general public or by non-governmental entities for purposes other than governmental purposes, and that--

(i) Has been sold, leased, or licensed to the general public; or

(ii) Has been offered for sale, lease, or license to the general public;

(2) Any item that evolved from an item described in paragraph (c)(1) of this clause through advances in technology or performance and that is not yet available in the commercial marketplace, but will be available in the commercial marketplace in time to satisfy the delivery requirements under a Government solicitation;

(3) Any item that would satisfy a criterion expressed in paragraphs (c)(1) or (c)(2) of this clause, but for--

(i) Modifications of a type customarily available in the commercial marketplace; or

(ii) Minor modifications of a type not customarily available in the commercial marketplace made to meet Federal Government requirements. “Minor” modifications means modifications that do not significantly alter the nongovernmental function or essential physical characteristics of an item or component, or change the purpose of a process. Factors to be considered in determining whether a modification is minor include the value and size of the modification and the comparative value and size of the final product. Dollar values and percentages may be used as guideposts, but are not conclusive evidence that a modification is minor;

(4) Any combination of items meeting the requirements of paragraphs (c)(1), (2), (3), or (5) of this clause that are of a type customarily combined and sold in combination to the general public;

(5) Installation services, maintenance services, repair services, training services, and other services if--

(i) Such services are procured for support of an item referred to in paragraph (c)(1), (2), (3), or (4) of this definition, regardless of whether such services are provided by the same source or at the same time as the item; and

(ii) The source of such services provides similar services contemporaneously to the general public under terms and conditions similar to those offered to the Federal Government;

(6) Services of a type offered and sold competitively in substantial quantities in the commercial marketplace based on established catalog or market prices for specific tasks performed under standard commercial terms and conditions. This does not include services that are sold based on hourly rates without an established catalog or market price for a specific service performed. For purposes of these services--

(i) Catalog price means a price included in a catalog, price list, schedule, or other form that is regularly maintained by the manufacturer or vendor, is either published or otherwise available for inspection by customers, and states prices at which sales are currently, or were last, made to a significant number of buyers constituting the general public; and

(ii) Market prices means current prices that are established in the course of ordinary trade between buyers and sellers free to bargain and that can be substantiated through competition or from sources independent of the offerors.

(7) Any item, combination of items, or service referred to in subparagraphs (c)(1) through (c)(6), notwithstanding the fact that the item, combination of items, or service is transferred between or among separate divisions, subsidiaries, or affiliates of a Contractor; or

(8) A nondevelopmental item, if the procuring agency determines the item was developed exclusively at private expense and sold in substantial quantities, on a competitive basis, to multiple State and local Governments.

(d) Component means any item supplied to the Government as part of an end item or of another component, except that for use in 52.225-9, and 52.225-11 see the definitions in 52.225-9(a) and 52.225-11(a).

(e) Contracting Officer means a person with the authority to enter into, administer, and/or terminate contracts and make related determinations and findings. The term includes certain authorized representatives of the Contracting Officer acting within the limits of their authority as delegated by the Contracting Officer.

(f) Nondevelopmental item means--

(1) Any previously developed item of supply used exclusively for governmental purposes by a Federal agency, a State or local government, or a foreign government with which the United States has a mutual defense cooperation agreement;

(2) Any item described in paragraph (f)(1) of this definition that requires only minor modification or modifications of a type customarily available in the commercial marketplace in order to meet the requirements of the procuring department or agency; or

(3) Any item of supply being produced that does not meet the requirements of paragraph (f)(1) or (f)(2) solely because the item is not yet in use.

(g) "Contracting Officer" means a person with the authority to enter into, administer, and/or terminate contracts and make related determinations and findings. The term includes certain authorized representatives of the Contracting Officer acting within the limits of their authority as delegated by the Contracting Officer.

(h) Except as otherwise provided in this contract, the term "subcontracts" includes, but is not limited to, purchase orders and changes and modifications to purchase orders under this contract.

(End of clause)

52.203-3 GRATUITIES (APR 1984)

(a) The right of the Contractor to proceed may be terminated by written notice if, after notice and hearing, the agency head or a designee determines that the Contractor, its agent, or another representative--

(1) Offered or gave a gratuity (e.g., an entertainment or gift) to an officer, official, or employee of the Government; and

(2) Intended, by the gratuity, to obtain a contract or favorable treatment under a contract.

(b) The facts supporting this determination may be reviewed by any court having lawful jurisdiction.

(c) If this contract is terminated under paragraph (a) of this clause, the Government is entitled--

(1) To pursue the same remedies as in a breach of the contract; and

(2) In addition to any other damages provided by law, to exemplary damages of not less than 3 nor more than 10 times the cost incurred by the Contractor in giving gratuities to the person concerned, as determined by the agency head or a designee. (This subparagraph (c)(2) is applicable only if this contract uses money appropriated to the Department of Defense.)

(d) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

(End of clause)

52.203-5 COVENANT AGAINST CONTINGENT FEES (APR 1984)

(a) The Contractor warrants that no person or agency has been employed or retained to solicit or obtain this contract upon an agreement or understanding for a contingent fee, except a bona fide employee or agency. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or, in its discretion, to deduct from the contract price or consideration, or otherwise recover, the full amount of the contingent fee.

(b) "Bona fide agency," as used in this clause, means an established commercial or selling agency, maintained by a contractor for the purpose of securing business, that neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds itself out as being able to obtain any Government contract or contracts through improper influence.

"Bona fide employee," as used in this clause, means a person, employed by a contractor and subject to the contractor's supervision and control as to time, place, and manner of performance, who neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds out as being able to obtain any Government contract or contracts through improper influence.

"Contingent fee," as used in this clause, means any commission, percentage, brokerage, or other fee that is contingent upon the success that a person or concern has in securing a Government contract.

"Improper influence," as used in this clause, means any influence that induces or tends to induce a Government employee or officer to give consideration or to act regarding a Government contract on any basis other than the merits of the matter.

(End of clause)

52.203-7 ANTI-KICKBACK PROCEDURES. (JUL 1995)

(a) Definitions.

"Kickback," as used in this clause, means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided, directly or indirectly, to any prime Contractor, prime Contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable

treatment in connection with a prime contract or in connection with a subcontract relating to a prime contract.

"Person," as used in this clause, means a corporation, partnership, business association of any kind, trust, joint-stock company, or individual.

"Prime contract," as used in this clause, means a contract or contractual action entered into by the United States for the purpose of obtaining supplies, materials, equipment, or services of any kind.

"Prime Contractor," as used in this clause, means a person who has entered into a prime contract with the United States.

"Prime Contractor employee," as used in this clause, means any officer, partner, employee, or agent of a prime Contractor.

"Subcontract," as used in this clause, means a contract or contractual action entered into by a prime Contractor or subcontractor for the purpose of obtaining supplies, materials, equipment, or services of any kind under a prime contract.

"Subcontractor," as used in this clause, (1) means any person, other than the prime Contractor, who offers to furnish or furnishes any supplies, materials, equipment, or services of any kind under a prime contract or a subcontract entered into in connection with such prime contract, and (2) includes any person who offers to furnish or furnishes general supplies to the prime Contractor or a higher tier subcontractor.

"Subcontractor employee," as used in this clause, means any officer, partner, employee, or agent of a subcontractor.

(b) The Anti-Kickback Act of 1986 (41 U.S.C. 51-58) (the Act), prohibits any person from -

(1) Providing or attempting to provide or offering to provide any kickback;

(2) Soliciting, accepting, or attempting to accept any kickback; or

(3) Including, directly or indirectly, the amount of any kickback in the contract price charged by a prime Contractor to the United States or in the contract price charged by a subcontractor to a prime Contractor or higher tier subcontractor.

(c)(1) The Contractor shall have in place and follow reasonable procedures designed to prevent and detect possible violations described in paragraph (b) of this clause in its own operations and direct business relationships.

(2) When the Contractor has reasonable grounds to believe that a violation described in paragraph (b) of this clause may have occurred, the Contractor shall promptly report in writing the possible violation. Such reports shall be made to the inspector general of the contracting agency, the head of the contracting agency if the agency does not have an inspector general, or the Department of Justice.

(3) The Contractor shall cooperate fully with any Federal agency investigating a possible violation described in paragraph (b) of this clause.

(4) The Contracting Officer may (i) offset the amount of the kickback against any monies owed by the United States under the prime contract and/or (ii) direct that the Prime Contractor withhold, from sums owed a subcontractor under the prime contract, the amount of any kickback. The Contracting Officer may order the monies withheld under subdivision (c)(4)(ii) of this clause be paid over to the Government unless the Government has already offset those monies under subdivision (c)(4)(i) of this clause. In either case, the Prime Contractor shall notify the Contracting Officer when the monies are withheld.

(5) The Contractor agrees to incorporate the substance of this clause, including this subparagraph (c)(5) but excepting subparagraph (c)(1), in all subcontracts under this contract which exceed $100,000.

52.203-8 CANCELLATION, RESCISSION, AND RECOVERY OF FUNDS FOR ILLEGAL OR IMPROPER ACTIVITY (JAN 1997)

(a) If the Government receives information that a contractor or a person has engaged in conduct constituting a violation of subsection (a), (b), (c), or (d) of Section 27 of the Office of Federal Procurement Policy Act (41 U.S.C. 423) (the Act), as amended by section 4304 of the 1996 National Defense Authorization Act for Fiscal Year 1996 (Pub. L. 104-106), the Government may--

(1) Cancel the solicitation, if the contract has not yet been awarded or issued; or

(2) Rescind the contract with respect to which--

(i) The Contractor or someone acting for the Contractor has been convicted for an offense where the conduct constitutes a violation of subsection 27(a) or (b) of the Act for the purpose of either--

(A) Exchanging the information covered by such subsections for anything of value; or

(B) Obtaining or giving anyone a competitive advantage in the award of a Federal agency procurement contract; or

(ii) The head of the contracting activity has determined, based upon a preponderance of the evidence, that the Contractor or someone acting for the Contractor has engaged in conduct constituting an offense punishable under subsections 27(e)(1) of the Act.

(b) If the Government rescinds the contract under paragraph (a) of this clause, the Government is entitled to recover, in addition to any penalty prescribed by law, the amount expended under the contract.

(c) The rights and remedies of the Government specified herein are not exclusive, and are in addition to any other rights and remedies provided by law, regulation, or under this contract.

(End of clause)

52.203-10 PRICE OR FEE ADJUSTMENT FOR ILLEGAL OR IMPROPER ACTIVITY (JAN 1997)

(a) The Government, at its election, may reduce the price of a fixed-price type contract and the total cost and fee under a cost-type contract by the amount of profit or fee determined as set forth in paragraph (b) of this clause if the head of the contracting activity or designee determines that there was a violation of subsection 27 (a), (b), or (c) of the Office of Federal Procurement Policy Act, as amended (41 U.S.C. 423), as implemented in section 3.104 of the Federal Acquisition Regulation.

(b) The price or fee reduction referred to in paragraph (a) of this clause shall be--

(1) For cost-plus-fixed-fee contracts, the amount of the fee specified in the contract at the time of award;

(2) For cost-plus-incentive-fee contracts, the target fee specified in the contract at the time of award, notwithstanding

any minimum fee or "fee floor" specified in the contract;

(3) For cost-plus-award-fee contracts--

(i) The base fee established in the contract at the time of contract award;

(ii) If no base fee is specified in the contract, 30 percent of the amount of each award fee otherwise payable to the Contractor for each award fee evaluation period or at each award fee determination point.

(4) For fixed-price-incentive contracts, the Government may--

(i) Reduce the contract target price and contract target profit both by an amount equal to the initial target profit specified in the contract at the time of contract award; or

(ii) If an immediate adjustment to the contract target price and contract target profit would have a significant adverse impact on the incentive price revision relationship under the contract, or adversely affect the contract financing provisions, the Contracting Officer may defer such adjustment until establishment of the total final price of the contract. The total final price established in accordance with the incentive price revision provisions of the contract shall be reduced by an amount equal to the initial target profit specified in the contract at the time of contract award and such reduced price shall be the total final contract price.

(5) For firm-fixed-price contracts, by 10 percent of the initial contract price or a profit amount determined by the Contracting Officer from records or documents in existence prior to the date of the contract award.

(c) The Government may, at its election, reduce a prime contractor's price or fee in accordance with the procedures of paragraph (b) of this clause for violations of the Act by its subcontractors by an amount not to exceed the amount of profit or fee reflected in the subcontract at the time the subcontract was first definitively priced.

(d) In addition to the remedies in paragraphs (a) and (c) of this clause, the Government may terminate this contract for default. The rights and remedies of the Government specified herein are not exclusive, and are in addition to any other rights and remedies provided by law or under this contract.

(End of clause)

52.203-12 LIMITATION ON PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (JUN 1997)

(a) Definitions.

"Agency," as used in this clause, means executive agency as defined in 2.101.

"Covered Federal action," as used in this clause, means any of the following Federal actions:

(1) The awarding of any Federal contract.

(2) The making of any Federal grant.

(3) The making of any Federal loan.

(4) The entering into of any cooperative agreement.

(5) The extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

"Indian tribe" and "tribal organization," as used in this clause, have the meaning provided in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) and include Alaskan Natives.

"Influencing or attempting to influence," as used in this clause, means making, with the intent to influence, any communication to or appearance before an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any covered Federal action.

"Local government," as used in this clause, means a unit of government in a State and, if chartered, established, or otherwise recognized by a State for the performance of a governmental duty, including a local public authority, a special district, an intrastate district, a council of governments, a sponsor group representative organization, and any other instrumentality of a local government.

"Officer or employee of an agency," as used in this clause, includes the following individuals who are employed by an agency:

(1) An individual who is appointed to a position in the Government under Title 5, United States Code, including a position under a temporary appointment.

(2) A member of the uniformed services, as defined in subsection 101(3),Title 37, United States Code.

(3) A special Government employee, as defined in section 202, Title 18, United States Code.

(4) An individual who is a member of a Federal advisory committee, as defined by the Federal Advisory Committee Act, Title 5, United States Code, appendix 2.

"Person," as used in this clause, means an individual, corporation, company, association, authority, firm, partnership, society, State, and local government, regardless of whether such entity is operated for profit, or not for profit. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Reasonable compensation," as used in this clause, means, with respect to a regularly employed officer or employee of any person, compensation that is consistent with the normal compensation for such officer or employee for work that is not furnished to, not funded by, or not furnished in cooperation with the Federal Government.

"Reasonable payment," as used in this clause, means, with respect to professional and other technical services, a payment in an amount that is consistent with the amount normally paid for such services in the private sector.

"Recipient," as used in this clause, includes the Contractor and all subcontractors. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Regularly employed," as used in this clause, means, with respect to an officer or employee of a person requesting or receiving a Federal contract, an officer or employee who is employed by such person for at least 130 working days within 1 year immediately preceding the date of the submission that initiates agency consideration of such person for receipt of such contract. An officer or employee who is employed by such person for less than 130 working days within 1 year immediately preceding the date of the submission that initiates agency consideration of such person shall be considered to be regularly emp loyed as soon as he or she is employed by such person for 130 working days.

"State," as used in this clause, means a State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, a territory or possession of the United States, an agency or instrumentality of a State, and multi-State, regional, or interstate entity having governmental duties and powers.

(b) Prohibitions.

(1) Section 1352 of Title 31, United States Code, among other things, prohibits a recipient of a Federal contract, grant, loan, or cooperative agreement from using appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.

(2) The Act also requires Contractors to furnish a disclosure if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

(3) The prohibitions of the Act do not apply under the following conditions:

(i) Agency and legislative liaison by own employees.

(A) The prohibition on the use of appropriated funds, in subparagraph (b)(1) of this clause, does not apply in the case of a payment of reasonable compensation made to an officer or employee of a person requesting or receiving a covered Federal action if the payment is for agency and legislative liaison activities not directly related to a covered Federal action.

(B) For purposes of subdivision (b)(3)(i)(A) of this clause, providing any information specifically requested by an agency or Congress is permitted at any time.

(C) The following agency and legislative liaison activities are permitted at any time where they are not related to a specific solicitation for any covered Federal action:

(1) Discussing with an agency the qualities and characteristics (including individual demonstrations) of the person's products or services, conditions or terms of sale, and service capabilities.

(2) Technical discussions and other activities regarding the application or adaptation of the person's products or services for an agency's use.

(D) The following agency and legislative liaison activities are permitted where they are prior to formal solicitation of any covered Federal action--

(1) Providing any information not specifically requested but necessary for an agency to make an informed decision about initiation of a covered Federal action;

(2) Technical discussions regarding the preparation of an unsolicited proposal prior to its official submission; and

(3) Capability presentations by persons seeking awards from an agency pursuant to the provisions of the Small Business Act, as amended by Pub. L. 95-507, and subsequent amendments.

(E) Only those services expressly authorized by subdivision (b)(3)(i)(A) of this clause are permitted under this clause.

(ii) Professional and technical services.

(A) The prohibition on the use of appropriated funds, in subparagraph (b)(1) of this clause, does not apply in the case of--

(1) A payment of reasonable compensation made to an officer or employee of a person requesting or receiving a covered Federal action or an extension, continuation, renewal, amendment, or modification of a covered Federal action, if payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal action or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal action.

(2) Any reasonable payment to a person, other than an officer or employee of a person requesting or receiving a covered Federal action or an extension, continuation, renewal, amendment, or modification of a covered Federal action if the payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal action or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal action. Persons other than officers or employees of a person requesting or receiving a covered Federal action include consultants and trade associations.

(B) For purposes of subdivision (b)(3)(ii)(A) of this clause, "professional and technical services" shall be limited to advice and analysis directly applying any professional or technical discipline. For example, drafting of a legal document accompanying a bid or proposal by a lawyer is allowable. Similarly, technical advice provided by an engineer on the performance or operational capability of a piece of equipment rendered directly in the negotiation of a contract is allowable. However, communications with the intent to influence made by a professional (such as a licensed lawyer) or a technical person (such as a licensed accountant) are not allowable under this section unless they provide advice and analysis directly applying their professional or technical expertis e and unless the advice or analysis is rendered directly and solely in the preparation, submission or negotiation of a covered Federal action. Thus, for example, communications with the intent to influence made by a lawyer that do not provide legal advice or analysis directly and solely related to the legal aspects of his or her client's proposal, but generally advocate one proposal over another are not allowable under this section because the lawyer is not providing professional legal services. Similarly, communications with the intent to influence made by an engineer providing an engineering analysis prior to the preparation or submission of a bid or proposal are not allowable under this section since the engineer is providing technical services but not directly in the preparation, submission or negotiation of a covered Federal action.

(C) Requirements imposed by or pursuant to law as a condition for receiving a covered Federal award include those required by law or regulation and any other requirements in the actual award documents.

(D) Only those services expressly authorized by subdivisions (b)(3)(ii)(A)(1) and (2) of this clause are permitted under this clause.

(E) The reporting requirements of FAR 3.803(a) shall not apply with respect to payments of reasonable compensation made to regularly employed officers or employees of a person.

(c) Disclosure.

(1) The Contractor who requests or receives from an agency a Federal contract shall file with that agency a disclosure form, OMB standard form LLL, Disclosure of Lobbying Activities, if such person has made or has agreed to make any payment using nonappropriated funds (to include profits from any covered Federal action), which would be prohibited under subparagraph (b)(1) of this clause, if paid for with appropriated funds.

(2) The Contractor shall file a disclosure form at the end of each calendar quarter in which there occurs any event that materially affects the accuracy of the information contained in any disclosure form previously filed by such person under subparagraph (c)(1) of this clause. An event that materially affects the accuracy of the information reported includes--

(i) A cumulative increase of $25,000 or more in the amount paid or expected to be paid for influencing or attempting to influence a covered Federal action; or

(ii) A change in the person(s) or individual(s) influencing or attempting to influence a covered Federal action; or

(iii) A change in the officer(s), employee(s), or Member(s) contacted to influence or attempt to influence a covered Federal action.

(3) The Contractor shall require the submittal of a certification, and if required, a disclosure form by any person who requests or receives any subcontract exceeding $100,000 under the Federal contract.

(4) All subcontractor disclosure forms (but not certifications) shall be forwarded from tier to tier until received by the prime Contractor. The prime Contractor shall submit all disclosures to the Contracting Officer at the end of the calendar quarter in which the disclosure form is submitted by the subcontractor. Each subcontractor certification shall be retained in the subcontract file of the awarding Contractor.

(d) Agreement. The Contractor agrees not to make any payment prohibited by this clause.

(e) Penalties.

(1) Any person who makes an expenditure prohibited under paragraph (a) of this clause or who fails to file or amend the disclosure form to be filed or amended by paragraph (b) of this clause shall be subject to civil penalties as provided for by 31 U.S.C. 1352. An imposition of a civil penalty does not prevent the Government from seeking any other remedy that may be applicable.

(2) Contractors may rely without liability on the representation made by their subcontractors in the certification and disclosure form.

(f) Cost allowability. Nothing in this clause makes allowable or reasonable any costs which would otherwise be unallowable or unreasonable. Conversely, costs made specifically unallowable by the requirements in this clause will not be made allowable under any other provision.

(End of clause)

52.204-2 SECURITY REQUIREMENTS (AUG 1996) - ALTERNATE I (APR 1984)

(a) This clause applies to the extent that this contract involves access to information classified "Confidential," "Secret," or "Top Secret."

(b) The Contractor shall comply with (1) the Security Agreement (DD Form 441), including the National Industrial Security Program Operating Manual (DOD 5220.22-M); and (2) any revisions to that manual, notice of which has been furnished to the Contractor.

(c) If, subsequent to the date of this contract, the security classification or security requirements under this contract are changed by the Government and if the changes cause an increase or decrease in security costs or otherwise affect any other term or condition of this contract, the contract shall be subject to an equitable adjustment as if the changes were directed under the Changes clause of this contract.

(d) The Contractor agrees to insert terms that conform substantially to the language of this clause, including this paragraph (d) but excluding any reference to the Changes clause of this contract, in all subcontracts under this contract that involve access to classified information.

(e) If a change in security requirements, as provided in paragraphs (b) and (c), results (1) in a change in the security classification of this contract or any of its elements from an unclassified status or a lower classification to a higher

classification, or (2) in more restrictive area controls than previously required, the Contractor shall exert every reasonable effort compatible with the Contractor's established policies to continue the performance of work under the contract in compliance with the change in security classification or requirements. If, despite reasonable efforts, the Contractor determines that the continuation of work under this contract is not practicable because of the change in security classification or requirements, the Contractor shall notify the Contracting Officer in writing. Until resolution of the problem is made by the Contracting Officer, the Contractor shall continue safeguarding all classified material as required by this contract.

(f) After receiving the written notification, the Contracting Officer shall explore the circumstances surrounding the proposed change in security classification or requirements, and shall endeavor to work out a mutually satisfactory method whereby the Contractor can continue performance of the work under this contract.

(3) If, 15 days after receipt by the Contracting Officer of the notification of the Contractor's stated inability to proceed, (1) the application to this contract of the change in security classification or requirements has not been withdrawn, or (2) a mutually satisfactory method for continuing performance of work under this contract has not been agreed upon, the Contractor may request the Contracting Officer to terminate the contract in whole or in part. The Contracting Officer shall terminate the contract in whole or in part, as may be appropriate, and the termination shall be deemed a termination under the terms of the Termination for the Convenience of the Government clause.

52.204-4 PRINTED OR COPIED DOUBLE-SIDED ON RECYCLED PAPER (AUG 2000)

(a) Definitions. As used in this clause--

“Postconsumer material” means a material or finished product that has served its intended use and has been discarded for disposal or recovery, having completed its life as a consumer item. Postconsumer material is a part of the broader category of “recovered material.” For paper and paper products, postconsumer material means “postconsumer fiber” defined by the U.S. Environmental Protection Agency (EPA) as--

(1) Paper, paperboard, and fibrous materials from retail stores, office buildings, homes, and so forth, after they have passed through their end-usage as a consumer item, including: used corrugated boxes; old newspapers; old magazines; mixed waste paper; tabulating cards; and used cordage; or

(2) All paper, paperboard, and fibrous materials that enter and are collected from municipal solid waste; but not

(3) Fiber derived from printers' over-runs, converters' scrap, and over-issue publications.

“Printed or copied double-sided” means printing or reproducing a document so that information is on both sides of a sheet of paper.

“Recovered material,” for paper and paper products, is defined by EPA in its Comprehensive Procurement Guideline as “recovered fiber” and means the following materials:

(1) Postconsumer fiber; and

(2) Manufacturing wastes such as--

(i) Dry paper and paperboard waste generated after completion of the papermaking process (that is, those manufacturing operations up to and including the cutting and trimming of the paper machine reel into smaller rolls or rough sheets) including: envelope cuttings, bindery trimmings, and other paper and paperboard waste resulting from printing, cutting, forming, and other converting operations; bag, box, and carton manufacturing wastes; and butt rolls, mill wrappers, and rejected unused stock; and

(ii) Repulped finished paper and paperboard from obsolete inventories of paper and paperboard manufacturers, merchants, wholesalers, dealers, printers, converters, or others.

(b) In accordance with Section 101 of Executive Order 13101 of September 14, 1998, Greening the Government through Waste Prevention, Recycling, and Federal Acquisition, the Contractor is encouraged to submit paper documents, such as offers, letters, or reports, that are printed or copied double-sided on recycled paper that meet minimum content standards specified in Section 505 of Executive Order 13101, when not using electronic commerce methods to submit information or data to the Government.

(c) If the Contractor cannot purchase high-speed copier paper, offset paper, forms bond, computer printout paper, carbonless paper, file folders, white wove envelopes, writing and office paper, book paper, cotton fiber paper, and cover stock meeting the 30 percent postconsumer material standard for use in submitting paper documents to the Government, it should use paper containing no less than 20 percent postconsumer material. This lesser standard should be used only when paper meeting the 30 percent postconsumer material standard is not obtainable at a reasonable price or does not meet reasonable performance standards.

(End of clause)

52.209-6 PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED, OR PROPOSED FOR DEBARMENT (JUL 1995)

(a) The Government suspends or debars Contractors to protect the Government's interests. The Contractor shall not enter into any subcontract in excess of the $25,000 with a Contractor that is debarred, suspended, or proposed for debarment unless there is a compelling reason to do so.

(b) The Contractor shall require each proposed first-tier subcontractor, whose subcontract will exceed $25,000, to disclose to the Contractor, in writing, whether as of the time of award of the subcontract, the subcontractor, or its principles, is or is not debarred, suspended, or proposed for debarment by the Federal Government.

(c) A corporate officer or a designee of the Contractor shall notify the Contracting Officer, in writing, before entering into a subcontract with a party that is debarred, suspended, or proposed for debarment (see FAR 9.404 for information on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs). The notice must include the following:

(1) The name of the subcontractor.

(2) The Contractor's knowledge of the reasons for the subcontractor being on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.

(3) The compelling reason(s) for doing business with the subcontractor notwithstanding its inclusion on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.

(4) The systems and procedures the Contractor has established to ensure that it is fully protecting the Government's interests when dealing with such subcontractor in view of the specific basis for the party's debarment, suspension, or proposed debarment.

(End of clause)

52.211-18 VARIATION IN ESTIMATED QUANTITY (APR 1984)

If the quantity of a unit-priced item in this contract is an estimated quantity and the actual quantity of the unit-priced item varies more than 15 percent above or below the estimated quantity, an equitable adjustment in the contract price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above 115 percent or below 85 percent of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the Contractor may request, in writing, an extension of time, to be received by the Contracting Officer within 10 days from the beginning of the delay, or within such further period as may be granted by the Contracting Officer before the date of final settlement of the contract. Upon the receipt of a written request for an extension, the Contracting Officer shall ascertain the facts and make an adjustment for extending the completion date as, in the judgement of the Contracting Officer, is justified.

52.214-26 AUDIT AND RECORDS--SEALED BIDDING. (OCT 1997)

(a) As used in this clause, records includes books, documents, accounting procedures and practices, and other data, regardless of type and regardless of whether such items are in written form, in the form of computer data, or in any other form.

(b) Cost or pricing data. If the Contractor has been required to submit cost or pricing data in connection with the pricing of any modification to this contract, the Contracting Officer, or an authorized representative of the Contracting Officer, in order to evaluate the accuracy, completeness, and currency of the cost or pricing data, shall have the right to examine and audit all of the Contractor's records, including computations and projections, related to--

(1) The proposal for the modification;

(2) The discussions conducted on the proposal(s), including those related to negotiating;

(3) Pricing of the modification; or

(4) Performance of the modification.

(c) Comptroller General. In the case of pricing any modification, the Comptroller General of the United States, or an authorized representative, shall have the same rights as specified in paragraph (b) of this clause.

(d) Availability. The Contractor shall make available at its office at all reasonable times the materials described in reproduction, until 3 years after final payment under this contract, or for any other period specified in Subpart 4.7 of the Federal Acquisition Regulation (FAR). FAR Subpart 4.7, Contractor Records Retention, in effect on the data of this contract, is incorporated by reference in its entirety and made a part of this contract.

(1) If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for 3 years after any resulting final termination settlement.

(2) Records pertaining to appeals under the Disputes clause or to litigation or the settlement of claims arising under or relating to the performance of this contract shall be made available until disposition of such appeals, litigation, or claims.

(e) The Contractor shall insert a clause containing all the provisions of this clause, including this paragraph (e), in all subcontracts expected to exceed the threshold in FAR 15.403-4(a)(1) for submission of cost or pricing data.

(End of clause)

52.214-27 PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA - MODIFICATIONS - SEALED BIDDING. (OCT 1997)

(a) This clause shall become operative only for any modification to this contract involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed the threshold for the submission of cost or pricing data at FAR 15.403-4(a)(1), except that this clause does not apply to a modification if an exception under FAR 15.403-1(b) applies.

(1) Based on adequate price competition;

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(3) Set by law or regulation.

(b) If any price, including profit, negotiated in connection with any modification under this clause, was increased by any significant amount because

(1) the Contractor or a subcontractor furnished cost or pricing data that were not complete, accurate, and current as certified in its Certificate of Current Cost or Pricing Data;

(2) a subcontractor or prospective subcontractor furnished the Contractor cost or pricing data that were not complete, accurate, and current as certified in the Contractor's Certificate of Current Cost or Pricing Data; or

(3) any of these parties furnished data of any description that were not accurate, the price shall be reduced accordingly and the contract shall be modified to reflect the reduction. This right to a price reduction is limited to that resulting from defects in data relating to modifications for which this clause becomes operative under paragraph (a) above.

(c) Any reduction in the contract price under paragraph (b) above due to defective data from a prospective subcontractor that was not subsequently awarded the subcontract shall be limited to the amount, plus applicable overhead and profit markup, by which:

(1) the actual subcontract; or

(2) the actual cost to the Contractor, if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the Contractor; provided, that the actual subcontract price was not itself affected by defective cost or pricing data.

(d) If the Contracting Officer determines under paragraph (b) of this clause that a price or cost reduction should be made:

(1) the Contractor agrees not to raise the following matters as a defense:

(i) The Contractor or subcontractor was a sole source supplier or otherwise was in a superior bargaining position and thus the price of the contract would not have been modified even if accurate, complete, and current cost or pricing data had been submitted;

(ii) The Contracting Officer should have known that the cost or pricing data in issue were defective even though the Contractor or subcontractor took no affirmative action to bring the character of the data to the attention of the Contracting Officer;

(iii) The contract was based on an agreement about the total cost of the contract and there was no agreement about the cost of each item procured under the contract; or

(iv) The Contractor or subcontractor did not submit a Certificate of Current Cost or Pricing Data.

(2) Except as prohibited by subdivision (d)(2)(ii) of this clause:

(i) an offset in an amount determined appropriate by the Contracting Officer based upon the facts shall be allowed against the amount of a contract price reduction if:

(A) The Contractor certifies to the Contracting Officer that, to the best of the Contractor's knowledge and belief, the Contractor is entitled to the offset in the amount requested; and

(B) The Contractor proves that the cost or pricing data were available before the date of agreement on the price of the contract (or price of the modification) and that the data were not submitted before such date.

(ii) An offset shall not be allowed if:

(A) The understated data was known by the Contractor to be understated when the Certificate of Current Cost or Pricing Data was signed; or (B) The Government proves that the facts demonstrate that the contract price would not have increased in the amount to be offset even if the available data had been submitted before the date of agreement on price.

(e) If any reduction in the contract price under this clause reduces the price of items for which payment was made prior to the date of the modification reflecting the price reduction, the Contractor shall be liable to and shall pay the United States at the time such overpayment is repaid:

(1) Simple interest on the amount of such overpayment to be computed from the date(s) of overpayment to the Contractor to the date the Government is repaid by the Contractor at the applicable underpayment rate effective for each quarter prescribed by the Secretary of the Treasury under 26 U.S.C. 6621(a)(2); and

(2) A penalty equal to the amount of the overpayment, if the Contractor or subcontractor knowingly submitted cost or pricing data which were incomplete, inaccurate, or noncurrent.

(End of clause)

52.214-28 SUBCONTRACTOR COST OR PRICING DATA - MODIFICATIONS - SEALED BIDDING. (OCT 1997)

(a) The requirements of paragraphs (b) and (c) of this clause shall:

(1) become operative only for any modification to this contract involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed the threshold for submission of cost or pricing data at (FAR) 48 CFR 15.403-4(a)(1); and

(2) be limited to such modifications.

(b) Before awarding any subcontract expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4(a)(1), on the date of agreement on price or the date of award, whichever is later; or before pricing any subcontract modifications involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4(a)(1), the Contractor shall require the

subcontractor to submit cost or pricing data (actually or by specific identification in writing), unless an exception under FAR 15.403-1(b) applies.

(1) Based on adequate price competition;

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(3) Set by law or regulation.

(c) The Contractor shall require the subcontractor to certify in substantially the form prescribed in subsection 15.406-2 of the Federal Acquisition Regulation that, to the best of its knowledge and belief, the data submitted under paragraph (b) above were accurate, complete, and current as of the date of agreement on the negotiated price of the subcontract or subcontract modification.

(d) The Contractor shall insert the substance of this clause, including this paragraph (d), in each subcontract that, when entered into, exceeds the threshold for submission of cost or pricing data at FAR 15.403-4(a)(1).

(End of clause)

52.214-29 ORDER OF PRECEDENCE--SEALED BIDDING (JAN 1986)

Any inconsistency in this solicitation or contract shall be resolved by giving precedence in the following order: (a) the Schedule (excluding the specifications); (b) representations and other instructions; (c) contract clauses; (d) other documents, exhibits, and attachments; and (e) the specifications.

(End of clause)

52.215-13 SUBCONTRACTOR COST OR PRICING DATA--MODIFICATIONS (OCT 1997)

(a) The requirements of paragraphs (b) and (c) of this clause shall--

(1) Become operative only for any modification to this contract involving a pricing adjustment expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4; and

(2) Be limited to such modifications.

(b) Before awarding any subcontract expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4, on the date of agreement on price or the date of award, whichever is later; or before pricing any subcontract modification involving a pricing adjustment expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4, the Contractor shall require the subcontractor to submit cost or pricing data (actually or by specific identification in writing), unless an exception under FAR 15.403-1 applies.

(c) The Contractor shall require the subcontractor to certify in substantially the form prescribed in FAR 15.406-2 that, to the best of its knowledge and belief, the data submitted under paragraph (b) of this clause were accurate, complete, and current as of the date of agreement on the negotiated price of the subcontract or subcontract modification.

The Contractor shall insert the substance of this clause, including this paragraph (d), in each subcontract that exceeds the threshold for submission of cost or pricing data at FAR 15.403-4 on the date of agreement on price or the date of award, whichever is later.

(End of clause)

52.219-8 UTILIZATION OF SMALL BUSINESS CONCERNS (OCT 2000)

(a) It is the policy of the United States that small business concerns, veteran-owned small business concerns, service-disabled veteran-owned small business concerns, HUBZone small business concerns, small disadvantaged business concerns, and women-owned small business concerns shall have the maximum practicable opportunity to participate in performing contracts let by any Federal agency, including contracts and subcontracts for subsystems, assemblies, components, and related services for major systems. It is further the policy of the United States that its prime contractors establish procedures to ensure the timely payment of amounts due pursuant to the terms of their subcontracts with small business concerns, veteran-owned small business concerns, service-disabled veteran-owned small business concerns, HUBZone small business concerns, small disadvantaged business concerns, and women-owned small business concerns.

(b) The Contractor hereby agrees to carry out this policy in the awarding of subcontracts to the fullest extent consistent with efficient contract performance. The Contractor further agrees to cooperate in any studies or surveys as may be conducted by the United States Small Business Administration or the awarding agency of the United States as may be necessary to determine the extent of the Contractor's compliance with this clause.

Definitions. As used in this contract--

HUBZone small business concern means a small business concern that appears on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration.

Service-disabled veteran-owned small business concern--

(1) Means a small business concern--

(i) Not less than 51 percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more service-disabled veterans; and

(ii) The management and daily business operations of which are controlled by one or more service-disabled veterans or, in the case of a veteran with permanent and severe disability, the spouse or permanent caregiver of such veteran.

(2) Service-disabled veteran means a veteran, as defined in 38 U.S.C. 101(2), with a disability that is service-connected, as defined in 38 U.S.C. 101(16).

Small business concern means a small business as defined pursuant to Section 3 of the Small Business Act and relevant regulations promulgated pursuant thereto.

Small disadvantaged business concern means a small business concern that represents, as part of its offer that--

(1) It has received certification as a small disadvantaged business concern consistent with 13 CFR part 124, subpart B;

(2) No material change in disadvantaged ownership and control has occurred since its certification;

(3) Where the concern is owned by one or more individuals, the net worth of each individual upon whom the certification is based does not exceed $750,000 after taking into account the applicable exclusions set forth at 13 CFR 124.104(c)(2); and

(4) It is identified, on the date of its representation, as a certified small disadvantaged business in the database maintained by the Small Business Administration (PRO-Net).

Veteran-owned small business concern means a small business concern--

(1) Not less than 51 percent of which is owned by one or more veterans (as defined at 38 U.S.C. 101(2)) or, in the case of any publicly owned business, not less than 51 percent of the stock of which is owned by one or more veterans; and

(2) The management and daily business operations of which are controlled by one or more veterans.

Women-owned small business concern means a small business concern--

(1) That is at least 51 percent owned by one or more women, or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(2) Whose management and daily business operations are controlled by one or more women.

(d) Contractors acting in good faith may rely on written representations by their subcontractors regarding their status as a small business concern, a veteran-owned small business concern, a service-disabled veteran-owned small business concern, a HUBZone small business concern, a small disadvantaged business concern, or a women-owned small business concern.

(End of clause)

52.222-1 NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (FEB 1997)

If the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance of this contract, the Contractor shall immediately give notice, including all relevant information, to the Contracting Officer.

(End of clause)

52.222-3 CONVICT LABOR (AUG 1996)

The Contractor agrees not to employ in the performance of this contract any person undergoing a sentence of imprisonment which has been imposed by any court of a State, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, or the Trust Territory of the Pacific Islands. This limitation, however, shall not prohibit the employment by the Contractor in the performance of this contract of persons on parole or probation to work at paid employment during the term of their sentence or persons who have been pardoned or who have served their terms. Nor shall it prohibit the employment by the Contractor in the performance of this contract of persons confined for violation of the laws of any of the States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, or the Trust Territory of the Pacific Islands who are authorized to work at paid employment in the community under the laws of such jurisdiction, if--

(a)(1) The worker is paid or is in an approved work training program on a voluntary basis;

(2) Representatives of local union central bodies or similar labor union organizations have been consulted;

(3) Such paid employment will not result in the displacement of employed workers, or be applied in skills, crafts, or trades in which there is a surplus of available gainful labor in the locality, or impair existing contracts for services; and

(4) The rates of pay and other conditions of employment will not be less than those paid or provided for work of a similar nature in the locality in which the work is being performed; and

(b) The Attorney General of the United States has certified that the work-release laws or regulations of the jurisdiction involved are in conformity with the requirements of Executive Order 11755, as amended by Executive Orders 12608 and 12943.

(End of clause)

52.222-4 CONTRACT WORK HOURS AND SAFETY STANDARDS ACT - OVERTIME COMPENSATION. (SEP 2000)

(a) Overtime requirements. No Contractor or subcontractor employing laborers or mechanics (see Federal Acquisition Regulation 22.300) shall require or permit them to work over 40 hours in any workweek unless they are paid at least 1 and 1/2 times the basic rate of pay for each hour worked over 40 hours.

(b) Violation; liability for unpaid wages; liquidated damages. The responsible Contractor and subcontractor are liable for unpaid wages if they violate the terms in paragraph (a) of this clause. In addition, the Contractor and subcontractor are liable for liquidated damages payable to the Government. The Contracting Officer will assess liquidated damages at the rate of $10 per affected employee for each calendar day on which the employer required or permitted the employee to work in excess of the standard workweek of 40 hours without paying overtime wages required by the Contract Work Hours and Safety Standards Act.

(c) Withholding for unpaid wages and liquidated damages. The Contracting Officer will withhold from payments due under the contract sufficient funds required to satisfy any Contractor or subcontractor liabilities for unpaid wages and liquidated damages. If amounts withheld under the contract are insufficient to satisfy Contractor or subcontractor liabilities, the Contracting Officer will withhold payments from other Federal or Federally assisted contracts held by the same Contractor that are subject to the Contract Work Hours and Safety Standards Act.

(d) Payrolls and basic records.

(1) The Contractor and its subcontractors shall maintain payrolls and basic payroll records for all laborers and mechanics working on the contract during the contract and shall make them available to the Government until 3 years after contract completion. The records shall contain the name and address of each employee, social security number, labor classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. The records need not duplicate those required for construction work by Department of Labor regulations at 29 CFR 5.5(a)(3) implementing the Davis-Bacon Act.

(2) The Contractor and its subcontractors shall allow authorized representatives of the Contracting Officer or the Department of Labor to inspect, copy, or transcribe records maintained under paragraph (d)(1) of this clause. The Contractor or subcontractor also shall allow authorized representatives of the Contracting Officer or Department of Labor to interview employees in the workplace during working hours.

(e) Subcontracts. The Contractor shall insert the provisions set forth in paragraphs (a) through (d) of this clause in subcontracts exceeding $100,000 and require subcontractors to include these provisions in any lower tier

subcontracts. The Contractor shall be responsible for compliance by any subcontractor or lower-tier subcontractor with the provisions set forth in paragraphs (a) through (d) of this clause.

(End of clause)

52.222-6 DAVIS-BACON ACT (FEB 1995)

(a) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (d) of this clause; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such period. Such laborers and mechanics shall be paid not less than the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in the clause entitled Apprentices and Trainees. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph (b) of this clause) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(b)(1) The Contracting Officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The Contracting Officer shall approve an additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination.

(ii) The classification is utilized in the area by the construction industry.

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the Contracting Officer agree on the classification and wage rate (including the amount designated for fringe benefits, where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator or an authorized representative will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(3) In the event the Contractor, the laborers or mechanics to be employed in the classification, or their

representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits, where appropriate) determined pursuant to subparagraphs (b)(2) and (b)(3) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(c) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(4) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, That the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(End of clause)

52.222-7 WITHHOLDING OF FUNDS (FEB 1988)

The Contracting Officer shall, upon his or her own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same Prime Contractor, or any other Federally assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same Prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(End of clause)

52.222-8 PAYROLLS AND BASIC RECORDS (FEB 1988)

(a) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of 3 years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under paragraph (d) of the clause entitled Davis-Bacon Act, that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or

the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(b)(1) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under paragraph (a) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. The Prime Contractor is responsible for the submission of copies of payrolls by all subcontractors.

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify--

(i) That the payroll for the payroll period contains the information required to be maintained under paragraph (a) of this clause and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR Part 3; and

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph (b)(2) of this clause.

(4) The falsification of any of the certifications in this clause may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

(c) The Contractor or subcontractor shall make the records required under paragraph (a) of this clause available for inspection, copying, or transcription by the Contracting Officer or authorized representatives of the Contracting Officer or the Department of Labor. The Contractor or subcontractor shall permit the Contracting Officer or representatives of the Contracting Officer or the Department of Labor to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit required records or to make them available, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(End of clause)

52.222-9 APPRENTICES AND TRAINEES (FEB 1988)

(a) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or

her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph, shall be paid not less than the applicable wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(b) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(c) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

(End of clause)

52.222-10 COMPLIANCE WITH COPELAND ACT REQUIREMENTS (FEB 1988)

The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.

(End of clause)

52.222-11 SUBCONTRACTS (LABOR STANDARDS (FEB 1988)

(a) The Contractor or subcontractor shall insert in any subcontracts the clauses entitled Davis-Bacon Act, Contract Work Hours and Safety Standards Act-Overtime Compensation, Apprentices and Trainees, Payrolls and Basic Records, Compliance with Copeland Act Requirements, Withholding of Funds, Subcontracts (Labor Standards), Contract Termination-Debarment, Disputes Concerning Labor Standards, Compliance with Davis-Bacon and Related Act Regulations, and Certification of Eligibility, and such other clauses as the Contracting Officer may, by appropriate instructions, require, and also a clause requiring subcontractors to include these clauses in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with all the contract clauses cited in this paragraph.

(b)(1) Within 14 days after award of the contract, the Contractor shall deliver to the Contracting Officer a completed Statement and Acknowledgment Form (SF 1413) for each subcontract, including the subcontractor's signed and dated acknowledgment that the clauses set forth in paragraph (a) of this clause have been included in the subcontract.

(2) Within 14 days after the award of any subsequently awarded subcontract the Contractor shall deliver to the Contracting Officer an updated completed SF 1413 for such additional subcontract.

(End of clause)

52.222-12 CONTRACT TERMINATION--DEBARMENT (FEB 1988)

A breach of the contract clauses entitled Davis-Bacon Act, Contract Work Hours and Safety Standards Act--Overtime Compensation, Apprentices and Trainees, Payrolls and Basic Records, Compliance with Copeland Act Requirements, Subcontracts (Labor Standards), Compliance with Davis-Bacon and Related Act Regulations, or Certification of Eligibility may be grounds for termination of the contract, and for debarment as a Contractor and subcontractor as provided in 29 CFR 5.12.

(End of clause)

52.222-13 COMPLIANCE WITH DAVIS-BACON AND RELATED ACT REGULATIONS (FEB 1988)

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are hereby incorporated by reference in this contract.

(End of clause)

52.222-14 DISPUTES CONCERNING LABOR STANDARDS (FEB 1988)

The United States Department of Labor has set forth in 29 CFR Parts 5, 6, and 7 procedures for resolving disputes concerning labor standards requirements. Such disputes shall be resolved in accordance with those procedures and not the Disputes clause of this contract. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(End of clause)

52.222-15 CERTIFICATION OF ELIGIBILITY (FEB 1988)

(a) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(b) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(c) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(End of clause)

52.222-23 NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY FOR CONSTRUCTION (FEB 1999)

(a) The offeror's attention is called to the Equal Opportunity clause and the Affirmative Action Compliance Requirements for Construction clause of this solicitation.

(b) The goals for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for minority participation for each trade	Goals for female participation for each trade
7.2%	6.9%

These goals are applicable to all the Contractor's construction work performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, the Contractor shall apply the goals established for the geographical area where the work is actually performed. Goals are published periodically in the Federal Register in notice form, and these notices may be obtained from any Office of Federal Contract Compliance Programs office.

(c) The Contractor's compliance with Executive Order 11246, as amended, and the regulations in 41 CFR 60-4 shall be based on (1) its implementation of the Equal Opportunity clause, (2) specific affirmative action obligations required by the clause entitled "Affirmative Action Compliance Requirements for Construction," and (3) its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade. The Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor, or from project to project, for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, Executive Order 11246, as amended, and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

(d) The Contractor shall provide written notification to the Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, within 10 working days following award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the --

(1) Name, address, and telephone number of the subcontractor;

(2) Employer's identification number of the subcontractor;

(3) Estimated dollar amount of the subcontract;

(4) Estimated starting and completion dates of the subcontract; and

(5) Geographical area in which the subcontract is to be performed.

(e) As used in this Notice, and in any contract resulting from this solicitation, the "covered area" is Howard Hanson Dam, King County, Washington.
(End of provision)

52.222-26 EQUAL OPPORTUNITY (APR 2002)

(a) Definition. United States, as used in this clause, means the 50 States, the District of Columbia, Puerto Rico, the Northern Mariana Islands, American Samoa, Guam, the U.S. Virgin Islands, and Wake Island.

(b) If, during any 12-month period (including the 12 months preceding the award of this contract), the Contractor has been or is awarded nonexempt Federal contracts and/or subcontracts that have an aggregate value in excess of $10,000, the Contractor shall comply with paragraphs (b)(1) through (b)(11) of this clause, except for work performed outside the United States by employees who were not recruited within the United States. Upon request, the Contractor shall provide information necessary to determine the applicability of this clause.

(1) The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. However, it shall not be a violation of this clause for the Contractor to extend a publicly announced preference in employment to Indians living on or near an Indian reservation, in connection with employment opportunities on or near an Indian reservation, as permitted by 41 CFR 60-1.5.

(2) The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. This shall include, but not be limited to, (i) employment, (ii) upgrading, (iii) demotion, (iv) transfer, (v) recruitment or recruitment advertising, (vi) layoff or termination, (vii) rates of pay or other forms of compensation, and (viii) selection for training, including apprenticeship.

(3) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.

(4) The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(5) The Contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.

(6) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

(7) The Contractor shall furnish to the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor. The Contractor shall also file Standard Form 100 (EEO-1), or any successor form, as prescribed in 41 CFR part 60-1. Unless the Contractor has filed within the 12 months preceding the date of contract award, the Contractor shall, within 30 days after contract award, apply to either the regional Office of Federal Contract Compliance Programs (OFCCP) or the local office of the Equal Employment Opportunity Commission for the necessary forms.

(8) The Contractor shall permit access to its premises, during normal business hours, by the contracting agency or the OFCCP for the purpose of conducting on-site compliance evaluations and complaint investigations. The Contractor shall permit the Government to inspect and copy any books, accounts, records (including computerized records), and other material that may be relevant to the matter under investigation and pertinent to compliance with Executive Order 11246, as amended, and rules and regulations that implement the Executive Order.

(9) If the OFCCP determines that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended; in the rules, regulations, and orders of the Secretary of Labor; or as otherwise provided by law.

(10) The Contractor shall include the terms and conditions of subparagraphs (b)(1) through (11) of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.

(11) The Contractor shall take such action with respect to any subcontract or purchase order as the contracting officer may direct as a means of enforcing these terms and conditions, including sanctions for noncompliance; provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of any direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

(c) Notwithstanding any other clause in this contract, disputes relative to this clause will be governed by the procedures in 41 CFR 60-1.1.

(End of clause)

52.222-27 AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR CONSTRUCTION (FEB 1999)

(a) Definitions. "Covered area," as used in this clause, means the geographical area described in the solicitation for this contract.

"Deputy Assistant Secretary," as used in this clause, means Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, or a designee.

"Employer's identification number," as used in this clause, means the Federal Social Security number used on the employer's quarterly federal tax return, U.S. Treasury Department Form 941.

"Minority," as used in this clause, means--

(1) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

(2) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands);

(3) Black (all persons having origins in any of the black African racial groups not of Hispanic origin); and

(4) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race).

(b) If the Contractor, or a subcontractor at any tier, subcontracts a portion of the work involving any construction trade, each such subcontract in excess of $10,000 shall include this clause and the Notice containing the goals for minority and female participation stated in the solicitation for this contract.

(c) If the Contractor is participating in a Hometown Plan (41 CFR 60-4) approved by the U.S. Department of Labor in a covered area, either individually or through an association, its affirmative action obligations on all work in the plan area (including goals) shall comply with the plan for those trades that have unions participating in the plan. Contractors must be able to demonstrate participation in, and compliance with, the provisions of the plan. Each Contractor or subcontractor participating in an approved plan is also required to comply with its obligations under the Equal Opportunity clause, and to make a good faith effort to achieve each goal under the plan in each trade in which it has employees. The overall good-faith performance by other Contractors or subcontractors toward a goal in an approved plan does not excuse any Contractor's or subcontractor's failure to make good-faith efforts to achieve the plan's goals.

(d) The Contractor shall implement the affirmative action procedures in subparagraphs (g)(1) through (16) of this clause. The goals stated in the solicitation for this contract are expressed as percentages of the total hours of employment and training of minority and female utilization that the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for the geographical area where that work is actually performed. The Contractor is expected to make substantially uniform progress toward its goals in each craft.

(e) Neither the terms and conditions of any collective bargaining agreement, nor the failure by a union with which the Contractor has a collective bargaining agreement, to refer minorities or women shall excuse the Contractor's obligations under this clause, Executive Order 11246, as amended, or the regulations thereunder.

(f) In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

(g) The Contractor shall take affirmative action to ensure equal employment opportunity. The evaluation of the Contractor's compliance with this clause shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and implement affirmative action steps at least as extensive as the following:

(1) Ensure a working environment free of harassment, intimidation, and coercion at all sites and in all facilities where the Contractor's employees are assigned to work. The Contractor, if possible, will assign two or more women to each construction project. The Contractor shall ensure that foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at these sites or facilities.

(2) Establish and maintain a current list of sources for minority and female recruitment. Provide written notification to minority and female recruitment sources and community organizations when the Contractor or its unions have

employment opportunities available, and maintain a record of the organizations' responses.

(3) Establish and maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant, referrals of minorities or females from unions, recruitment sources, or community organizations, and the action taken with respect to each individual. If an individual was sent to the union hiring hall for referral and not referred back to the Contractor by the union or, if referred back, not employed by the Contractor, this shall be documented in the file, along with whatever additional actions the Contractor may have taken.

(4) Immediately notify the Deputy Assistant Secretary when the union or unions with which the Contractor has a collective bargaining agreement has not referred back to the Contractor a minority or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

(5) Develop on-the-job training opportunities and/or participate in training programs for the area that expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under subparagraph (g)(2) of this clause.

(6) Disseminate the Contractor's equal employment policy by--

(i) Providing notice of the policy to unions and to training, recruitment, and outreach programs, and requesting their cooperation in assisting the Contractor in meeting its contract obligations;

(ii) Including the policy in any policy manual and in collective bargaining agreements;

(iii) Publicizing the policy in the company newspaper, annual report, etc.;

(iv) Reviewing the policy with all management personnel and with all minority and female employees at least once a year; and

(v) Posting the policy on bulletin boards accessible to employees at each location where construction work is performed.

(7) Review, at least annually, the Contractor's equal employment policy and affirmative action obligations with all employees having responsibility for hiring, assignment, layoff, termination, or other employment decisions. Conduct review of this policy with all on-site supervisory personnel before initiating construction work at a job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

(8) Disseminate the Contractor's equal employment policy externally by including it in any advertising in the news media, specifically including minority and female news media. Provide written notification to, and discuss this policy with, other Contractors and subcontractors with which the Contractor does or anticipates doing business.

(9) Direct recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students, and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than 1 month before the date for acceptance of applications for apprenticeship or training by any recruitment source, send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

(10) Encourage present minority and female employees to recruit minority persons and women. Where reasonable, provide after-school, summer, and vacation employment to minority and female youth both on the site and in other areas of the Contractor's workforce.

(11) Validate all tests and other selection requirements where required under 41 CFR 60-3.

(12) Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities. Encourage these employees to seek or to prepare for, through appropriate training, etc., opportunities for promotion.

(13) Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment-related activities to ensure that the Contractor's obligations under this contract are being carried out.

(14) Ensure that all facilities and company activities are nonsegregated except that separate or single-user rest rooms and necessary dressing or sleeping areas shall be provided to assure privacy between the sexes.

(15) Maintain a record of solicitations for subcontracts for minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

(16) Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's equal employment policy and affirmative action obligations.

(h) The Contractor is encouraged to participate in voluntary associations that may assist in fulfilling one or more of the affirmative action obligations contained in subparagraphs (g)(1) through (16) of this clause. The efforts of a contractor association, joint contractor-union, contractor-community, or similar group of which the contractor is a member and participant may be asserted as fulfilling one or more of its obligations under subparagraphs (g)(1) through (16) of this clause, provided the Contractor--

(1) Actively participates in the group;

(2) Makes every effort to ensure that the group has a positive impact on the employment of minorities and women in the industry;

(3) Ensures that concrete benefits of the program are reflected in the Contractor's minority and female workforce participation;

(4) Makes a good-faith effort to meet its individual goals and timetables; and

(5) Can provide access to documentation that demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply is the Contractor's, and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

(i) A single goal for minorities and a separate single goal for women shall be established. The Contractor is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and nonminority. Consequently, the Contractor may be in violation of Executive Order 11246, as amended, if a particular group is employed in a substantially disparate manner.

(j) The Contractor shall not use goals or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

(k) The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts under Executive Order 11246, as amended.

(l) The Contractor shall carry out such sanctions and penalties for violation of this clause and of the Equal

Opportunity clause, including suspension, termination, and cancellation of existing subcontracts, as may be imposed or ordered under Executive Order 11246, as amended, and its implementing regulations, by the OFCCP. Any failure to carry out these sanctions and penalties as ordered shall be a violation of this clause and Executive Order 11246, as amended.

(m) The Contractor in fulfilling its obligations under this clause shall implement affirmative action procedures at least as extensive as those prescribed in paragraph (g) of this clause, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of Executive Order 11246, as amended, the implementing regulations, or this clause, the Deputy Assistant Secretary shall take action as prescribed in 41 CFR 60-4.8.

(n) The Contractor shall designate a responsible official to--

(1) Monitor all employment-related activity to ensure that the Contractor's equal employment policy is being carried out;

(2) Submit reports as may be required by the Government; and

(3) Keep records that shall at least include for each employee the name, address, telephone number, construction trade, union affiliation (if any), employee identification number, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, separate records are not required to be maintained.

Nothing contained herein shall be construed as a limitation upon the application of other laws that establish different standards of compliance or upon the requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

(End of clause)

52.222-35 AFFIRMATIVE ACTION FOR DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA (APR 1998)

(a)) Definitions. As used in this clause--

All employment openings includes all positions except executive and top management, those positions that will be filled from within the contractor's organization, and positions lasting 3 days or less. This term includes full-time employment, temporary employment of more than 3 days' duration, and part-time employment.

Appropriate office of the State employment service system means the local office of the Federal-State national system of public employment offices with assigned responsibility to serve the area where the employment opening is to be filled, including the District of Columbia, Guam, the Commonwealth of Puerto Rico, and the Virgin Islands.

Positions that will be filled from within the Contractor's organization means employment openings for which no consideration will be given to persons outside the Contractor's organization (including any affiliates, subsidiaries, and parent companies) and includes any openings that the Contractor proposes to fill from regularly established “recall” lists. The exception does not apply to a particular opening once an employer decides to consider applicants outside of its organization.

Veteran of the Vietnam era means a person who--

(1) Served on active duty for a period of more than 180 days, any part of which occurred between August 5, 1964, and May 7, 1975, and was discharged or released therefrom with other than a dishonorable discharge; or

(2) Was discharged or released from active duty for a service-connected disability if any part of such active duty was performed between August 5, 1964, and May 7, 1975.

(b) General. (1) Regarding any position for which the employee or applicant for employment is qualified, the Contractor shall not discriminate against the individual because the individual is a disabled veteran or a veteran of the Vietnam era. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified disabled veterans and veterans of the Vietnam era without discrimination based upon their disability or veterans' status in all employment practices such as--

(i) Employment;

(ii) Upgrading;

(iii) Demotion or transfer;

(iv) Recruitment;

(v) Advertising;

(vi) Layoff or termination;

(vii) Rates of pay or other forms of compensation; and

(viii) Selection for training, including apprenticeship.

(2) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Vietnam Era Veterans' Readjustment Assistance Act of 1972 (the Act), as amended.

(c) Listing openings. (1) The Contractor agrees to list all employment openings existing at contract award or occurring during contract performance, at an appropriate office of the State employment service system in the locality where the opening occurs. These openings include those occurring at any Contractor facility, including one not connected with performing this contract. An independent corporate affiliate is exempt from this requirement.

(2) State and local government agencies holding Federal contracts of $10,000 or more shall also list all their employment openings with the appropriate office of the State employment service.

(3) The listing of employment openings with the State employment service system is required at least concurrently with using any other recruitment source or effort and involves the obligations of placing a bona fide job order, including accepting referrals of veterans and nonveterans. This listing does not require hiring any particular job applicant or hiring from any particular group of job applicants and is not intended to relieve the Contractor from any requirements of Executive orders or regulations concerning nondiscrimination in employment.

(4) Whenever the Contractor becomes contractually bound to the listing terms of this clause, it shall advise the State employment service system, in each State where it has establishments, of the name and location of each hiring location in the State. As long as the Contractor is contractually bound to these terms and has so advised the State system, it need not advise the State system of subsequent contracts. The Contractor may advise the State system when it is no longer bound by this contract clause.

(d) Applicability. This clause does not apply to the listing of employment openings that occur and are filled outside the 50 States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, and the Virgin Islands.

(e) Postings. (1) The Contractor agrees to post employment notices stating (i) the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified disabled veterans and veterans of the Vietnam era, and (ii) the rights of applicants and employees.

(2) These notices shall be posted in conspicuous places that are available to employees and applicants for employment. They shall be in a form prescribed by the Deputy Assistant Secretary for Federal Contract Compliance Programs, Department of Labor (Deputy Assistant Secretary), and provided by or through the Contracting Officer.

(3) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of the Act, and is committed to take affirmative action to employ, and advance in employment, qualified disabled veterans and veterans of the Vietnam Era.

(f) Noncompliance. If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations, and relevant orders of the Secretary issued pursuant to the Act.

(g) Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order of $10,000 or more unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Deputy Assistant Secretary to enforce the terms, including action for noncompliance.

(End of clause)

52.222-36 AFFIRMATIVE ACTION FOR WORKERS WITH DISABILITIES (JUN 1998)

(a) General. (1) Regarding any position for which the employee or applicant for employment is qualified, the Contractor shall not discriminate against any employee or applicant because of physical or mental disability. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified individuals with disabilities without discrimination based upon their physical or mental disability in all employment practices such as--

(i) Recruitment, advertising, and job application procedures;

(ii) Hiring, upgrading, promotion, award of tenure, demotion, transfer, layoff, termination, right of return from layoff, and rehiring;

(iii) Rates of pay or any other form of compensation and changes in compensation;

(iv) Job assignments, job classifications, organizational structures, position descriptions, lines of progression, and seniority lists;

(v) Leaves of absence, sick leave, or any other leave;

(vi) Fringe benefits available by virtue of employment, whether or not administered by the Contractor;

(vii) Selection and financial support for training, including apprenticeships, professional meetings, conferences, and other related activities, and selection for leaves of absence to pursue training;

(viii) Activities sponsored by the Contractor, including social or recreational programs; and

(ix) Any other term, condition, or privilege of employment.

(2) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Rehabilitation Act of 1973 (29 U.S.C. 793) (the Act), as amended.

(b) Postings. (1) The Contractor agrees to post employment notices stating--

(i) The Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified individuals with disabilities; and

(ii) The rights of applicants and employees.

(2) These notices shall be posted in conspicuous places that are available to employees and applicants for employment. The Contractor shall ensure that applicants and employees with disabilities are informed of the contents of the notice (e.g., the Contractor may have the notice read to a visually disabled individual, or may lower the posted notice so that it might be read by a person in a wheelchair). The notices shall be in a form prescribed by the Deputy Assistant Secretary for Federal Contract Compliance of the U.S. Department of Labor (Deputy Assistant Secretary) and shall be provided by or through the Contracting Officer.

(3) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of Section 503 of the Act and is committed to take affirmative action to employ, and advance in employment, qualified individuals with physical or mental disabilities.

(c) Noncompliance. If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations, and relevant orders of the Secretary issued pursuant to the Act.

(d) Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order in excess of $10,000 unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Deputy Assistant Secretary to enforce the terms, including action for noncompliance.

(End of clause)

52.222-37 EMPLOYMENT REPORTS ON DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA (JAN 1999)

(a) Unless the Contractor is a State or local government agency, the Contractor shall report at least annually, as required by the Secretary of Labor, on--

(1) The number of disabled veterans and the number of veterans of the Vietnam era in the workforce of the contractor by job category and hiring location; and

(2) The total number of new employees hired during the period covered by the report, and of that total, the number of disabled veterans, and the number of veterans of the Vietnam era.

(b) The above items shall be reported by completing the form entitled "Federal Contractor Veterans' Employment Report VETS-100."

(c) Reports shall be submitted no later than September 30 of each year beginning September 30, 1988.

(d) The employment activity report required by paragraph (a)(2) of this clause shall reflect total hires during the most recent 12-month period as of the ending date selected for the employment profile report required by paragraph (a)(1) of this clause. Contractors may select an ending date: (1) As of the end of any pay period during the period January through March 1st of the year the report is due, or (2) as of December 31, if the contractor has previous written

approval from the Equal Employment Opportunity Commission to do so for purposes of submitting the Employer Information Report EEO-1 (Standard Form 100).

(e) The count of veterans reported according to paragraph (a) of this clause shall be based on voluntary disclosure. Each Contractor subject to the reporting requirements at 38 U.S.C. 4212 shall invite all disabled veterans and veterans of the Vietnam era who wish to benefit under the affirmative action program at 38 U.S.C. 4212 to identify themselves to the Contractor. The invitation shall state that the information is voluntarily provided; that the information will be kept confidential; that disclosure or refusal to provide the information will not subject the applicant or employee to any adverse treatment; and that the information will be used only in accordance with the regulations promulgated under 38 U.S.C. 4212.

(f) Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order of $10,000 or more unless exempted by rules, regulations, or orders of the Secretary.

(End of clause)

52.223-3 HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA (JAN 1997)

(a) "Hazardous material", as used in this clause, includes any material defined as hazardous under the latest version of Federal Standard No. 313 (including revisions adopted during the term of the contract).

(b) The offeror must list any hazardous material, as defined in paragraph (a) of this clause, to be delivered under this contract. The hazardous material shall be properly identified and include any applicable identification number, such as National Stock Number or Special Item Number. This information shall also be included on the Material Safety Data Sheet submitted under this contract.

Material (If none, insert "None")	Identification No.
_____	_____
_____	_____
_____	_____

(c) This list must be updated during performance of the contract whenever the Contractor determines that any other material to be delivered under this contract is hazardous.

(d) The apparently successful offeror agrees to submit, for each item as required prior to award, a Material Safety Data Sheet, meeting the requirements of 29 CFR 1910.1200(g) and the latest version of Federal Standard No. 313, for all hazardous material identified in paragraph (b) of this clause. Data shall be submitted in accordance with Federal Standard No. 313, whether or not the apparently successful offeror is the actual manufacturer of these items. Failure to submit the Material Safety Data Sheet prior to award may result in the apparently successful offeror being considered nonresponsible and ineligible for award.

(e) If, after award, there is a change in the composition of the item(s) or a revision to Federal Standard No. 313, which renders incomplete or inaccurate the data submitted under paragraph (d) of this clause, the Contractor shall promptly notify the Contracting Officer and resubmit the data.

(f) Neither the requirements of this clause nor any act or failure to act by the Government shall relieve the Contractor of any responsibility or liability for the safety of Government, Contractor, or subcontractor personnel or property.

(g) Nothing contained in this clause shall relieve the Contractor from complying with applicable Federal, State, and local laws, codes, ordinances, and regulations (including the obtaining of licenses and permits) in connection with hazardous material.

(h) The Government's rights in data furnished under this contract with respect to hazardous material are as follows:

(1) To use, duplicate and disclose any data to which this clause is applicable. The purposes of this right are to--

(i) Apprise personnel of the hazards to which they may be exposed in using, handling, packaging, transporting, or disposing of hazardous materials;

(ii) Obtain medical treatment for those affected by the material; and

(iii) Have others use, duplicate, and disclose the data for the Government for these purposes.

(2) To use, duplicate, and disclose data furnished under this clause, in accordance with subparagraph (h)(1) of this clause, in precedence over any other clause of this contract providing for rights in data.

(3) The Government is not precluded from using similar or identical data acquired from other sources.

(End of clause)

52.223-6 DRUG-FREE WORKPLACE (MAY 2001)

(a) Definitions. As used in this clause --

"Controlled substance" means a controlled substance in schedules I through V of section 202 of the Controlled Substances Act (21 U.S.C. 812) and as further defined in regulation at 21 CFR 1308.11 - 1308.15.

"Conviction" means a finding of guilt (including a plea of nolo contendere) or imposition of sentence, or both, by any judicial body charged with the responsibility to deter- mine violations of the Federal or State criminal drug statutes.

"Criminal drug statute" means a Federal or non-Federal criminal statute involving the manufacture, distribution, dispensing, possession, or use of any controlled substance.

"Drug-free workplace" means the site(s) for the performance of work done by the Contractor in connection with a specific contract at which employees of the Contractor are prohibited from engaging in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance.

"Employee" means an employee of a Contractor directly engaged in the performance of work under a Government contract. "Directly engaged" is defined to include all direct cost employees and any other Contractor employee who has other than a minimal impact or involvement in contract performance.

"Individual" means an offeror/contractor that has no more than one employee including the offeror/contractor.

(b) The Contractor, if other than an individual, shall-- within 30 days after award (unless a longer period is agreed to in writing for contracts of 30 days or more performance duration), or as soon as possible for contracts of less than 30 days performance duration--

(1) Publish a statement notifying its employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the Contractor's workplace and specifying the actions that will be

taken against employees for violations of such prohibition;

(2) Establish an ongoing drug-free awareness program to inform such employees about--

(i) The dangers of drug abuse in the workplace;

(ii) The Contractor's policy of maintaining a drug-free workplace;

(iii) Any available drug counseling, rehabilitation, and employee assistance programs; and

(iv) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(3) Provide all employees engaged in performance of the contract with a copy of the statement required by subparagraph (b)(1) of this clause;

(4) Notify such employees in writing in the statement required by subparagraph (b)(1) of this clause that, as a condition of continued employment on this contract, the employee will--

(i) Abide by the terms of the statement; and

(ii) Notify the employer in writing of the employee's conviction under a criminal drug statute for a violation occurring in the workplace no later than 5 days after such conviction.

(5) Notify the Contracting Officer in writing within 10 days after receiving notice under subdivision (b)(4)(ii) of this clause, from an employee or otherwise receiving actual notice of such conviction. The notice shall include the position title of the employee;

(6) Within 30 days after receiving notice under subdivision (b)(4)(ii) of this clause of a conviction, take one of the following actions with respect to any employee who is convicted of a drug abuse violation occurring in the workplace:

(i) Taking appropriate personnel action against such employee, up to and including termination; or

(ii) Require such employee to satisfactorily participate in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency; and

(7) Make a good faith effort to maintain a drug-free workplace through implementation of subparagraphs (b)(1) though (b)(6) of this clause.

(c) The Contractor, if an individual, agrees by award of the contract or acceptance of a purchase order, not to engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance while performing this contract.

(d) In addition to other remedies available to the Government, the Contractor's failure to comply with the requirements of paragraph (b) or (c) of this clause may, pursuant to FAR 23.506, render the Contractor subject to suspension of contract payments, termination of the contract for default, and suspension or debarment.

(End of clause)

52.223-14 TOXIC CHEMICAL RELEASE REPORTING (OCT 2000)

(a) Unless otherwise exempt, the Contractor, as owner or operator of a facility used in the performance of this contract, shall file by July 1 for the prior calendar year an annual Toxic Chemical Release Inventory Form (Form R) as described in sections 313(a) and (g) of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023(a) and (g)), and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106). The Contractor shall file, for each facility subject to the Form R filing and reporting requirements, the annual Form R throughout the life of the contract.

(b) A Contractor owned or operated facility used in the performance of this contract is exempt from the requirement to file an annual Form R if--

(1) The facility does not manufacture, process, or otherwise use any toxic chemicals listed under section 313(c) of EPCRA, 42 U.S.C. 11023(c);

(2) The facility does not have 10 or more full-time employees as specified in section 313(b)(1)(A) of EPCRA, 42 U.S.C. 11023(b)(1)(A);

(3) The facility does not meet the reporting thresholds of toxic chemicals established under of EPCRA, 42 U.S.C. 11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

(4) The facility does not fall within Standard Industrial Classification Code (SIC) major groups 20 through 39 or their corresponding North American Industry Classification System (NAICS) sectors 31 through 33; or

(5) The facility is not located within any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Northern Mariana Islands, or any other territory or possession over which the United States has jurisdiction.

(c) If the Contractor has certified to an exemption in accordance with one or more of the criteria in paragraph (b) of this clause, and after award of the contract circumstances change so that any of its owned or operated facilities used in the performance of this contract is no longer exempt--

(1) The Contractor shall notify the Contracting Officer; and

(2) The Contractor, as owner or operator of a facility used in the performance of this contract that is no longer exempt, shall (i) submit a Toxic Chemical Release Inventory Form (Form R) on or before July 1 for the prior calendar year during which the facility becomes eligible; and (ii) continue to file the annual Form R for the life of the contract for such facility.

(d) The Contracting Officer may terminate this contract or take other action as appropriate, if the Contractor fails to comply accurately and fully with the EPCRA and PPA toxic chemical release filing and reporting requirements.

(e) Except for acquisitions of commercial items, as defined in FAR Part 2, the Contractor shall--

(1) For competitive subcontracts expected to exceed $100,000 (including all options), include a solicitation provision substantially the same as the provision at FAR 52.223-13, Certification of Toxic Chemical Release Reporting; and

(2) Include in any resultant subcontract exceeding $100,000 (including all options), the substance of this clause, except this paragraph (e).

(End of clause)

52.225-11 BUY AMERICAN ACT--CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS (JUN 2003)

(a) Definitions. As used in this clause--

Component means an article, material, or supply incorporated directly into a construction material.

Construction material means an article, material, or supply brought to the construction site by the Contractor or subcontractor for incorporation into the building or work. The term also includes an item brought to the site preassembled from articles, materials, or supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, that are discrete systems incorporated into a public building or work and that are produced as complete systems, are evaluated as a single and distinct construction material regardless of when or how the individual parts or components of those systems are delivered to the construction site. Materials purchased directly by the Government are supplies, not construction material.

Cost of components means--

(1) For components purchased by the Contractor, the acquisition cost, including transportation costs to the place of incorporation into the construction material (whether or not such costs are paid to a domestic firm), and any applicable duty (whether or not a duty-free entry certificate is issued); or

(2) For components manufactured by the Contractor, all costs associated with the manufacture of the component, including transportation costs as described in paragraph (1) of this definition, plus allocable overhead costs, but excluding profit. Cost of components does not include any costs associated with the manufacture of the end product.

Designated country means any of the following countries: Aruba, Austria, Bangladesh, Belgium, Benin, Bhutan, Botswana, Burkina Faso, Burundi, Canada, Cape Verde, Central African Republic, Chad, Comoros, Denmark.

Djibouti, Equatorial Guinea, Finland, France, Gambia, Germany, Greece, Guinea, Guinea-Bissau, Haiti, Hong Kong, Ireland, Israel, Italy, Japan.

Kiribati, Korea, Republic of, Lesotho, Liechtenstein, Luxembourg, Malawi, Maldives, Mali, Mozambique, Nepal, Netherlands, Niger, Norway, Portugal, Rwanda.

Sao Tome and Principe, Sierra Leone, Singapore, Somalia, Spain, Sweden, Switzerland, Tanzania U.R., Togo, Tuvalu, Uganda, United Kingdom, Vanuatu, Western Samoa, Yemen.

Designated country construction material means a construction material that--

(1) Is wholly the growth, product, or manufacture of a designated country; or

(2) In the case of a construction material that consists in whole or in part of materials from another country, has been substantially transformed in a designated country into a new and different construction material distinct from the materials from which it was transformed.

Domestic construction material means--

(1) An unmanufactured construction material mined or produced in the United States; or

(2) A construction material manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind for which nonavailability determinations have been made are treated as domestic.

Foreign construction material means a construction material other than a domestic construction material.

North American Free Trade Agreement country means Canada or Mexico.

North American Free Trade Agreement country construction material means a construction material that--

(1) Is wholly the growth, product, or manufacture of a North American Free Trade Agreement (NAFTA) country; or

(2) In the case of a construction material that consists in whole or in part of materials from another country, has been substantially transformed in a NAFTA country into a new and different construction material distinct from the materials from which it was transformed.

United States means the 50 States, the District of Columbia, and outlying areas.

(b) Construction materials. (1) This clause implements the Buy American Act (41 U.S.C. 10a-10d) and the Balance of Payments Program by providing a preference for domestic construction material. In addition, the Contracting Officer has determined that the Trade Agreements Act and the North American Free Trade Agreement (NAFTA) apply to this acquisition. Therefore, the Buy American Act restrictions are waived for designated country and NAFTA country construction materials.

(2) The Contractor shall use only domestic, designated country, or NAFTA country construction material in performing this contract, except as provided in paragraphs (b)(3) and (b)(4) of this clause.

(3) The requirement in paragraph (b)(2) of this clause does not apply to the construction materials or components listed by the Government as follows: NONE

(4) The Contracting Officer may add other foreign construction material to the list in paragraph (b)(3) of this clause if the Government determines that--

(i) The cost of domestic construction material would be unreasonable. The cost of a particular domestic construction material subject to the restrictions of the Buy American Act is unreasonable when the cost of such material exceeds the cost of foreign material by more than 6 percent;

(ii) The application of the restriction of the Buy American Act to a particular construction material would be impracticable or inconsistent with the public interest; or

(iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities of a satisfactory quality.

(c) Request for determination of inapplicability of the Buy American Act.

(1)(i) Any Contractor request to use foreign construction material in accordance with paragraph (b)(4) of this clause shall include adequate information for Government evaluation of the request, including--

(A) A description of the foreign and domestic construction materials;

(B) Unit of measure;

(C) Quantity;

(D) Price;

(E) Time of delivery or availability;

(F) Location of the construction project;

(G) Name and address of the proposed supplier; and

(H) A detailed justification of the reason for use of foreign construction materials cited in accordance with paragraph (b)(3) of this clause.

(ii) A request based on unreasonable cost shall include a reasonable survey of the market and a completed price comparison table in the format in paragraph (d) of this clause.

(iii) The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued).

(iv) Any Contractor request for a determination submitted after contract award shall explain why the Contractor could not reasonably foresee the need for such determination and could not have requested the determination before contract award. If the Contractor does not submit a satisfactory explanation, the Contracting Officer need not make a determination.

(2) If the Government determines after contract award that an exception to the Buy American Act applies and the Contracting Officer and the Contractor negotiate adequate consideration, the Contracting Officer will modify the contract to allow use of the foreign construction material. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration is not less than the differential established in paragraph (b)(4)(i) of this clause.

(3) Unless the Government determines that an exception to the Buy American Act applies, use of foreign construction material is noncompliant with the Buy American Act.

(d) Data. To permit evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the Contractor shall include the following information and any applicable supporting data based on the survey of suppliers:

Foreign and Domestic Construction Materials Price Comparison

Construction material description	Unit of measure	Quantity	Price (dollars) \1\
Item 1:			
Foreign construction material....	.....	.....	.....
Domestic construction material...	.....	.....	.....
Item 2:			
Foreign construction material....	.....	.....	.....
Domestic construction material...	.....	.....	.....

\1\ Include all delivery costs to the construction site and any applicable duty (whether or not a duty-free entry certificate is issued).

List name, address, telephone number, and contact for suppliers surveyed. Attach copy of response; if oral, attach summary.

Include other applicable supporting information.

(End of clause)

52.225-12 NOTICE OF BUY AMERICAN ACT REQUIREMENT-- CONSTRUCTION MATERIALS UNDER TRADE AGREEMENTS (MAY 2002)

(a) Definitions. Construction material, designated country construction material, domestic construction material, foreign construction material, and NAFTA country construction material, as used in this provision, are defined in the clause of this solicitation entitled "Buy American Act --Construction Materials under Trade Agreements" (Federal Acquisition Regulation (FAR) clause 52.225-11).

(b) Requests for determination of inapplicability. An offeror requesting a determination regarding the inapplicability of the Buy American Act should submit the request to the Contracting Officer in time to allow a determination before submission of offers. The offeror shall include the information and applicable supporting data required by paragraphs (c) and (d) of FAR clause 52.225-11 in the request. If an offeror has not requested a determination regarding the inapplicability of the Buy American Act before submitting its offer, or has not received a response to a previous request, the offeror shall include the information and supporting data in the offer.

(c) Evaluation of offers. (1) The Government will evaluate an offer requesting exception to the requirements of the Buy American Act, based on claimed unreasonable cost of domestic construction materials, by adding to the offered price the appropriate percentage of the cost of such foreign construction material, as specified in paragraph (b)(4)(i) of FAR clause 52.225-11.

(2) If evaluation results in a tie between an offeror that requested the substitution of foreign construction material based on unreasonable cost and an offeror that did not request an exception, the Contracting Officer will award to the offeror that did not request an exception based on unreasonable cost.

(d) Alternate offers. (1) When an offer includes foreign construction material, other than designated country or NAFTA country construction material, that is not listed by the Government in this solicitation in paragraph (b)(3) of FAR clause 52.225-11, the offeror also may submit an alternate offer based on use of equivalent domestic, designated country, or NAFTA country construction material.

(2) If an alternate offer is submitted, the offeror shall submit a separate Standard Form 1442 for the alternate offer, and a separate price comparison table prepared in accordance with paragraphs (c) and (d) of FAR clause 52.225-11 for the offer that is based on the use of any foreign construction material for which the Government has not yet determined an exception applies.

(3) If the Government determines that a particular exception requested in accordance with paragraph (c) of FAR clause 52.225-11 does not apply, the Government will evaluate only those offers based on use of the equivalent domestic, designated country, or NAFTA country construction material, and the offeror shall be required to furnish such domestic, designated country, or NAFTA country construction material. An offer based on use of the foreign construction material for which an exception was requested--

(i) Will be rejected as nonresponsive if this acquisition is conducted by sealed bidding; or

(ii) May be accepted if revised during negotiations.

(End of provision)

52.225-13 RESTRICTIONS ON CERTAIN FOREIGN PURCHASES (JUL 2000)

(a) The Contractor shall not acquire, for use in the performance of this contract, any supplies or services originating from sources within, or that were located in or transported from or through, countries whose products are banned from importation into the United States under regulations of the Office of Foreign Assets Control, Department of the

Treasury. Those countries are Cuba, Iran, Iraq, Libya, North Korea, Sudan, the territory of Afghanistan controlled by the Taliban, and Serbia (excluding the territory of Kosovo).

(b) The Contractor shall not acquire for use in the performance of this contract any supplies or services from entities controlled by the government of Iraq.

(c) The Contractor shall insert this clause, including this paragraph (c), in all subcontracts.

(End of clause)

52.227-1 AUTHORIZATION AND CONSENT (JUL 1995)

(a) The Government authorizes and consents to all use and manufacture, in performing this contract or any subcontract at any tier, of any invention described in and covered by a United States patent (1) embodied in the structure or composition of any article the delivery of which is accepted by the Government under this contract or (2) used in machinery, tools, or methods whose use necessarily results from compliance by the Contractor or a subcontractor with (i) specifications or written provisions forming a part of this contract or (ii) specific written instructions given by the Contracting Officer directing the manner of performance. The entire liability to the Government for infringement of a patent of the United States shall be determined solely by the provisions of the indemnity clause, if any, included in this contract or any subcontract hereunder (including any lower-tier subcontract), and the Government assumes liability for all other infringement to the extent of the authorization and consent hereinabove granted.

(b) The Contractor agrees to include, and require inclusion of, this clause, suitably modified to identify the parties, in all subcontracts at any tier for supplies or services (including construction, architect-engineer services, and materials, supplies, models, samples, and design or testing services expected to exceed the simplified acquisition threshold (however, omission of this clause from any subcontract, including those at or below the simplified acquisition threshold, does not affect this authorization and consent.)

(End of clause)

52.227-4 PATENT INDEMNITY--CONSTRUCTION CONTRACTS (APR 1984)

Except as otherwise provided, the Contractor agrees to indemnify the Government and its officers, agents, and employees against liability, including costs and expenses, for infringement upon any United States patent (except a patent issued upon an application that is now or may hereafter be withheld from issue pursuant to a Secrecy Order under 35 U.S.C. 181) arising out of performing this contract or out of the use or disposal by or for the account of the Government of supplies furnished or work performed under this contract.

(End of clause)

52.228-2 ADDITIONAL BOND SECURITY (OCT 1997)

The Contractor shall promptly furnish additional security required to protect the Government and persons supplying labor or materials under this contract if--

(a) Any surety upon any bond, or issuing financial institution for other security, furnished with this contract becomes unacceptable to the Government.

(b) Any surety fails to furnish reports on its financial condition as required by the Government;

(c) The contract price is increased so that the penal sum of any bond becomes inadequate in the opinion of the Contracting Officer; or

(d) An irrevocable letter of credit (ILC) used as security will expire before the end of the period of required security. If the Contractor does not furnish an acceptable extension or replacement ILC, or other acceptable substitute, at least 30 days before an ILC's scheduled expiration, the Contracting officer has the right to immediately draw on the ILC.

(End of clause)

52.228-11 PLEDGES OF ASSETS (FEB 1992)

(a) Offerors shall obtain from each person acting as an individual surety on a bid guarantee, a performance bond, or a payment bond--

(1) Pledge of assets; and

(2) Standard Form 28, Affidavit of Individual Surety.

(b) Pledges of assets from each person acting as an individual surety shall be in the form of--

(1) Evidence of an escrow account containing cash, certificates of deposit, commercial or Government securities, or other assets described in FAR 28.203-2 (except see 28.203-2(b)(2) with respect to Government securities held in book entry form) and/or;

(2) A recorded lien on real estate. The offeror will be required to provide--

(i) Evidence of title in the form of a certificate of title prepared by a title insurance company approved by the United States Department of Justice. This title evidence must show fee simple title vested in the surety along with any concurrent owners; whether any real estate taxes are due and payable; and any recorded encumbrances against the property, including the lien filed in favor of the Government as required by FAR 28.203-3(d);

(ii) Evidence of the amount due under any encumbrance shown in the evidence of title;

(iii) A copy of the current real estate tax assessment of the property or a current appraisal dated no earlier than 6 months prior to the date of the bond, prepared by a professional appraiser who certifies that the appraisal has been conducted in accordance with the generally accepted appraisal standards as reflected in the Uniform Standards of Professional Appraisal Practice, as promulgated by the Appraisal Foundation.

(End of clause)

52.228-12 PROSPECTIVE SUBCONTRACTOR REQUESTS FOR BONDS. (OCT 1995)

In accordance with Section 806(a)(3) of Pub. L. 102-190, as amended by Sections 2091 and 8105 of Pub. L. 103-355, upon the request of a prospective subcontractor or supplier offering to furnish labor or material for the performance of this contract for which a payment bond has been furnished to the Government pursuant to the Miller Act, the Contractor shall promptly provide a copy of such payment bond to the requester.

(End of clause)

52.228-15 PERFORMANCE AND PAYMENT BONDS--CONSTRUCTION (JUL 2000)-

(a) Definitions. As used in this clause--

Original contract price means the award price of the contract; or, for requirements contracts, the price payable for the estimated total quantity; or, for indefinite-quantity contracts, the price payable for the specified minimum quantity. Original contract price does not include the price of any options, except those options exercised at the time of contract award.

(b) Amount of required bonds. Unless the resulting contract price is $100,000 or less, the successful offeror shall furnish performance and payment bonds to the Contracting Officer as follows:

(1) Performance bonds (Standard Form 25). The penal amount of performance bonds at the time of contract award shall be 100 percent of the original contract price.

(2) Payment Bonds (Standard Form 25-A). The penal amount of payment bonds at the time of contract award shall be 100 percent of the original contract price.

(3) Additional bond protection. (i) The Government may require additional performance and payment bond protection if the contract price is increased. The increase in protection generally will equal 100 percent of the increase in contract price.

(ii) The Government may secure the additional protection by directing the Contractor to increase the penal amount of the existing bond or to obtain an additional bond.

(c) Furnishing executed bonds. The Contractor shall furnish all executed bonds, including any necessary reinsurance agreements, to the Contracting Officer, within the time period specified in the Bid Guarantee provision of the solicitation, or otherwise specified by the Contracting Officer, but in any event, before starting work.

(d) Surety or other security for bonds. The bonds shall be in the form of firm commitment, supported by corporate sureties whose names appear on the list contained in Treasury Department Circular 570, individual sureties, or by other acceptable security such as postal money order, certified check, cashier's check, irrevocable letter of credit, or, in accordance with Treasury Department regulations, certain bonds or notes of the United States. Treasury Circular 570 is published in the Federal Register or may be obtained from the U.S. Department of Treasury, Financial Management Service, Surety Bond Branch, 401 14th Street, NW, 2nd Floor, West Wing, Washington, DC 20227.

(e) Notice of subcontractor waiver of protection (40 U.S.C. 270b(c). Any waiver of the right to sue on the payment bond is void unless it is in writing, signed by the person whose right is waived, and executed after such person has first furnished labor or material for use in the performance of the contract.

(End of clause)

52.229-3 FEDERAL, STATE, AND LOCAL TAXES (JAN 1991)

(a) "Contract date," as used in this clause, means the date set for bid opening or, if this is a negotiated contract or a modification, the effective date of this contract or modification.

"All applicable Federal, State, and local taxes and duties," as used in this clause, means all taxes and duties, in effect on the contract date, that the taxing authority is imposing and collecting on the transactions or property covered by this contract.

"After-imposed Federal tax," as used in this clause, means any new or increased Federal excise tax or duty, or tax that was exempted or excluded on the contract date but whose exemption was later revoked or reduced during the contract period, on the transactions or property covered by this contract that the Contractor is required to pay or bear as the result of legislative, judicial, or administrative action taking effect after the contract date. It does not include social security tax or other employment taxes.
"After-relieved Federal tax," as used in this clause, means any amount of Federal excise tax or duty, except social security or other employment taxes, that would otherwise have been payable on the transactions or property covered by this contract, but which the Contractor is not required to pay or bear, or for which the Contractor obtains a refund or drawback, as the result of legislative, judicial, or administrative action taking effect after the contract date.

(b) The contract price includes all applicable Federal, State, and local taxes and duties.

(c) The contract price shall be increased by the amount of any after-imposed Federal tax, provided the Contractor warrants in writing that no amount for such newly imposed Federal excise tax or duty or rate increase was included in the contract price, as a contingency reserve or otherwise.

(d) The contract price shall be decreased by the amount of any after-relieved Federal tax.

(e) The contract price shall be decreased by the amount of any Federal excise tax or duty, except social security or other employment taxes, that the Contractor is required to pay or bear, or does not obtain a refund of, through the Contractor's fault, negligence, or failure to follow instructions of the Contracting Officer.

(f) No adjustment shall be made in the contract price under this clause unless the amount of the adjustment exceeds $250.

(g) The Contractor shall promptly notify the Contracting Officer of all matters relating to any Federal excise tax or duty that reasonably may be expected to result in either an increase or decrease in the contract price and shall take appropriate action as the Contracting Officer directs.

(h) The Government shall, without liability, furnish evidence appropriate to establish exemption from any Federal, State, or local tax when the Contractor requests such evidence and a reasonable basis exists to sustain the exemption.

(End of clause)

52.229-5 TAXES--CONTRACTS PERFORMED IN U.S. POSSESSIONS OR PUERTO RICO (APR 1984)

The term "local taxes," as used in the Federal, State, and local taxes clause of this contract, includes taxes imposed by a possession of the United States or by Puerto Rico.

(End of clause)

52.232-5 PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS (MAY 1997)

(a) Payment of price. The Government shall pay the Contractor the contract price as provided in this contract.

(b) Progress payments. The Government shall make progress payments monthly as the work proceeds, or at more frequent intervals as determined by the Contracting Officer, on estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer.

(1) The Contractor's request for progress payments shall include the following substantiation:

(i) An itemization of the amounts requested, related to the various elements of work required by the contract covered by the payment requested.

(ii) A listing of the amount included for work performed by each subcontractor under the contract.

(iii) A listing of the total amount of each subcontract under the contract.

(iv) A listing of the amounts previously paid to each such subcontractor under the contract.

(v) Additional supporting data in a form and detail required by the Contracting Officer.

(2) In the preparation of estimates, the Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the site also may be taken into consideration if--

(i) Consideration is specifically authorized by this contract; and

(ii) The Contractor furnishes satisfactory evidence that it has acquired title to such material and that the material will be used to perform this contract.

(c) Contractor certification. Along with each request for progress payments, the Contractor shall furnish the following certification, or payment shall not be made: (However, if the Contractor elects to delete paragraph (c)(4) from the certification, the certification is still acceptable.)

I hereby certify, to the best of my knowledge and belief, that--

(1) The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the contract;

(2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements and the requirements of chapter 39 of Title 31, United States Code;

(3) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract; and

(4) This certification is not to be construed as final acceptance of a subcontractor's performance.

_____

(Name)

_____

(Title)

_____

(Date)

(d) Refund of unearned amounts. If the Contractor, after making a certified request for progress payments, discovers that a portion or all of such request constitutes a payment for performance by the Contractor that fails to conform to

the specifications, terms, and conditions of this contract (hereinafter referred to as the "unearned amount"), the Contractor shall--

(1) Notify the Contracting Officer of such performance deficiency; and

(2) Be obligated to pay the Government an amount (computed by the Contracting Officer in the manner provided in paragraph (j) of this clause) equal to interest on the unearned amount from the 8th day after the date of receipt of the unearned amount until--

(i) The date the Contractor notifies the Contracting Officer that the performance deficiency has been corrected; or

(ii) The date the Contractor reduces the amount of any subsequent certified request for progress payments by an amount equal to the unearned amount.

(e) Retainage. If the Contracting Officer finds that satisfactory progress was achieved during any period for which a progress payment is to be made, the Contracting Officer shall authorize payment to be made in full. However, if satisfactory progress has not been made, the Contracting Officer may retain a maximum of 10 percent of the amount of the payment until satisfactory progress is achieved. When the work is substantially complete, the Contracting Officer may retain from previously withheld funds and future progress payments that amount the Contracting Officer considers adequate for protection of the Government and shall release to the Contractor all the remaining withheld funds. Also, on completion and acceptance of each separate building, public work, or other division of the contract, for which the price is stated separately in the contract, payment shall be made for the completed work without retention of a percentage.

(f) Title, liability, and reservation of rights. All material and work covered by progress payments made shall, at the time of payment, become the sole property of the Government, but this shall not be construed as--

(1) Relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or

(2) Waiving the right of the Government to require the fulfillment of all of the terms of the contract.

(g) Reimbursement for bond premiums. In making these progress payments, the Government shall, upon request, reimburse the Contractor for the amount of premiums paid for performance and payment bonds (including coinsurance and reinsurance agreements, when applicable) after the Contractor has furnished evidence of full payment to the surety. The retainage provisions in paragraph (e) of this clause shall not apply to that portion of progress payments attributable to bond premiums.

(h) Final payment. The Government shall pay the amount due the Contractor under this contract after--

(1) Completion and acceptance of all work;

(2) Presentation of a properly executed voucher; and

(3) Presentation of release of all claims against
the Government arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned under the Assignment of Claims Act of 1940 (31 U.S.C. 3727 and 41 U.S.C. 15).

(i) Limitation because of undefinitized work. Notwithstanding any provision of this contract, progress payments shall not exceed 80 percent on work accomplished on undefinitized contract actions. A "contract action" is any action resulting in a contract, as defined in FAR Subpart 2.1, including contract modifications for additional supplies or

services, but not including contract modifications that are within the scope and under the terms of the contract, such as contract modifications issued pursuant to the Changes clause, or funding and other administrative changes.

(j) Interest computation on unearned amounts. In accordance with 31 U.S.C. 3903(c)(1), the amount payable under subparagraph (d)(2) of this clause shall be--

(1) Computed at the rate of average bond equivalent rates of 91-day Treasury bills auctioned at the most recent auction of such bills prior to the date the Contractor receives the unearned amount; and

(2) Deducted from the next available payment to the Contractor.

(End of clause)

52.232-16 PROGRESS PAYMENTS (FEB 2002)

The Government will make progress payments to the Contractor when requested as work progresses, but not more frequently than monthly, in amounts of $2,500 or more approved by the Contracting Officer, under the following conditions:

(a) Computation of amounts. (1) Unless the Contractor requests a smaller amount, the Government will compute each progress payment as 80 percent of the Contractor's total costs incurred under this contract whether or not actually paid, plus financing payments to subcontractors (see paragraph (j) of this clause), less the sum of all previous progress payments made by the Government under this contract. The Contracting Officer will consider cost of money that would be allowable under FAR 31.205-10 as an incurred cost for progress payment purposes.

(2) The amount of financing and other payments for supplies and services purchased directly for the contract are limited to the amounts that have been paid by cash, check, or other forms of payment, or that will be paid to subcontractors--

(i) In accordance with the terms and conditions of a subcontract or invoice; and

(ii) Ordinarily prior to the submission of the Contractor's next payment request to the Government.

(3) The Government will exclude accrued costs of Contractor contributions under employee pension plans until actually paid unless--

(i) The Contractor's practice is to make contributions to the retirement fund quarterly or more frequently; and

(ii) The contribution does not remain unpaid 30 days after the end of the applicable quarter or shorter payment period (any contribution remaining unpaid shall be excluded from the Contractor's total costs for progress payments until paid).

(4) The Contractor shall not include the following in total costs for progress payment purposes in subparagraph (a)(1)(i) above:

(i) Costs that are not reasonable, allocable to this contract, and consistent with sound and generally accepted accounting principles and practices.

(ii) Costs incurred by subcontractors or suppliers.

(iii) Costs ordinarily capitalized and subject to depreciation or amortization except for the properly depreciated or amortized portion of such costs.

(iv) Payments made or amounts payable to subcontractors or suppliers, except for --

(A) Completed work, including partial deliveries, to which the Contractor has acquired title; and

(B) Work under cost-reimbursement or time-and-material subcontracts to which the Contractor has acquired title.

(5) The Contractor shall not include the following in total costs for progress payment purposes in paragraph (a)(1) of this clause:

(i) the progress payments made against incomplete work (including allowable unliquidated progress payments to subcontractors) nor

(ii) the value, for progress payment purposes, of the incomplete work. Incomplete work shall be considered to be the supplies and services required by this contract, for which delivery and invoicing by the Contractor and acceptance by the Government are incomplete.

(6) The total amount of progress payments shall not exceed 80 percent of the total contract price.

(7) If a progress payment or the unliquidated progress payments exceed the amounts permitted by subparagraphs (a)(4) or (a)(5) above, the Contractor shall repay the amount of such excess to the Government on demand.

(8) Notwithstanding any other terms of the contract, the Contractor agrees not to request progress payments in dollar amounts of less than $2,500. The Contracting Officer may make exceptions.

(b) Liquidation. Except as provided in the Termination for Convenience of the Government clause, all progress payments shall be liquidated by deducting from any payment under this contract, other than advance or progress payments, the unliquidated progress payments, or 80 percent of the amount invoiced, whichever is less. The Contractor shall repay to the Government any amounts required by a retroactive price reduction, after computing liquidations and payments on past invoices at the reduced prices and adjusting the unliquidated progress payments accordingly. The Government reserves the right to unilaterally change from the ordinary liquidation rate to an alternate rate when deemed appropriate for proper contract financing.

(c) Reduction or suspension. The Contracting Officer may reduce or suspend progress payments, increase the rate of liquidation, or take a combination of these actions, after finding on substantial evidence any of the following conditions:

(1) The Contractor failed to comply with any material requirement of this contract (which includes paragraphs (f) and (g) below).

(2) Performance of this contract is endangered by the Contractor's (i) failure to make progress or (ii) unsatisfactory financial condition.

(3) Inventory allocated to this contract substantially exceeds reasonable requirements.

(4) The Contractor is delinquent in payment of the costs of performing this contract in the ordinary course of business.

(5) The unliquidated progress payments exceed the fair value of the work accomplished on the undelivered portion of this contract.

(6) The Contractor is realizing less profit than that reflected in the establishment of any alternate liquidation rate in paragraph (b) above, and that rate is less than the progress payment rate stated in subparagraph (a)(1) above.

(d) Title. (1) Title to the property described in this paragraph (d) shall vest in the Government. Vestiture shall be immediately upon the date of this contract, for property acquired or produced before that date. Otherwise, vestiture shall occur when the property is or should have been allocable or properly chargeable to this contract.

(2) "Property," as used in this clause, includes all of the below-described items acquired or produced by the Contractor that are or should be allocable or properly chargeable to this contract under sound and generally accepted accounting principles and practices.

(i) Parts, materials, inventories, and work in process;

(ii) Special tooling and special test equipment to which the Government is to acquire title under any other clause of this contract;

(iii) Nondurable (i.e., noncapital) tools, jigs, dies, fixtures, molds, patterns, taps, gauges, test equipment, and other similar manufacturing aids, title to which would not be obtained as special tooling under subparagraph (ii) above; and

(iv) Drawings and technical data, to the extent the Contractor or subcontractors are required to deliver them to the Government by other clauses of this contract.

(3) Although title to property is in the Government under this clause, other applicable clauses of this contract; e.g., the termination or special tooling clauses, shall determine the handling and disposition of the property.

(4) The Contractor may sell any scrap resulting from production under this contract without requesting the Contracting Officer's approval, but the proceeds shall be credited against the costs of performance.

(5) To acquire for its own use or dispose of property to which title is vested in the Government under this clause, the Contractor must obtain the Contracting Officer's advance approval of the action and the terms. The Contractor shall (i) exclude the allocable costs of the property from the costs of contract performance, and (ii) repay to the Government any amount of unliquidated progress payments allocable to the property. Repayment may be by cash or credit memorandum.

(6) When the Contractor completes all of the obligations under this contract, including liquidation of all progress payments, title shall vest in the Contractor for all property (or the proceeds thereof) not--

(i) Delivered to, and accepted by, the Government under this contract; or

(ii) Incorporated in supplies delivered to, and accepted by, the Government under this contract and to which title is vested in the Government under this clause.

(7) The terms of this contract concerning liability for Government-furnished property shall not apply to property to which the Government acquired title solely under this clause.

(e) Risk of loss. Before delivery to and acceptance by the Government, the Contractor shall bear the risk of loss for property, the title to which vests in the Government under this clause, except to the extent the Government expressly assumes the risk. The Contractor shall repay the Government an amount equal to the unliquidated progress payments that are based on costs allocable to property that is damaged, lost, stolen, or destroyed.

(f) Control of costs and property. The Contractor shall maintain an accounting system and controls adequate for the proper administration of this clause.

(g) Reports and access to records. The Contractor shall promptly furnish reports, certificates, financial statements, and other pertinent information reasonably requested by the Contracting Officer for the administration of this clause.

Also, the Contractor shall give the Government reasonable opportunity to examine and verify the Contractor's books, records, and accounts.

(h) Special terms regarding default. If this contract is terminated under the Default clause, (i) the Contractor shall, on demand, repay to the Government the amount of unliquidated progress payments and (ii) title shall vest in the Contractor, on full liquidation of progress payments, for all property for which the Government elects not to require delivery under the Default clause. The Government shall be liable for no payment except as provided by the Default clause.

(i) Reservations of rights. (1) No payment or vesting of title under this clause shall (i) excuse the Contractor from performance of obligations under this contract or (ii) constitute a waiver of any of the rights or remedies of the parties under the contract.

(2) The Government's rights and remedies under this clause (i) shall not be exclusive but rather shall be in addition to any other rights and remedies provided by law or this contract and (ii) shall not be affected by delayed, partial, or omitted exercise of any right, remedy, power, or privilege, nor shall such exercise or any single exercise preclude or impair any further exercise under this clause or the exercise of any other right, power, or privilege of the Government.

(j) Financing payments to subcontractors. The financing payments to subcontractors mentioned in paragraphs (a)(1) and (a)(2) of this clause shall be all financing payments to subcontractors or divisions, if the following conditions are met:

(1) The amounts included are limited to--

(i) The unliquidated remainder of financing payments made; plus

(ii) Any unpaid subcontractor requests for financing payments.

(2) The subcontract or interdivisional order is expected to involve a minimum of approximately 6 months between the beginning of work and the first delivery; or, if the subcontractor is a small business concern, 4 months.

(3) If the financing payments are in the form of progress payments, the terms of the subcontract or interdivisional order concerning progress payments--

(i) Are substantially similar to the terms of this clause for any subcontractor that is a large business concern, or this clause with its Alternate I for any subcontractor that is a small business concern;

(ii) Are at least as favorable to the Government as the terms of this clause;

(iii) Are not more favorable to the subcontractor or division than the terms of this clause are to the Contractor;

(iv) Are in conformance with the requirements of FAR 32.504(e); and

(v) Subordinate all subcontractor rights concerning property to which the Government has title under the subcontract to the Government's right to require delivery of the property to the Government if--

(A) The Contractor defaults; or

(B) The subcontractor becomes bankrupt or insolvent.

(4) If the financing payments are in the form of performance-based payments, the terms of the subcontract or interdivisional order concerning payments--

(i) Are substantially similar to the Performance-Based Payments clause at FAR 52.232-32 and meet the criteria for, and definition of, performance-based payments in FAR Part 32;

(ii) Are in conformance with the requirements of FAR 32.504(f); and

(iii) Subordinate all subcontractor rights concerning property to which the Government has title under the subcontract to the Government's right to require delivery of the property to the Government if--

(A) The Contractor defaults; or

(B) The subcontractor becomes bankrupt or insolvent.

(5) If the financing payments are in the form of commercial item financing payments, the terms of the subcontract or interdivisional order concerning payments--

(i) Are constructed in accordance with FAR 32.206(c) and included in a subcontract for a commercial item purchase that meets the definition and standards for acquisition of commercial items in FAR Parts 2 and 12;

(ii) Are in conformance with the requirements of FAR 32.504(g); and

(iii) Subordinate all subcontractor rights concerning property to which the Government has title under the subcontract to the Government's right to require delivery of the property to the Government if--

(A) The Contractor defaults; or

(B) The subcontractor becomes bankrupt or insolvent.

(6) If financing is in the form of progress payments, the progress payment rate in the subcontract is the customary rate used by the contracting agency, depending on whether the subcontractor is or is not a small business concern.

(7) Concerning any proceeds received by the Government for property to which title has vested in the Government under the subcontract terms, the parties agree that the proceeds shall be applied to reducing any unliquidated financing payments by the Government to the Contractor under this contract.

(8) If no unliquidated financing payments to the Contractor remain, but there are unliquidated financing payments that the Contractor has made to any subcontractor, the Contractor shall be subrogated to all the rights the Government obtained through the terms required by this clause to be in any subcontract, as if all such rights had been assigned and transferred to the Contractor.

(9) To facilitate small business participation in subcontracting under this contract, the Contractor shall provide financing payments to small business concerns, in conformity with the standards for customary contract financing payments stated in FAR 32.113. The Contractor shall not consider the need for such financing payments as a handicap or adverse factor in the award of subcontracts.

(k) Limitations on Undefinitized Contract Actions. Notwithstanding any other progress payment provisions in this contract, progress payments may not exceed 80 percent of costs incurred on work accomplished under undefinitized contract actions. A "contract action" is any action resulting in a contract, as defined in Subpart 2.1, including contract modifications for additional supplies or services, but not including contract modifications that are within the scope and under the terms of the contract, such as contract modifications issued pursuant to the Changes clause, or funding and other administrative changes. This limitation shall apply to the costs incurred, as computed in accordance with paragraph (a) of this clause, and shall remain in effect until the contract action is definitized. Costs incurred which are subject to this limitation shall be segregated on Contractor progress payment requests and invoices from those costs eligible for higher progress payment rates. For purposes of progress payment liquidation,

as described in paragraph (b) of this clause, progress payments for undefinitized contract actions shall be liquidated at 80 percent of the amount invoiced for work performed under the undefinitized contract action as long as the contract action remains undefinitized. The amount of unliquidated progress payments for undefinitized contract actions shall not exceed 80 percent of the maximum liability of the Government under the undefinitized contract action or such lower limit specified elsewhere in the contract. Separate limits may be specified for separate actions.

(l) Due date. The designated payment office will make progress payments on the 14th day after the designated billing office receives a proper progress payment request. In the event that the Government requires an audit or other review of a specific progress payment request to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the specified due date. Progress payments are considered contract financing and are not subject to the interest penalty provisions of the Prompt Payment Act.

(End of clause)

52.232-17 INTEREST (JUNE 1996)

(a) Except as otherwise provided in this contract under a Price Reduction for Defective Cost or Pricing Data clause or a Cost Accounting Standards clause, all amounts that become payable by the Contractor to the Government under this contract (net of any applicable tax credit under the Internal Revenue Code (26 U.S.C. 1481)) shall bear simple interest from the date due until paid unless paid within 30 days of becoming due. The interest rate shall be the interest rate established by the Secretary of the Treasury as provided in Section 12 of the Contract Disputes Act of 1978 (Public Law 95-563), which is applicable to the period in which the amount becomes due, as provided in paragraph (b) of this clause, and then at the rate applicable for each six-month period as fixed by the Secretary until the amount is paid. reproduce, prepare derivative works, distribute copies to the public, and (b) Amounts shall be due at the earliest of the following dates:

(1) The date fixed under this contract.

(2) The date of the first written demand for payment consistent with this contract, including any demand resulting from a default termination.

(3) The date the Government transmits to the Contractor a proposed supplemental agreement to confirm completed negotiations establishing the amount of debt.

(4) If this contract provides for revision of prices, the date of written notice to the Contractor stating the amount of refund payable in connection with a pricing proposal or a negotiated pricing agreement not confirmed by contract modification.

(c) The interest charge made under this clause may be reduced under the procedures prescribed in 32.614-2 of the Federal Acquisition Regulation in effect on the date of this contract.

(End of clause)

52.232-23 ASSIGNMENT OF CLAIMS (JAN 1986) - ALTERNATE I (APR 1984)

(a) The Contractor, under the Assignment of Claims Act, as amended, 31 U.S.C. 3727, 41 U.S.C. 15 (hereafter referred to as "the Act"), may assign its rights to be paid amounts due or to become due as a result of the performance of this contract to a bank, trust company, or other financing institution, including any Federal lending agency. The assignee under such an assignment may thereafter further assign or reassign its right under the original assignment to any type of financing institution described in the preceding sentence. Unless otherwise stated in this contract, payments

to an assignee of any amounts due or to become due under this contract shall not, to the extent specified in the Act, be subject to reduction or setoff.

(b) Any assignment or reassignment authorized under the Act and this clause shall cover all unpaid amounts payable under this contract, and shall not be made to more than one party, except that an assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in the financing of this contract.

(c) The Contractor shall not furnish or disclose to any assignee under this contract any classified document (including this contract) or information related to work under this contract until the Contracting Officer authorizes such action in writing.

(End of clause)

52.232-27 PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS (FEB 2002)

Notwithstanding any other payment terms in this contract, the Government will make invoice payments under the terms and conditions specified in this clause. The Government considers payment as being made on the day a check is dated or the date of an electronic funds transfer. Definitions of pertinent terms are set forth in sections 2.101, 32.001, and 32.902 of the Federal Acquisition Regulation. All days referred to in this clause are calendar days, unless otherwise specified. (However, see paragraph (a)(3) concerning payments due on Saturdays, Sundays, and legal holidays.)

(a) Invoice payments--(1) Types of invoice payments. For purposes of this clause, there are several types of invoice payments that may occur under this contract, as follows:

(i) Progress payments, if provided for elsewhere in this contract, based on Contracting Officer approval of the estimated amount and value of work or services performed, including payments for reaching milestones in any project.

(A) The due date for making such payments is 14 days after the designated billing office receives a proper payment request. If the designated billing office fails to annotate the payment request with the actual date of receipt at the time of receipt, the payment due date is the 14th day after the date of the Contractor's payment request, provided the designated billing office receives a proper payment request and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(B) The due date for payment of any amounts retained by the Contracting Officer in accordance with the clause at 52.232-5, Payments Under Fixed-Price Construction Contracts, is as specified in the contract or, if not specified, 30 days after approval by the Contracting Officer for release to the Contractor.

(ii) Final payments based on completion and acceptance of all work and presentation of release of all claims against the Government arising by virtue of the contract, and payments for partial deliveries that have been accepted by the Government (e.g., each separate building, public work, or other division of the contract for which the price is stated separately in the contract).

(A) The due date for making such payments is the later of the following two events:

(1) The 30th day after the designated billing office receives a proper invoice from the Contractor.

(2) The 30th day after Government acceptance of the work or services completed by the Contractor. For a final invoice when the payment amount is subject to contract settlement actions (e.g., release of claims), acceptance is deemed to occur on the effective date of the contract settlement.

(B) If the designated billing office fails to annotate the invoice with the date of actual receipt at the time of receipt, the invoice payment due date is the 30th day after the date of the Contractor's invoice, provided the designated billing office receives a proper invoice and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(2) Contractor's invoice. The Contractor shall prepare and submit invoices to the designated billing office specified in the contract. A proper invoice must include the items listed in paragraphs (a)(2)(i) through (a)(2)(xi) of this clause. If the invoice does not comply with these requirements, the designated billing office must return it within 7 days after receipt, with the reasons why it is not a proper invoice. When computing any interest penalty owed the Contractor, the Government will take into account if the Government notifies the Contractor of an improper invoice in an untimely manner.

(i) Name and address of the Contractor.

(ii) Invoice date and invoice number. (The Contractor should date invoices as close as possible to the date of mailing or transmission.)

(iii) Contract number or other authorization for work or services performed (including order number and contract line item number).

(iv) Description of work or services performed.

(v) Delivery and payment terms (e.g., discount for prompt payment terms).

(vi) Name and address of Contractor official to whom payment is to be sent (must be the same as that in the contract or in a proper notice of assignment).

(vii) Name (where practicable), title, phone number, and mailing address of person to notify in the event of a defective invoice.

(viii) For payments described in paragraph (a)(1)(i) of this clause, substantiation of the amounts requested and certification in accordance with the requirements of the clause at 52.232-5, Payments Under Fixed-Price Construction Contracts.

(ix) Taxpayer Identification Number (TIN). The Contractor shall include its TIN on the invoice only if required elsewhere in this contract.

(x) Electronic funds transfer (EFT) banking information.

(A) The Contractor shall include EFT banking information on the invoice only if required elsewhere in this contract.

(B) If EFT banking information is not required to be on the invoice, in order for the invoice to be a proper invoice, the Contractor shall have submitted correct EFT banking information in accordance with the applicable solicitation provision (e.g., 52.232-38, Submission of Electronic Funds Transfer Information with Offer), contract clause (e.g., 52.232-33, Payment by Electronic Funds Transfer--Central Contractor Registration, or 52.232-34, Payment by Electronic Funds Transfer--Other Than Central Contractor Registration), or applicable agency procedures.

(C) EFT banking information is not required if the Government waived the requirement to pay by EFT.

(xi) Any other information or documentation required by the contract.

(3) Interest penalty. The designated payment office will pay an interest penalty automatically, without request from the Contractor, if payment is not made by the due date and the conditions listed in paragraphs (a)(3)(i) through

(a)(3)(iii) of this clause are met, if applicable. However, when the due date falls on a Saturday, Sunday, or legal holiday, the designated payment office may make payment on the following working day without incurring a late payment interest penalty.

(i) The designated billing office received a proper invoice.

(ii) The Government processed a receiving report or other Government documentation authorizing payment and there was no disagreement over quantity, quality, Contractor compliance with any contract term or condition, or requested progress payment amount.

(iii) In the case of a final invoice for any balance of funds due the Contractor for work or services performed, the amount was not subject to further contract settlement actions between the Government and the Contractor.

(4) Computing penalty amount. The Government will compute the interest penalty in accordance with the Office of Management and Budget prompt payment regulations at 5 CFR part 1315.

(i) For the sole purpose of computing an interest penalty that might be due the Contractor for payments described in paragraph (a)(1)(ii) of this clause, Government acceptance or approval is deemed to occur constructively on the 7th day after the Contractor has completed the work or services in accordance with the terms and conditions of the contract. If actual acceptance or approval occurs within the constructive acceptance or approval period, the Government will base the determination of an interest penalty on the actual date of acceptance or approval. Constructive acceptance or constructive approval requirements do not apply if there is a disagreement over quantity, quality, or Contractor compliance with a contract provision. These requirements also do not compel Government officials to accept work or services, approve Contractor estimates, perform contract administration functions, or make payment prior to fulfilling their responsibilities.

(ii) The prompt payment regulations at 5 CFR 1315.10(c) do not require the Government to pay interest penalties if payment delays are due to disagreement between the Government and the Contractor over the payment amount or other issues involving contract compliance, or on amounts temporarily withheld or retained in accordance with the terms of the contract. The Government and the Contractor shall resolve claims involving disputes, and any interest that may be payable in accordance with the clause at FAR 52.233-1, Disputes.

(5) Discounts for prompt payment. The designated payment office will pay an interest penalty automatically, without request from the Contractor, if the Government takes a discount for prompt payment improperly. The Government will calculate the interest penalty in accordance with the prompt payment regulations at 5 CFR part 1315.

(6) Additional interest penalty. (i) The designated payment office will pay a penalty amount, calculated in accordance with the prompt payment regulations at 5 CFR part 1315 in addition to the interest penalty amount only if--

(A) The Government owes an interest penalty of $1 or more;

(B) The designated payment office does not pay the interest penalty within 10 days after the date the invoice amount is paid; and

(C) The Contractor makes a written demand to the designated payment office for additional penalty payment, in accordance with paragraph (a)(6)(ii) of this clause, postmarked not later than 40 days after the date the invoice amount is paid.

(ii)(A) The Contractor shall support written demands for additional penalty payments with the following data. The Government will not request any additional data. The Contractor shall--

(1) Specifically assert that late payment interest is due under a specific invoice, and request payment of all overdue late payment interest penalty and such additional penalty as may be required;

(2) Attach a copy of the invoice on which the unpaid late payment interest was due; and

(3) State that payment of the principal has been received, including the date of receipt.

(B) If there is no postmark or the postmark is illegible--

(1) The designated payment office that receives the demand will annotate it with the date of receipt provided the demand is received on or before the 40th day after payment was made; or

(2) If the designated payment office fails to make the required annotation, the Government will determine the demand's validity based on the date the Contractor has placed on the demand, provided such date is no later than the 40th day after payment was made.

(b) Contract financing payments. If this contract provides for contract financing, the Government will make contract financing payments in accordance with the applicable contract financing clause.

(c) Subcontract clause requirements. The Contractor shall include in each subcontract for property or services (including a material supplier) for the purpose of performing this contract the following:

(1) Prompt payment for subcontractors. A payment clause that obligates the Contractor to pay the subcontractor for satisfactory performance under its subcontract not later than 7 days from receipt of payment out of such amounts as are paid to the Contractor under this contract.

(2) Interest for subcontractors. An interest penalty clause that obligates the Contractor to pay to the subcontractor an interest penalty for each payment not made in accordance with the payment clause--

(i) For the period beginning on the day after the required payment date and ending on the date on which payment of the amount due is made; and

(ii) Computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

(3) Subcontractor clause flowdown. A clause requiring each subcontractor to use:

(i) Include a payment clause and an interest penalty clause conforming to the standards set forth in paragraphs (c)(1) and (c)(2) of this clause in each of its subcontracts; and

(ii) Require each of its subcontractors to include such clauses in their subcontracts with each lower-tier subcontractor or supplier.

(d) Subcontract clause interpretation. The clauses required by paragraph (c) of this clause shall not be construed to impair the right of the Contractor or a subcontractor at any tier to negotiate, and to include in their subcontract, provisions that--

(1) Retainage permitted. Permit the Contractor or a subcontractor to retain (without cause) a specified percentage of each progress payment otherwise due to a subcontractor for satisfactory performance under the subcontract without incurring any obligation to pay a late payment interest penalty, in accordance with terms and conditions agreed to by the parties to the subcontract, giving such recognition as the parties deem appropriate to the ability of a subcontractor to furnish a performance bond and a payment bond;

(2) Withholding permitted. Permit the Contractor or subcontractor to make a determination that part or all of the subcontractor's request for payment may be withheld in accordance with the subcontract agreement; and

(3) Withholding requirements. Permit such withholding without incurring any obligation to pay a late payment penalty if--

(i) A notice conforming to the standards of paragraph (g) of this clause previously has been furnished to the subcontractor; and

(ii) The Contractor furnishes to the Contracting Officer a copy of any notice issued by a Contractor pursuant to paragraph (d)(3)(i) of this clause.

(e) Subcontractor withholding procedures. If a Contractor, after making a request for payment to the Government but before making a payment to a subcontractor for the subcontractor's performance covered by the payment request, discovers that all or a portion of the payment otherwise due such subcontractor is subject to withholding from the subcontractor in accordance with the subcontract agreement, then the Contractor shall--

(1) Subcontractor notice. Furnish to the subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon ascertaining the cause giving rise to a withholding, but prior to the due date for subcontractor payment;

(2) Contracting Officer notice. Furnish to the Contracting Officer, as soon as practicable, a copy of the notice furnished to the subcontractor pursuant to paragraph (e)(1) of this clause;

(3) Subcontractor progress payment reduction. Reduce the subcontractor's progress payment by an amount not to exceed the amount specified in the notice of withholding furnished under paragraph (e)(1) of this clause;

(4) Subsequent subcontractor payment. Pay the subcontractor as soon as practicable after the correction of the identified subcontract performance deficiency, and--

(i) Make such payment within--

(A) Seven days after correction of the identified subcontract performance deficiency (unless the funds therefor must be recovered from the Government because of a reduction under paragraph
(e)(5)(i)) of this clause; or

(B) Seven days after the Contractor recovers such funds from the Government; or

(ii) Incur an obligation to pay a late payment interest penalty computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty;

(5) Notice to Contracting Officer. Notify the Contracting Officer upon--

(i) Reduction of the amount of any subsequent certified application for payment; or

(ii) Payment to the subcontractor of any withheld amounts of a progress payment, specifying--

(A) The amounts withheld under paragraph (e)(1) of this clause; and

(B) The dates that such withholding began and ended; and

(6) Interest to Government. Be obligated to pay to the Government an amount equal to interest on the withheld payments (computed in the manner provided in 31 U.S.C. 3903(c)(1)), from the 8th day after receipt of the withheld amounts from the Government until--

(i) The day the identified subcontractor performance deficiency is corrected; or

(ii) The date that any subsequent payment is reduced under paragraph (e)(5)(i) of this clause.

(f) Third-party deficiency reports--(1) Withholding from subcontractor. If a Contractor, after making payment to a first-tier subcontractor, receives from a supplier or subcontractor of the first-tier subcontractor (hereafter referred to as a "second-tier subcontractor") a written notice in accordance with section 2 of the Act of August 24, 1935 (40 U.S.C. 270b, Miller Act), asserting a deficiency in such first-tier subcontractor's performance under the contract for which the Contractor may be ultimately liable, and the Contractor determines that all or a portion of future payments otherwise due such first-tier subcontractor is subject to withholding in accordance with the subcontract agreement, the Contractor may, without incurring an obligation to pay an interest penalty under paragraph (e)(6) of this clause--

(i) Furnish to the first-tier subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon making such determination; and

(ii) Withhold from the first-tier subcontractor's next available progress payment or payments an amount not to exceed the amount specified in the notice of withholding furnished under paragraph (f)(1)(i) of this clause.

(2) Subsequent payment or interest charge. As soon as practicable, but not later than 7 days after receipt of satisfactory written notification that the identified subcontract performance deficiency has been corrected, the Contractor shall--

(i) Pay the amount withheld under paragraph (f)(1)(ii) of this clause to such first-tier subcontractor; or

(ii) Incur an obligation to pay a late payment interest penalty to such first-tier subcontractor computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts DisputesAct of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

(g) Written notice of subcontractor withholding. The Contractor shall issue a written notice of any withholding to a subcontractor (with a copy furnished to the Contracting Officer), specifying--

(1) The amount to be withheld;

(2) The specific causes for the withholding under the terms of the subcontract; and

(3) The remedial actions to be taken by the subcontractor in order to receive payment of the amounts withheld.

(h) Subcontractor payment entitlement. The Contractor may not request payment from the Government of any amount withheld or retained in accordance with paragraph (d) of this clause until such time as the Contractor has determined and certified to the Contracting Officer that the subcontractor is entitled to the payment of such amount.

(i) Prime-subcontractor disputes. A dispute between the Contractor and subcontractor relating to the amount or entitlement of a subcontractor to a payment or a late payment interest penalty under a clause included in the subcontract pursuant to paragraph (c) of this clause does not constitute a dispute to which the Government is a party. The Government may not be interpleaded in any judicial or administrative proceeding involving such a dispute.

(j) Preservation of prime-subcontractor rights. Except as provided in paragraph (i) of this clause, this clause shall not limit or impair any contractual, administrative, or judicial remedies otherwise available to the Contractor or a

subcontractor in the event of a dispute involving late payment or nonpayment by the Contractor or deficient subcontract performance or nonperformance by a subcontractor.

(k) Non-recourse for prime contractor interest penalty. The Contractor's obligation to pay an interest penalty to a subcontractor pursuant to the clauses included in a subcontract under paragraph (c) of this clause shall not be construed to be an obligation of the Government for such interest penalty. A cost-reimbursement claim may not include any amount for reimbursement of such interest penalty.

(l) Overpayments. If the Contractor becomes aware of a duplicate payment or that the Government has otherwise overpaid on an invoice payment, the Contractor shall immediately notify the Contracting Officer and request instructions for disposition of the overpayment.

(End of clause)

52.232-33 PAYMENT BY ELECTRONIC FUNDS TRANSFER—CENTRAL CONTRACTOR REGISTRATION (MAY 1999)

(a) Method of payment. (1) All payments by the Government under this contract shall be made by electronic funds transfer (EFT), except as provided in paragraph (a)(2) of this clause. As used in this clause, the term “EFT” refers to the funds transfer and may also include the payment information transfer.

(2) In the event the Government is unable to release one or more payments by EFT, the Contractor agrees to either--

(i) Accept payment by check or some other mutually agreeable method of payment; or

(ii) Request the Government to extend the payment due date until such time as the Government can make payment by EFT (but see paragraph (d) of this clause).

(b) Contractor's EFT information. The Government shall make payment to the Contractor using the EFT information contained in the Central Contractor Registration (CCR) database. In the event that the EFT information changes, the Contractor shall be responsible for providing the updated information to the CCR database.

(c) Mechanisms for EFT payment. The Government may make payment by EFT through either the Automated Clearing House (ACH) network, subject to the rules of the National Automated Clearing House Association, or the Fedwire Transfer System. The rules governing Federal payments through the ACH are contained in 31 CFR part 210.

(d) Suspension of payment. If the Contractor's EFT information in the CCR database is incorrect, then the Government need not make payment to the Contractor under this contract until correct EFT information is entered into the CCR database; and any invoice or contract financing request shall be deemed not to be a proper invoice for the purpose of prompt payment under this contract. The prompt payment terms of the contract regarding notice of an improper invoice and delays in accrual of interest penalties apply.

(e) Contractor EFT arrangements. If the Contractor has identified multiple payment receiving points (i.e., more than one remittance address and/or EFT information set) in the CCR database, and the Contractor has not notified the Government of the payment receiving point applicable to this contract, the Government shall make payment to the first payment receiving point (EFT information set or remittance address as applicable) listed in the CCR database.

(f) Liability for uncompleted or erroneous transfers. (1) If an uncompleted or erroneous transfer occurs because the Government used the Contractor's EFT information incorrectly, the Government remains responsible for--

(i) Making a correct payment;

(ii) Paying any prompt payment penalty due; and

(iii) Recovering any erroneously directed funds.

(2) If an uncompleted or erroneous transfer occurs because the Contractor's EFT information was incorrect, or was revised within 30 days of Government release of the EFT payment transaction instruction to the Federal Reserve System, and--

(i) If the funds are no longer under the control of the payment office, the Government is deemed to have made payment and the Contractor is responsible for recovery of any erroneously directed funds; or

(ii) If the funds remain under the control of the payment office, the Government shall not make payment, and the provisions of paragraph (d) of this clause shall apply.

(g) EFT and prompt payment. A payment shall be deemed to have been made in a timely manner in accordance with the prompt payment terms of this contract if, in the EFT payment transaction instruction released to the Federal Reserve System, the date specified for settlement of the payment is on or before the prompt payment due date, provided the specified payment date is a valid date under the rules of the Federal Reserve System.

(h) EFT and assignment of claims. If the Contractor assigns the proceeds of this contract as provided for in the assignment of claims terms of this contract, the Contractor shall require as a condition of any such assignment, that the assignee shall register in the CCR database and shall be paid by EFT in accordance with the terms of this clause. In all respects, the requirements of this clause shall apply to the assignee as if it were the Contractor. EFT information that shows the ultimate recipient of the transfer to be other than the Contractor, in the absence of a proper assignment of claims acceptable to the Government, is incorrect EFT information within the meaning of paragraph (d) of this clause.

(i) Liability for change of EFT information by financial agent. The Government is not liable for errors resulting from changes to EFT information made by the Contractor's financial agent.

(j) Payment information. The payment or disbursing office shall forward to the Contractor available payment information that is suitable for transmission as of the date of release of the EFT instruction to the Federal Reserve System. The Government may request the Contractor to designate a desired format and method(s) for delivery of payment information from a list of formats and methods the payment office is capable of executing. However, the Government does not guarantee that any particular format or method of delivery is available at any particular payment office and retains the latitude to use the format and delivery method most convenient to the Government. If the Government makes payment by check in accordance with paragraph (a) of this clause, the Government shall mail the payment information to the remittance address contained in the CCR database.

(End of Clause)

52.233-1 DISPUTES. (JUL 2002)

(a) This contract is subject to the Contract Disputes Act of 1978, as amended (41 U.S.C. 601-613).

(b) Except as provided in the Act, all disputes arising under or relating to this contract shall be resolved under this clause.

(c) Claim, as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract

terms, or other relief arising under or relating to this contract. However, a written demand or written assertion by the Contractor seeking the payment of money exceeding $100,000 is not a claim under the Act until certified. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim under the Act. The submission may be converted to a claim under the Act, by complying with the submission and certification requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.

(d)(1) A claim by the Contractor shall be made in writing and, unless otherwise stated in this contract, submitted within 6 years after accrual of the claim to the Contracting Officer for a written decision. A claim by the Government against the Contractor shall be subject to a written decision by the Contracting Officer.

(2)(i) The contractors shall provide the certification specified in subparagraph (d)(2)(iii) of this clause when submitting any claim -

(A) Exceeding $100,000; or

(B) Regardless of the amount claimed, when using -

(1) Arbitration conducted pursuant to 5 U.S.C. 575-580; or

(2) Any other alternative means of dispute resolution (ADR) technique that the agency elects to handle in accordance with the Administrative Dispute Resolution Act (ADRA).

(ii) The certification requirement does not apply to issues in controversy that have not been submitted as all or part of a claim.

(iii) The certification shall state as follows: "I certify that the claim is made in good faith; that the supporting data are accurate and complete to the best of my knowledge and belief; that the amount requested accurately reflects the contract adjustment for which the Contractor believes the Government is liable; and that I am duly authorized to certify the claim on behalf of the Contractor.

(3) The certification may be executed by any person duly authorized to bind the Contractor with respect to the claim.

(e) For Contractor claims of $100,000 or less, the Contracting Officer must, if requested in writing by the Contractor, render a decision within 60 days of the request. For Contractor-certified claims over $100,000, the Contracting Officer must, within 60 days, decide the claim or notify the Contractor of the date by which the decision will be made.

(f) The Contracting Officer's decision shall be final unless the Contractor appeals or files a suit as provided in the Act.

(g) If the claim by the Contractor is submitted to the Contracting Officer or a claim by the Government is presented to the Contractor, the parties, by mutual consent, may agree to use alternative disput resolution (ADR). If the Contractor refuses an offer for ADR, the Contractor shall inform the Contracting Officer, in writing, of the Contractor's specific reasons for rejecting the request.

(h) The Government shall pay interest on the amount found due and unpaid from (1) the date the Contracting Officer receives the claim (certified, if required); or (2) the date that payment otherwise would be due, if that date is later, until the date of payment. With regard to claims having defective certifications, as defined in (FAR) 48 CFR 33.201, interest shall be paid from the date that the Contracting Officer initially receives the claim. Simple interest on claims shall be paid at the rate, fixed by the Secretary of the Treasury as provided in the Act, which is applicable to the period during which the Contracting Officer receives the claim and then at the rate applicable for each 6-month period as fixed by the Treasury Secretary during the pendency of the claim.

(i) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request

for relief, claim, appeal, or action arising under the contract, and comply with any decision of the Contracting Officer.

(End of clause)

52.233-3 PROTEST AFTER AWARD (AUG. 1996)

(a) Upon receipt of a notice of protest (as defined in FAR 33.101) or a determination that a protest is likely (see FAR 33.102(d)), the Contracting Officer may, by written order to the Contractor, direct the Contractor to stop performance of the work called for by this contract. The order shall be specifically identified as a stop-work order issued under this clause. Upon receipt of the order, the Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the order during the period of work stoppage. Upon receipt of the final decision in the protest, the Contracting Officer shall either--

(1) Cancel the stop-work order; or

(2) Terminate the work covered by the order as provided in the Default, or the Termination for Convenience of the Government, clause of this contract.

(b) If a stop-work order issued under this clause is canceled either before or after a final decision in the protest, the Contractor shall resume work. The Contracting Officer shall make an equitable adjustment in the delivery schedule or contract price, or both, and the contract shall be modified, in writing, accordingly, if--

(1) The stop-work order results in an increase in the time required for, or in the Contractor's cost properly allocable to, the performance of any part of this contract; and

(2) The Contractor asserts its right to an adjustment within 30 days after the end of the period of work stoppage; provided, that if the Contracting Officer decides the facts justify the action, the Contracting Officer may receive and act upon a proposal at any time before final payment under this contract.

(c) If a stop-work order is not canceled and the work covered by the order is terminated for the convenience of the Government, the Contracting Officer shall allow reasonable costs resulting from the stop-work order in arriving at the termination settlement.

(d) If a stop-work order is not canceled and the work covered by the order is terminated for default, the Contracting Officer shall allow, by equitable adjustment or otherwise, reasonable costs resulting from the stop-work order.

(e) The Government's rights to terminate this contract at any time are not affected by action taken under this clause.

(f) If, as the result of the Contractor's intentional or negligent misstatement, misrepresentation, or miscertification, a protest related to this contract is sustained, and the Government pays costs, as provided in FAR 33.102(b)(2) or 33.104(h)(1), the Government may require the Contractor to reimburse the Government the amount of such costs. In addition to any other remedy available, and pursuant to the requirements of Subpart 32.6, the Government may collect this debt by offsetting the amount against any payment due the Contractor under any contract between the Contractor and the Government.

(End of clause)

52.236-5 MATERIAL AND WORKMANSHIP (APR 1984)

(a) All equipment, material, and articles incorporated into the work covered by this contract shall be new and of the

most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the specifications to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.

(b) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. When directed to do so, the Contractor shall submit samples for approval at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

(c) All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer may require, in writing, that the Contractor remove from the work any employee the Contracting Officer deems incompetent, careless, or otherwise objectionable.

(End of clause)

52.236-6 SUPERINTENDENCE BY THE CONTRACTOR (APR 1984)

At all times during performance of this contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the worksite a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.

(End of clause)

52.236-7 PERMITS AND RESPONSIBILITIES (NOV 1991)

The Contractor shall, without additional expense to the Government, be responsible for obtaining any necessary licenses and permits, and for complying with any Federal, State, and municipal laws, codes, and regulations applicable to the performance of the work. The Contractor shall also be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.

(End of clause)

52.236-8 OTHER CONTRACTS (APR 1984)

The Government may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with Government employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by Government employees.

(End of clause)

52.236-9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS (APR 1984)

(a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

(b) The Contractor shall protect from damage all existing improvements and utilities

(1) at or near the work site, and

(2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

(End of clause)

52.236-10 OPERATIONS AND STORAGE AREAS (APR 1984)

(a) The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.

(b) Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.

(c) The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

(End of clause)

52.236-11 USE AND POSSESSION PRIOR TO COMPLETION (APR 1984)

(a) The Government shall have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the Government intends to

take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The Government's possession or use shall not be deemed an acceptance of any work under the contract.

(b) While the Government has such possession or use, the Contractor shall be relieved of the responsibility for the loss of or damage to the work resulting from the Government's possession or use, notwithstanding the terms of the clause in this contract entitled "Permits and Responsibilities." If prior possession or use by the Government delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

(End of clause)

52.236-12 CLEANING UP (APR 1984)

The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. Before completing the work, the Contractor shall remove from the work and premises any rubbish, tools, scaffolding, equipment, and materials that are not the property of the Government. Upon comp leting the work, the Contractor shall leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer.

(End of clause)

52.236-13 ACCIDENT PREVENTION (NOV 1991)

(a) The Contractor shall provide and maintain work environments and procedures which will

(1) safeguard the public and Government personnel, property, materials, supplies, and equipment exposed to Contractor operations and activities;

(2) avoid interruptions of Government operations and delays in project completion dates; and

(3) control costs in the performance of this contract.

(b) For these purposes on contracts for construction or dismantling, demolition, or removal of improvements, the Contractor shall-

(1) Provide appropriate safety barricades, signs, and signal lights;

(2) Comply with the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910; and

(3) Ensure that any additional measures the Contracting Officer determines to be reasonably necessary for the purposes are taken.

(c) If this contract is for construction or dismantling, demolition or removal of improvements with any Department of Defense agency or component, the Contractor shall comply with all pertinent provisions of the latest version of U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, in effect on the date of the solicitation.

(d) Whenever the Contracting Officer becomes aware of any noncompliance with these requirements or any condition which poses a serious or imminent danger to the health or safety of the public or Government personnel, the Contracting Officer shall notify the Contractor orally, with written confirmation, and request immediate initiation of corrective action. This notice, when delivered to the Contractor or the Contractor's representative at the work site,

shall be deemed sufficient notice of the noncompliance and that corrective action is required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to promptly take corrective action, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not be entitled to any equitable adjustment of the contract price or extension of the performance schedule on any stop work order issued under this clause.

(5) The Contractor shall insert this clause, including this paragraph (e), with appropriate changes in the designation of the parties, in subcontracts.

(End of clause)

52.236-14 AVAILABILITY AND USE OF UTILITY SERVICES (APR 1984)

(a) The Government shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to the Government or, where the utility is produced by the Government, at reasonable rates determined by the Contracting Officer. The Contractor shall carefully conserve any utilities furnished without charge.

(b) The Contractor, at its expense and in a workmanlike manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of each utility used for the purpose of determining charges. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia.

(End of clause)

52.236-15 SCHEDULES FOR CONSTRUCTION CONTRACTS (APR 1984)

(a) The Contractor shall, within five days after the work commences on the contract or another period of time determined by the Contracting Officer, prepare and submit to the Contracting Officer for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring materials, plant, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. If the Contractor fails to submit a schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments until the Contractor submits the required schedule.

(b) The Contractor shall enter the actual progress on the chart as directed by the Contracting Officer, and upon doing so shall immediately deliver three copies of the annotated schedule to the Contracting Officer. If, in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer, without additional cost to the Government. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.

(c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in

accordance with the default terms of this contract.

(End of clause)

52.236-21 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FEB 1997)

(a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

(b) Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription", of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean "approved by," or "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.

(c) Where "as shown," as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place," that is "furnished and installed".

(d) Shop drawings means drawings, submitted to the Government by the Contractor, subcontractor, or any lower tier subcontractor pursuant to a construction contract, showing in detail (1) the proposed fabrication and assembly of structural elements, and (2) the installation (i.e., fit, and attachment details) of materials or equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the contractor to explain in detail specific portions of the work required by the contract. The Government may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the Government's reasons therefor. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.

(f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Contracting Officer approves any such variation, the Contracting Officer shall issue an appropriate contract modification, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.

(g) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings, will be retained by the Contracting Officer and one set will be returned to the Contractor.

(End of clause)

52.236-26 PRECONSTRUCTION CONFERENCE (FEB 1995)

If the Contracting Officer decides to conduct a preconstruction conference, the successful offeror will be notified and will be required to attend. The Contracting Officer's notification will include specific details regarding the date, time, and location of the conference, any need for attendance by subcontractors, and information regarding the items to be discussed.

(End of clause)

52.236-28 PREPARATION OF PROPOSALS--CONSTRUCTION (OCT 1997)

(a) Proposals must be (1) submitted on the forms furnished by the Government or on copies of those forms, and (2) manually signed. The person signing a proposal must initial each erasure or change appearing on any proposal form.

(b) The proposal form may require offerors to submit proposed prices for one or more items on various bases, including--

(1) Lump sum price;

(2) Alternate prices;

(3) Units of construction; or

(4) Any combination of paragraphs (b)(1) through (b)(3) of this provision.

(c) If the solicitation requires submission of a proposal on all items, failure to do so may result in the proposal being rejected without further consideration. If a proposal on all items is not required, offerors should insert the words “no proposal” in the space provided for any item on which no price is submitted.

(d) Alternate proposals will not be considered unless this solicitation authorizes their submission.

(End of provision)

52.242-13 BANKRUPTCY (JUL 1995)

In the event the Contractor enters into proceedings relating to bankruptcy, whether voluntary or involuntary, the Contractor agrees to furnish, by certified mail or electronic commerce method authorized by the contract, written notification of the bankruptcy to the Contracting Officer responsible for administering the contract. This notification shall be furnished within five days of the initiation of the proceedings relating to bankruptcy filing. This notification shall include the date on which the bankruptcy petition was filed, the identity of the court in which the bankruptcy petition was filed, and a listing of Government contract numbers and contracting offices for all Government contracts against which final payment has not been made. This obligation remains in effect until final payment under this contract.

(End of clause)

52.242-14 SUSPENSION OF WORK (APR 1984)

(a) The Contracting Officer may order the Contractor, in writing, to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the Government.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified in this contract (or within a reasonable time if not specified), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by the unreasonable suspension, delay, or interruption, and the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor, or for which an equitable adjustment is provided for or excluded under any other term or condition of this contract. (c) A claim under this clause shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.

(End of clause)

52.243-4 CHANGES (AUG 1987)

(a) The Contracting Officer may, at any time, without notice to the sureties, if any, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract, including changes--

(1) In the specifications (including drawings and designs);

(2) In the method or manner of performance of the work;

(3) In the Government-furnished facilities, equipment, materials, services, or site; or

(4) Directing acceleration in the performance of the work.

(b) Any other written or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating

(1) the date, circumstances, and source of the order and

(2) that the Contractor regards the order as a change order.

(c) Except as provided in this clause, no order, statement, or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any such order, the

Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for an adjustment based on defective specifications, no adjustment for any change under paragraph (b) of this clause shall be made for any costs incurred more than 20 days before the Contractor gives written notice as required. In the case of defective specifications for which the Government is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.

(e) The Contractor must assert its right to an adjustment under this clause within 30 days after

(1) receipt of a written change order under paragraph (a) of this clause or (2) the furnishing of a written notice under paragraph (b) of this clause, by submitting to the Contracting Officer a written statement describing the general nature and amount of the proposal, unless this period is extended by the Government. The statement of proposal for adjustment may be included in the notice under paragraph (b) above.

(f) No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.

(End of clause)

52.244-6 SUBCONTRACTS FOR COMMERCIAL ITEMS (MAY 2002)

(a) Definitions. As used this clause--

"Commercial item", has the meaning contained in the clause at 52.202-1, Definitions.

"Subcontract", includes a transfer of commercial items between divisions, subsidiaries, or affiliates of the Contractor or subcontractor at any tier.

(b) To the maximum extent practicable, the Contractor shall incorporate, and require its subcontractors at all tiers to incorporate, commercial items or nondevelopmental items as components of items to be supplied under this contract.

(c)(1) The Contractor shall insert the following clauses in subcontracts for commercial items:

(i) 52.219-8, Utilization of Small Business Concerns (OCT 2000) (15 U.S.C. 637(d)(2) and (3)), in all subcontracts that offer further subcontracting opportunities. If the subcontract (except subcontracts to small business concerns) exceeds $500,000 ($1,000,000 for construction of any public facility), the subcontractor must include 52.219-8 in lower tier subcontracts that offer subcontracting opportunities.

(ii) 52.222-26, Equal Opportunity (APR 2002) (E.O. 11246).

(iii) 52.222-35, Equal Opportunity for Special Disabled Veterans, Veterans of the Vietnam Era and Other Eligible Veterans (DEC 2001) (38 U.S.C. 4212(a)).

(iv) 52.222-36, Affirmative Action for Workers with Disabilities (JUN 1998) (29 U.S.C. 793).

(v) 52.247-64, Preference for Privately Owned U.S.-Flag Commercial Vessels (JUN 2000) (46 U.S.C. Appx 1241) (flowdown not required for subcontracts awarded beginning May 1, 1996).

(2) While not required, the Contractor may flow down to subcontracts for commercial items a minimal number of additional clauses necessary to satisfy its contractual obligations.

(d) The Contractor shall include the terms of this clause, including this paragraph (d), in subcontracts awarded under this contract.

(End of clause)

52.245-1 PROPERTY RECORDS (APR 1984)

The Government shall maintain the Government's official property records in connection with Government property under this contract. The Government Property clause is hereby modified by deleting the requirement for the Contractor to maintain such records.

(End of clause)

52.246-12 INSPECTION OF CONSTRUCTION (AUG 1996)

(a) Definition. "Work" includes, but is not limited to, materials, workmanship, and manufacture and fabrication of components.

(b) The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. The Contractor shall maintain complete inspection records and make them available to the Government. All work shall be conducted under the general direction of the Contracting Officer and is subject to Government inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.

(c) Government inspections and tests are for the sole benefit of the Government and do not--

(1) Relieve the Contractor of responsibility for providing adequate quality control measures;

(2) Relieve the Contractor of responsibility for damage to or loss of the material before acceptance;

(3) Constitute or imply acceptance; or

(4) Affect the continuing rights of the Government after acceptance of the completed work under paragraph (i) of this section.

(d) The presence or absence of a Government inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specification without the Contracting Officer's written authorization.

(e) The Contractor shall promptly furnish, at no increase in contract price, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. The Government may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. The Government shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.

(f) The Contractor shall, without charge, replace or correct work found by the Government not to conform to contract requirements, unless in the public interest the Government consents to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

(g) If the Contractor does not promptly replace or correct rejected work, the Government may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor or (2) terminate for default the

Contractor's right to proceed.

(h) If, before acceptance of the entire work, the Government decides to examine already completed work by removing it or tearing it out, the Contractor, on request, shall promptly furnish all necessary facilities, labor, and material. If the work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray the expenses of the examination and of satis factory reconstruction. However, if the work is found to meet contract requirements, the Contracting Officer shall make an equitable adjustment for the additional services involved in the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.

(i) Unless otherwise specified in the contract, the Government shall accept, as promptly as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or the Government's rights under any warranty or guarantee.

(End of clause)

52.246-21 WARRANTY OF CONSTRUCTION (MAR 1994)

(a) In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph (i) of this clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

(b) This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the Government takes possession.

(c) The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Government-owned or controlled real or personal property, when that damage is the result of--

(1) The Contractor's failure to conform to contract requirements; or

(2) Any defect of equipment, material, workmanship, or design furnished.

(d) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

(e) The Contracting Officer shall notify the Contractor, in writing, within a reasonable time after the discovery of any failure, defect, or damage.

(f) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time after receipt of notice, the Government shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.
(g) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall--

(1) Obtain all warranties that would be given in normal commercial practice;

(2) Require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer; and

(3) Enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.

(h) In the event the Contractor's warranty under paragraph (b) of this clause has expired, the Government may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

(i) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage that results from any defect in Government-furnished material or design.

(j) This warranty shall not limit the Government's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistakes, or fraud.

(End of clause)

52.248-3 VALUE ENGINEERING--CONSTRUCTION (FEB 2000)

(a) General. The Contractor is encouraged to develop, prepare, and submit value engineering change proposals (VECP's) voluntarily. The Contractor shall share in any instant contract savings realized from accepted VECP's, in accordance with paragraph (f) below.

(b) Definitions. "Collateral costs," as used in this clause, means agency costs of operation, maintenance, logistic support, or Government-furnished property.

"Collateral savings," as used in this clause, means those measurable net reductions resulting from a VECP in the agency's overall projected collateral costs, exclusive of acquisition savings, whether or not the acquisition cost changes.

"Contractor's development and implementation costs," as used in this clause, means those costs the Contractor incurs on a VECP specifically in developing, testing, preparing, and submitting the VECP, as well as those costs the Contractor incurs to make the contractual changes required by Government acceptance of a VECP.

"Government costs," as used in this clause, means those agency costs that result directly from developing and implementing the VECP, such as any net increases in the cost of testing, operations, maintenance, and logistic support. The term does not include the normal administrative costs of processing the VECP.

"Instant contract savings," as used in this clause, means the estimated reduction in Contractor cost of performance resulting from acceptance of the VECP, minus allowable Contractor's development and implementation costs, including subcontractors' development and implementation costs (see paragraph (h) below).

"Value engineering change proposal (VECP)" means a proposal that--

(1) Requires a change to this, the instant contract, to implement; and

(2) Results in reducing the contract price or estimated cost without impairing essential functions or characteristics; provided, that it does not involve a change--

(i) In deliverable end item quantities only; or

(ii) To the contract type only.

(c) VECP preparation. As a minimum, the Contractor shall include in each VECP the information described in subparagraphs (1) through (7) below. If the proposed change is affected by contractually required configuration management or similar procedures, the instructions in those procedures relating to format, identification, and priority assignment shall govern VECP preparation. The VECP shall include the following:

(1) A description of the difference between the existing contract requirement and that proposed, the comparative advantages and disadvantages of each, a justification when an item's function or characteristics are being altered, and the effect of the change on the end item's performance.

(2) A list and analysis of the contract requirements that must be changed if the VECP is accepted, including any suggested specification revisions.

(3) A separate, detailed cost estimate for

(i) the affected portions of the existing contract requirement and

(ii) the VECP. The cost reduction associated with the VECP shall take into account the Contractor's allowable development and implementation costs, including any amount attributable to subcontracts under paragraph (h) below.

(4) A description and estimate of costs the Government may incur in implementing the VECP, such as test and evaluation and operating and support costs.

(5) A prediction of any effects the proposed change would have on collateral costs to the agency.

(6) A statement of the time by which a contract modification accepting the VECP must be issued in order to achieve the maximum cost reduction, noting any effect on the contract completion time or delivery schedule.

(7) Identification of any previous submissions of the VECP, including the dates submitted, the agencies and contract numbers involved, and previous Government actions, if known.

(d) Submission. The Contractor shall submit VECP's to the Resident Engineer at the worksite, with a copy to the Contracting Officer.

(e) Government action.

(1) The Contracting Officer will notify the Contractor of the status of the VECP within 45 calendar days after the contracting office receives it. If additional time is required, the Contracting Officer will notify the Contractor within the 45-day period and provide the reason for the delay and the expected date of the decision. The Government will process VECP's expeditiously; however, it shall not be liable for any delay in acting upon a VECP.

If the VECP is not accepted, the Contracting Officer will notify the Contractor in writing, explaining the reasons for rejection. The Contractor may withdraw any VECP, in whole or in part, at any time before it is accepted by the Government. The Contracting Officer may require that the Contractor provide written notification before undertaking significant expenditures for VECP effort.

Any VECP may be accepted, in whole or in part, by the Contracting Officer's award of a modification to this contract citing this clause. The Contracting Officer may accept the VECP, even though an agreement on price reduction has not been reached, by issuing the Contractor a notice to proceed with the change. Until a notice to proceed is issued

or a contract modification applies a VECP to this contract, the Contractor shall perform in accordance with the existing contract. The decision to accept or reject all or part of any VECP is a unilateral decision made solely at the discretion of the Contracting Officer.

(f) Sharing.

(1) Rates. The Government's share of savings is determined by subtracting Government costs from instant contract savings and multiplying the result by

(i) 45 percent for fixed-price contracts or

(ii) 75 percent for cost-reimbursement contracts.

(2) Payment. Payment of any share due the Contractor for use of a VECP on this contract shall be authorized by a modification to this contract to--

(i) Accept the VECP;

(ii) Reduce the contract price or estimated cost by the amount of instant contract savings; and

(iii) Provide the Contractor's share of savings by adding the amount calculated to the contract price or fee.

(g) Collateral savings. If a VECP is accepted, the Contracting Officer will increase the instant contract amount by 20 percent of any projected collateral savings determined to be realized in a typical year of use after subtracting any Government costs not previously offset. However, the Contractor's share of collateral savings will not exceed the contract's firm-fixed-price or estimated cost, at the time the VECP is accepted, or $100,000, whichever is greater. The Contracting Officer is the sole determiner of the amount of collateral savings.

(h) Subcontracts. The Contractor shall include an appropriate value engineering clause in any subcontract of $50,000 or more and may include one in subcontracts of lesser value. In computing any adjustment in this contract's price under paragraph (f) above, the Contractor's allowable development and implementation costs shall include any subcontractor's allowable development and implementation costs clearly resulting from a VECP accepted by the Government under this contract, but shall exclude any value engineering incentive payments to a subcontractor. The Contractor may choose any arrangement for subcontractor value engineering incentive payments; provided, that these payments shall not reduce the Government's share of the savings resulting from the VECP.

(i) Data. The Contractor may restrict the Government's right to use any part of a VECP or the supporting data by marking the following legend on the affected parts:

"These data, furnished under the Value Engineering-- Construction clause of contract . . . . . , shall not be disclosed outside the Government or duplicated, used, or disclosed, in whole or in part, for any purpose other than to evaluate a value engineering change proposal submitted under the clause. This restriction does not limit the Government's right to use information contained in these data if it has been obtained or is otherwise available from the Contractor or from another source without limitations." If a VECP is accepted, the Contractor hereby grants the Government unlimited rights in the VECP and supporting data, except that, with respect to data qualifying and submitted as limited rights technical data, the Government shall have the rights specified in the contract modification implementing the VECP and shall appropriately mark the data. (The terms "unlimited rights" and "limited rights" are defined in Part 27 of the Federal Acquisition Regulation.)

(End of clause)

52.249-2 TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED-PRICE) (SEP 1996)

(a) The Government may terminate performance of work under this contract in whole or, from time to time, in part if the Contracting Officer determines that a termination is in the Government's interest. The Contracting Officer shall terminate by delivering to the Contractor a Notice of Termination specifying the extent of termination and the effective date.

(b) After receipt of a Notice of Termination, and except as directed by the Contracting Officer, the Contractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due under this clause:

(1) Stop work as specified in the notice.

(2) Place no further subcontracts or orders (referred to as subcontracts in this clause) for materials, services, or facilities, except as necessary to complete the continued portion of the contract.

(3) Terminate all subcontracts to the extent they relate to the work terminated.

(4) Assign to the Government, as directed by the Contracting Officer, all right, title, and interest of the Contractor under the subcontracts terminated, in which case the Government shall have the right to settle or to pay any termination settlement proposal arising out of those terminations.

(5) With approval or ratification to the extent required by the Contracting Officer, settle all outstanding liabilities and termination settlement proposals arising from the termination of subcontracts; the approval or ratification will be final for purposes of this clause.

(6) As directed by the Contracting Officer, transfer title and deliver to the Government (i) the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced or acquired for the work terminated, and (ii) the completed or partially completed plans, drawings, information, and other property that, if the contract had been completed, would be required to be furnished to the Government.

(7) Complete performance of the work not terminated.

(8) Take any action that may be necessary, or that the Contracting Officer may direct, for the protection and preservation of the property related to this contract that is in the possession of the Contractor and in which the Government has or may acquire an interest.

(9) Use its best efforts to sell, as directed or authorized by the Contracting Officer, any property of the types referred to in subparagraph (b)(6) of this clause; provided, however, that the Contractor (i) is not required to extend credit to any purchaser and (ii) may acquire the property under the conditions prescribed by, and at prices approved by, the Contracting Officer. The proceeds of any transfer or disposition will be applied to reduce any payments to be made by the Government under this contract, credited to the price or cost of the work, or paid in any other manner directed by the Contracting Officer.

(c) The Contractor shall submit complete termination inventory schedules no later than 120 days from the effective date of termination, unless extended in writing by the Contracting Officer upon written request of the Contractor within this 120-day period.

(d) After expiration of the plant clearance period as defined in Subpart 45.6 of the Federal Acquisition Regulation, the Contractor may submit to the Contracting Officer a list, certified as to quantity and quality, of termination inventory not previously disposed of, excluding items authorized for disposition by the Contracting Officer. The Contractor

may request the Government to remove those items or enter into an agreement for their storage. Within 15 days, the Government will accept title to those items and remove them or enter into a storage agreement. The Contracting Officer may verify the list upon removal of the items, or if stored, within 45 days from submission of the list, and shall correct the list, as necessary, before final settlement.

(e) After termination, the Contractor shall submit a final termination settlement proposal to the Contracting Officer in the form and with the certification prescribed by the Contracting Officer. The Contractor shall submit the proposal promptly, but no later than 1 year from the effective date of termination, unless extended in writing by the Contracting Officer upon written request of the Contractor within this 1-year period. However, if the Contracting Officer determines that the facts justify it, a termination settlement proposal may be received and acted on after 1 year or any extension. If the Contractor fails to submit the proposal within the time allowed, the Contracting Officer may determine, on the basis of information available, the amount, if any, due the Contractor because of the termination and shall pay the amount determined.

(f) Subject to paragraph (e) of this clause, the Contractor and the Contracting Officer may agree upon the whole or any part of the amount to be paid or remaining to be paid because of the termination. The amount may include a reasonable allowance for profit on work done. However, the agreed amount, whether under this paragraph (g) or paragraph (g) of this clause, exclusive of costs shown in subparagraph (g)(3) of this clause, may not exceed the total contract price as reduced by (1) the amount of payments previously made and (2) the contract price of work not terminated. The contract shall be modified, and the Contractor paid the agreed amount. Paragraph (g) of this clause shall not limit, restrict, or affect the amount that may be agreed upon to be paid under this paragraph.

(g) If the Contractor and the Contracting Officer fail to agree on the whole amount to be paid because of the termination of work, the Contracting Officer shall pay the Contractor the amounts determined by the Contracting Officer as follows, but without duplication of any amounts agreed on under paragraph (f) of this clause:

(1) The contract price for completed supplies or services accepted by the Government (or sold or acquired under subparagraph (b)(9) of this clause) not previously paid for, adjusted for any saving of freight and other charges.

(2) The total of--

(i) The costs incurred in the performance of the work terminated, including initial costs and preparatory expense allocable thereto, but excluding any costs attributable to supplies or services paid or to be paid under subparagraph (f)(1) of this clause;

(ii) The cost of settling and paying termination settlement proposals under terminated subcontracts that are properly chargeable to the terminated portion of the contract if not included in subdivision (g)(2)(i) of this clause; and

(iii) A sum, as profit on subdivision (g)(2)(i) of this clause, determined by the Contracting Officer under 49.202 of the Federal Acquisition Regulation, in effect on the date of this contract, to be fair and reasonable; however, if it appears that the Contractor would have sustained a loss on the entire contract had it been completed, the Contracting Officer shall allow no profit under this subdivision (iii) and shall reduce the settlement to reflect the indicated rate of loss.

(3) The reasonable costs of settlement of the work terminated, including--

(i) Accounting, legal, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data;

(ii) The termination and settlement of subcontracts (excluding the amounts of such settlements); and

(iii) Storage, transportation, and other costs incurred, reasonably necessary for the preservation, protection, or disposition of the termination inventory.

(h) Except for normal spoilage, and except to the extent that the Government expressly assumed the risk of loss, the Contracting Officer shall exclude from the amounts payable to the Contractor under paragraph (g) of this clause, the fair value, as determined by the Contracting Officer, of property that is destroyed, lost, stolen, or damaged so as to become undeliverable to the Government or to a buyer.

(i) The cost principles and procedures of Part 31 of the Federal Acquisition Regulation, in effect on the date of this contract, shall govern all costs claimed, agreed to, or determined under this clause.

(j) The Contractor shall have the right of appeal, under the Disputes clause, from any determination made by the Contracting Officer under paragraph (e), (g), or (l) of this clause, except that if the Contractor failed to submit the termination settlement proposal or request for equitable adjustment within the time provided in paragraph (e) or (l), respectively, and failed to request a time extension, there is no right of appeal.

(k) In arriving at the amount due the Contractor under this clause, there shall be deducted--

(1) All unliquidated advance or other payments to the Contractor under the terminated portion of this contract;

(2) Any claim which the Government has against the Contractor under this contract; and

(3) The agreed price for, or the proceeds of sale of, materials, supplies, or other things acquired by the Contractor or sold under the provisions of this clause and not recovered by or credited to the Government.

(l) If the termination is partial, the Contractor may file a proposal with the Contracting Officer for an equitable adjustment of the price(s) of the continued portion of the contract. The Contracting Officer shall make any equitable adjustment agreed upon. Any proposal by the Contractor for an equitable adjustment under this clause shall be requested within 90 days from the effective date of termination unless extended in writing by the Contracting Officer.

(m)(1) The Government may, under the terms and conditions it prescribes, make partial payments and payments against costs incurred by the Contractor for the terminated portion of the contract, if the Contracting Officer believes the total of these payments will not exceed the amount to which the Contractor will be entitled.

(2) If the total payments exceed the amount finally determined to be due, the Contractor shall repay the excess to the Government upon demand, together with interest computed at the rate established by the Secretary of the Treasury under 50 U.S.C. App. 1215(b)(2). Interest shall be computed for the period from the date the excess payment is received by the Contractor to the date the excess is repaid. Interest shall not be charged on any excess payment due to a reduction in the Contractor's termination settlement proposal because of retention or other disposition of termination inventory until 10 days after the date of the retention or disposition, or a later date determined by the Contracting Officer because of the circumstances.

(n) Unless otherwise provided in this contract or by statute, the Contractor shall maintain all records and documents relating to the terminated portion of this contract for 3 years after final settlement. This includes all books and other evidence bearing on the Contractor's costs and expenses under this contract. The Contractor shall make these records and documents available to the Government, at the Contractor's office, at all reasonable times, without any direct charge. If approved by the Contracting Officer, photographs, microphotographs, or other authentic reproductions may be maintained instead of original records and documents.

(End of clause)

52.249-10 DEFAULT (FIXED-PRICE CONSTRUCTION) (APR 1984)

(a) If the Contractor refuses or fails to prosecute the work or any separable part, with the diligence that will insure its completion within the time specified in this contract including any extension, or fails to complete the work within this

time, the Government may, by written notice to the Contractor, terminate the right to proceed with the work (or the separable part of the work) that has been delayed. In this event, the Government may take over the work and complete it by contract or otherwise, and may take possession of and use any materials, appliances, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the Government resulting from the Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the Government in completing the work.

(b) The Contractor's right to proceed shall not be terminated nor the Contractor charged with damages under this clause, if--

(1) The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include

(i) acts of God or of the public enemy,

(ii) acts of the Government in either its sovereign or contractual capacity,

(iii) acts of another Contractor in the performance of a contract with the Government,

(iv) fires,

(v) floods,

(vi) epidemics,

(vii) quarantine restrictions,

(viii) strikes,

(ix) freight embargoes,

(x) unusually severe weather, or delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and

(2) The Contractor, within 10 days from the beginning of any delay (unless extended by the Contracting Officer), notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, the time for completing the work shall be extended. The findings of the Contracting Officer shall be final and conclusive on the parties, but subject to appeal under the Disputes clause.

(c) If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been issued for the convenience of the Government.

The rights and remedies of the Government in this clause are in addition to any other rights and remedies provided by law or under this contract.

(End of clause)

252.201-7000 CONTRACTING OFFICER'S REPRESENTATIVE (DEC 1991)

(a) "Definition. Contracting officer's representative" means an individual designated in accordance with subsection 201.602-2 of the Defense Federal Acquisition Regulation Supplement and authorized in writing by the contracting officer to perform specific technical or administrative functions.

(b) If the Contracting Officer designates a contracting officer's representative (COR), the Contractor will receive a copy of the written designation. It will specify the extent of the COR's authority to act on behalf of the contracting officer. The COR is not authorized to make any commitments or changes that will affect price, quality, quantity, delivery, or any other term or condition of the contract.

(End of clause)

252.203-7001 PROHIBITION ON PERSONS CONVICTED OF FRAUD OR OTHER DEFENSE-CONTRACT-RELATED FELONIES (MAR 1999)

(a) Definitions. As used in this clause—

(1) "Arising out of a contract with the DoD" means any act in connection with—

(i) Attempting to obtain;

(ii) Obtaining, or

(iii) Performing a contract or first-tier subcontract of any agency, department, or component of the Department of Defense (DoD).

(2) "Conviction of fraud or any other felony" means any conviction for fraud or a felony in violation of state or Federal criminal statutes, whether entered on a verdict or plea, including a plea of *nolo contendere*, for which sentence has been imposed.

(3) "Date of conviction" means the date judgment was entered against the individual.

(b) Any individual who is convicted after September 29, 1988, of fraud or any other felony arising out of a contract with the DoD is prohibited from serving--

(1) In a management or supervisory capacity on any DoD contract or first-tier subcontract;

(2) On the board of directors of any DoD contractor or first-tier subcontractor;

(3) As a consultant, agent, or representative for any DoD contractor or first-tier subcontractor; or

(4) In any other capacity with the authority to influence, advise, or control the decisions of any DoD contractor or subcontractor with regard to any DoD contract or first-tier subcontract.

(c) Unless waived, the prohibition in paragraph (b) of this clause applies for not less than 5 years from the date of conviction.

(d) 10 U.S.C. 2408 provides that a defense contractor or first-tier subcontractor shall be subject to a criminal penalty of not more than $500,000 if convicted of knowingly—

(1) Employing a person under a prohibition specified in paragraph (b) of this clause; or

(2) Allowing such a person to serve on the board of directors of the contractor or first-tier subcontractor.

(e) In addition to the criminal penalties contained in 10 U.S.C. 2408, the Government may consider other available remedies, such as—

(1) Suspension or debarment;

(2) Cancellation of the contract at no cost to the Government; or

(3) Termination of the contract for default.

(f) The Contractor may submit written requests for waiver of the prohibition in paragraph (b) of this clause to the Contracting Officer. Requests shall clearly identify—

(1) The person involved;

(2) The nature of the conviction and resultant sentence or punishment imposed;

(3) The reasons for the requested waiver; and

(4) An explanation of why a waiver is in the interest of national security.

(g) The Contractor agrees to include the substance of this clause, appropriately modified to reflect the identity and relationship of the parties, in all first-tier subcontracts exceeding the simplified acquisition threshold in Part 2 of the Federal Acquisition Regulation, except those for commercial items or components.

(h) Pursuant to 10 U.S.C. 2408(c), defense contractors and subcontractors may obtain information as to whether a particular person has been convicted of fraud or any other felony arising out of a contract with the DoD by contacting The Office of Justice Programs, The Denial of Federal Benefits Office, U.S. Department of Justice, telephone (202) 616-3507.

(End of clause)

252.204-7003 CONTROL OF GOVERNMENT PERSONNEL WORK PRODUCT (APR 1992)

The Contractor's procedures for protecting against unauthorized disclosure of information shall not require Department of Defense employees or members of the Armed Forces to relinquish control of their work products, whether classified or not, to the contractor.

(End of clause)

252.204-7004 REQUIRED CENTRAL CONTRACTOR REGISTRATION (NOV 2001)

(a) Definitions.

As used in this clause--

(1) Central Contractor Registration (CCR) database means the primary DoD repository for contractor information required for the conduct of business with DoD.

(2) Data Universal Numbering System (DUNS) number means the 9-digit number assigned by Dun and Bradstreet Information Services to identify unique business entities.

(3) Data Universal Numbering System +4 (DUNS+4) number means the DUNS number assigned by Dun and Bradstreet plus a 4-digit suffix that may be assigned by a parent (controlling) business concern. This 4-digit suffix may be assigned at the discretion of the parent business concern for such purposes as identifying subunits or affiliates of the parent business concern.

(4) Registered in the CCR database means that all mandatory information, including the DUNS number or the DUNS+4 number, if applicable, and the corresponding Commercial and Government Entity (CAGE) code, is in the CCR database; the DUNS number and the CAGE code have been validated; and all edits have been successfully completed.

(b)(1) By submission of an offer, the offeror acknowledges the requirement that a prospective awardee must be registered in the CCR database prior to award, during performance, and through final payment of any contract resulting from this solicitation, except for awards to foreign vendors for work to be performed outside the United States.

(2) The offeror shall provide its DUNS or, if applicable, its DUNS+4 number with its offer, which will be used by the Contracting Officer to verify that the offeror is registered in the CCR database.

(3) Lack of registration in the CCR database will make an offeror ineligible for award.

(4) DoD has established a goal of registering an applicant in the CCR database within 48 hours after receipt of a complete and accurate application via the Internet. However, registration of an applicant submitting an application through a method other than the Internet may take up to 30 days. Therefore, offerors that are not registered should consider applying for registration immediately upon receipt of this solicitation.

(c) The Contractor is responsible for the accuracy and completeness of the data within the CCR, and for any liability resulting from the Government's reliance on inaccurate or incomplete data. To remain registered in the CCR database after the initial registration, the Contractor is required to confirm on an annual basis that its information in the CCR database is accurate and complete.

(d) Offerors and contractors may obtain information on registration and annual confirmation requirements by calling 1-888-227-2423, or via the Internet at http://www.ccr.gov.

(End of clause)

252.209-7004 SUBCONTRACTING WITH FIRMS THAT ARE OWNED OR CONTROLLED BY THE GOVERNMENT OF A TERRORIST COUNTRY (MAR 1998)

(a) Unless the Government determines that there is a compelling reason to do so, the Contractor shall not enter into any subcontract in excess of $25,000 with a firm, or subsidiary of a firm, that is identified, on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs, as being ineligible for the award of Defense contracts or subcontracts because it is owned or controlled by the government of a terrorist country.

(b) A corporate officer or a designee of the Contractor shall notify the Contracting Officer, in writing, before entering into a subcontract with a party that is identified, on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs, as being ineligible for the award of Defense contracts or subcontracts because it is owned or controlled by the government of a terrorist country. The notice must include the name of the proposed subcontractor notwithstanding its inclusion on the List of Parties Excluded From Federal Procurement and

Nonprocurement Programs.

(End of clause)

252.223-7001 HAZARD WARNING LABELS (DEC 1991)

(a) "Hazardous material," as used in this clause, is defined in the Hazardous Material Identification and Material Safety Data clause of this contract.

(b) The Contractor shall label the item package (unit container) of any hazardous material to be delivered under this contract in accordance with the Hazard Communication Standard (29 CFR 1910.1200 et seq). The Standard requires that the hazard warning label conform to the requirements of the standard unless the material is otherwise subject to the labeling requirements of one of the following statutes:

(1) Federal Insecticide, Fungicide and Rodenticide Act;

(2) Federal Food, Drug and Cosmetics Act;

(3) Consumer Product Safety Act;

(4) Federal Hazardous Substances Act; or

(5) Federal Alcohol Administration Act.

(c) The Offeror shall list which hazardous material listed in the Hazardous Material Identification and Material Safety Data clause of this contract will be labeled in accordance with one of the Acts in paragraphs (b)(1) through (5) of this clause instead of the Hazard Communication Standard. Any hazardous material not listed will be interpreted to mean that a label is required in accordance with the Hazard Communication Standard.

MATERIAL (If None, Insert "None.")	ACT
_____	_____
_____	_____

(d) The apparently successful Offeror agrees to submit, before award, a copy of the hazard warning label for all hazardous materials not listed in paragraph (c) of this clause. The Offeror shall submit the label with the Material Safety Data Sheet being furnished under the Hazardous Material Identification and Material Safety Data clause of this contract.

(e) The Contractor shall also comply with MIL-STD-129, Marking for Shipment and Storage (including revisions adopted during the term of this contract).

(End of clause)

252.223-7004 DRUG-FREE WORK FORCE (SEP 1988)

(a) Definitions.

(1) "Employee in a sensitive position," as used in this clause, means an employee who has been granted access to classified information; or employees in other positions that the Contractor determines involve national security; health or safety, or functions other than the foregoing requiring a high degree of trust and confidence.

(2) "Illegal drugs," as used in this clause, means controlled substances included in Schedules I and II, as defined by section 802(6) of title 21 of the United States Code, the possession of which is unlawful under chapter 13 of that Title. The term "illegal drugs" does not mean the use of a controlled substance pursuant to a valid prescription or other uses authorized by law.

(b) The Contractor agrees to institute and maintain a program for achieving the objective of a drug-free work force. While this clause defines criteria for such a program, contractors are encouraged to implement alternative approaches comparable to the criteria in paragraph (c) that are designed to achieve the objectives of this clause.

(c) Contractor programs shall include the following, or appropriate alternatives:

(1) Employee assistance programs emphasizing high level direction, education, counseling, rehabilitation, and coordination with available community resources;

(2) Supervisory training to assist in identifying and addressing illegal drug use by Contractor employees;

(3) Provision for self-referrals as well as supervisory referrals to treatment with maximum respect for individual confidentiality consistent with safety and security issues;

(4) Provision for identifying illegal drug users, including testing on a controlled and carefully monitored basis. Employee drug testing programs shall be established taking account of the following:

(i) The Contractor shall establish a program that provides for testing for the use of illegal drugs by employees in sensitive positions. The extent of and criteria for such testing shall be determined by the Contractor based on considerations that include the nature of the work being performed under the contract, the employee's duties, and efficient use of Contractor resources, and the risks to health, safety, or national security that could result from the failure of an employee adequately to discharge his or her position.

(ii) In addition, the Contractor may establish a program for employee drug testing--

(A) When there is a reasonable suspicion that an employee uses illegal drugs; or

(B) When an employees has been involved in an accident or unsafe practice;

(C) As part of or as a follow-up to counseling or rehabilitation for illegal drug use;

(D) As part of a voluntary employee drug testing program.

(iii) The Contractor may establish a program to test applicants for employment for illegal drug use.

(iv) For the purpose of administering this clause, testing for illegal drugs may be limited to those substances for which testing is prescribed by section 2..1 of subpart B of the "Mandatory Guidelines for Federal Workplace Drug Testing Programs" (53 FR 11980 (April 11, 1988), issued by the Department of Health and Human Services.

(d) Contractors shall adopt appropriate personnel procedures to deal with employees who are found to be using drugs illegally. Contractors shall not allow any employee to remain on duty or perform in a sensitive position who is found to use illegal drugs until such times as the Contractor, in accordance with procedures established by the Contractor, determines that the employee may perform in such a position.

(e) The provisions of this clause pertaining to drug testing program shall not apply to the extent that are inconsistent with state or local law, or with an existing collective bargaining agreement; provided that with respect to the latter, the

Contractor agrees those issues that are in conflict will be a subject of negotiation at the next collective bargaining session.

(End of clause)

252.231-7000 SUPPLEMENTAL COST PRINCIPLES (DEC 1991)

When the allowability of costs under this contract is determined in accordance with part 31 of the Federal Acquisition Regulation (FAR), allowability shall also be determined in accordance with part 231 of the Defense FAR Supplement, in effect on the date of this contract.

(End of clause)

252.236-7000 MODIFICATION PROPOSALS - PRICE BREAKDOWN. (DEC 1991)

(a) The Contractor shall furnish a price breakdown, itemized as required and within the time specified by the Contracting Officer, with any proposal for a contract modification.

(b) The price breakdown --

(1) Must include sufficient detail to permit an analysis of profit, and of all costs for --

(i) Material;

(ii) Labor;

(iii) Equipment;

(iv) Subcontracts; and

(v) Overhead; and

(2) Must cover all work involved in the modification, whether the work was deleted, added, or changed.

(c) The Contractor shall provide similar price breakdowns to support any amounts claimed for subcontracts.

(d) The Contractor's proposal shall include a justification for any time extension proposed.

252.243-7001 PRICING OF CONTRACT MODIFICATIONS (DEC 1991)

When costs are a factor in any price adjustment under this contract, the contract cost principles and procedures in FAR part 31 and DFARS part 231, in effect on the date of this contract, apply.

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TABLE OF CONTENTS

SPECIAL CLAUSES

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SPECIAL CLAUSES

SC-1. COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK (APR 1984) (FAR 52.211-10).

The Contractor shall be required to (a) commence work under this Contract within 10 calendar days after the date the Contractor receives the notice to proceed, (b) prosecute the work diligently, and (c) complete the entire work ready for use not later than 685 calendar days after date of receipt by Contractor of notice to proceed. The time stated for completion shall include final cleanup of the premises.

SC-1.1 OPTION FOR INCREASED QUANTITY

a. The Government may increase the quantity of work awarded by exercising one or more of the Optional Bid Items 0019 and 0020 at any time, or not at all, but no later than 500 calendar days after receipt by Contractor of notice to proceed. Notice to proceed on work Item(s) added by exercise of the option(s) will be given upon execution of consent of surety.

b. The parties hereto further agree that any option herein shall be considered to have been exercised at the time the Government deposits written notification to the Contractor in the mails.

c. The time allowed for completion of any optional items awarded under this contract will be the same as that for the base item(s), and will be measured from the date of receipt of the notice to proceed for the base item(s).

SC-2. LIQUIDATED DAMAGES - CONSTRUCTION (SEP 2000) (FAR 52.211-12)

(a) If the Contractor fails to complete the work within the time specified in the Contract, or any extension, the Contractor shall pay to the Government as liquidated damages, the sum of $2,415.00 for each day of delay.

(b) If the Government terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the Government in completing the work.

(c) If the Government does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

SC-3 DELETED.

SC-4. VARIATIONS IN ESTIMATED QUANTITIES - SUBDIVIDED ITEMS (MAR 1995) (EFARS 52.212-5001): This variation in estimated quantities clause is applicable only to Item Nos. 0003, 0010, 0011, 0012, 0013 and 0014.

(a) Variation from the estimated quantity in the actual work performed under any second or subsequent sub-item or elimination of all work under such a second or subsequent sub-item will not be the basis for an adjustment in contract unit price.

(b) Where the actual quantity of work performed for Items Nos. 0003, 0010, 0011, 0012, 0013 and 0014 is less than 85 % of the quantity of the first sub-item listed under such item, the Contractor will be

paid at the contract unit price for that sub-item for the actual quantity of work performed and, in addition, an equitable adjustment shall be made in accordance with the clause FAR 52.211-18, Variation in Estimated Quantities.

(c) If the actual quantity of work performed under Items Nos. 0003, 0010, 0011, 0012, 0013 and 0014 exceeds 115 percent or is less than 85 percent of the total estimated quantity of the sub-item under that item and/or if the quantity of the work performed under the second sub-item or any subsequent sub-item under Items Nos. 0003, 0010, 0011, 0012, 0013 and 0014 exceeds 115 % or is less than 85 % of the estimated quantity of any such sub-item, and if such variation causes an increase or a decrease in the time required for performance of this contract the contract completion time will be adjusted in accordance with the clause FAR 52.211-18, Variation in Estimated Quantities.

SC-5. INSURANCE - WORK ON A GOVERNMENT INSTALLATION (JAN 1997) (FAR 52.228-5)

(a) The Contractor shall, at its own expense, provide and maintain during the entire performance period of this Contract at least the kinds and minimum amounts of insurance required in the Insurance Liability Schedule or elsewhere in the Contract.

(b) Before commencing work under this Contract, the Contractor shall certify to the Contracting Officer in writing that the required insurance has been obtained. The policies evidencing required insurance shall contain an endorsement to the effect that any cancellation or any material change adversely affecting the Government's interest shall not be effective:

(1) for such period as the laws of the State in which this Contract is to be performed prescribe; or

(2) until 30 days after the insurer or the Contractor gives written notice to the Contracting Officer, whichever period is longer.

(c) The Contractor shall insert the substance of this clause, including this paragraph (c), in subcontracts under this Contract that require work on a Government installation and shall require subcontractors to provide and maintain the insurance required in the Schedule or elsewhere in the Contract. The Contractor shall maintain a copy of all subcontractors' proofs of required insurance, and shall make copies available to the Contracting Officer upon request.

(d) Insurance Liability Schedule (FAR 28.307-2)

(1) Workers' compensation and employer's liability. Contractors are required to comply with applicable Federal and State workers' compensation and occupational disease statutes. If occupational diseases are not compensable under those statutes, they shall be covered under the employer's liability section of the insurance policy, except when Contract operations are so commingled with a Contractor's commercial operation that it would not be practical to require this coverage. Employer's liability coverage of at least $100,000 shall be required, except in states with exclusive or monopolistic funds that do not permit workers' compensation to be written by private carriers.

(2) General Liability.

(a) The Contracting Officer shall require bodily injury liability insurance coverage written on the comprehensive form of policy of at least $500,000 per occurrence.

(b) Property damage liability insurance shall be required only in special circumstances as determined by the agency.

(3) Automobile liability. The Contracting Officer shall require automobile liability insurance written on the comprehensive form of policy. The policy shall provide for bodily injury and property damage liability covering the operation of all automobiles used in connection with performing the Contract. Policies covering automobiles operated in the United States shall provide coverage of at least $200,000 per person and $500,000 per occurrence for bodily injury and $20,000 per occurrence for property damage. The amount of liability coverage on other policies shall be commensurate with any legal requirements of the locality and sufficient to meet normal and customary claims.

(4) Aircraft public and passenger liability. When aircraft are used in connection with performing the Contract, the Contracting Officer shall require aircraft public and passenger liability insurance. Coverage shall be at least $200,000 per person and $500,000 per occurrence for bodily injury, other than passenger liability, and $200,000 per occurrence for property damage. Coverage for passenger liability bodily injury shall be at least $200,000 multiplied by the number of seats or passengers, whichever is greater.

(5) Environmental Liability If this contract includes the transport, treatment, storage, or disposal of hazardous material waste the following coverage is required.

The Contractor shall ensure the transporter and disposal facility have liability insurance if effect for claims arising out of the death or bodily injury and property damage from hazardous material/waste transport, treatment, storage and disposal, including vehicle liability and legal defense costs in the amount of $1,000,000.00 as evidenced by a certificate of insurance for General, Automobile, and Environmental Liability Coverage. Proof of this insurance shall be provided to the Contracting Officer.

SC-6. CONTINUING CONTRACTS (EFARS 52.232-5001) (MAR 1995):

(a) This is a continuing contract, as authorized by Section 10 of the River and Harbor Act of September 22, 1922 (33 U.S. Code 621). The payment of some portion of the contract price is dependent upon reservations of funds from future appropriations, and from future contribution to the project having one or more non-federal project sponsors. The responsibilities of the Government are limited by this clause notwithstanding any contrary provision of the “Payments to Contractor” clause or any other clause of this contract.

(b) The sum of $7,000,000.00 has been reserved for this contract and is available for payments to the Contractor during the current fiscal year. It is expected that Congress will make appropriations for future fiscal years from which additional funds together with funds provided by one or more non-federal project sponsors will be reserved for this contract.

(c) Failure to make payments in excess of the amount currently reserved, or that may be reserved from time to time, shall not entitle the Contractor to a price adjustment under the terms of this contract, except as specifically provided in paragraphs (f) and (i) below. No such failure shall constitute a breach of this contract, except that this provision shall not bar a breach-of-contract action if an amount finally

determined to be due as a termination allowance remains unpaid for one year due solely to a failure to reserve sufficient additional funds therefore.

(d) The Government may at any time reserve additional funds for payments under the contract if there are funds available for such purpose. The Contracting Officer will promptly notify the Contractor of any additional funds reserved for the contract by issuing an administrative modification to the contract.

(e) If earnings will be such that funds reserved for the contract will be exhausted before the end of any fiscal year, the contractor shall give written notice to the Contracting Officer of the estimated date of exhaustion and the amount of additional funds which will be needed to meet payments due, or to become due, under the contract during that fiscal year. This notice shall be given not less than 45 nor more than 60 days prior to the estimated date of exhaustion.

(f) No payments will be made after exhaustion of funds except to the extent that additional funds are reserved for the contract. The Contractor shall be entitled to simple interest on any payment that the contracting officer determines was actually earned under the terms of the contract and would have been made except for exhaustion of funds. Interest shall be computed from the time such payment would otherwise have been made until actually or constructively made, and shall be at the rate established by the Secretary of the Treasury pursuant to Public Law 92-41, 85 STAT 97, as in effect on the first day of the delay in such payment.

(g) Any suspension, delay, or interruption of work arising from exhaustion or anticipated exhaustion of funds shall not constitute a breach of this contract and shall not entitle the contractor to any price adjustment under the "Suspension of Work" clause or in any other manner under this contract.

(h) An equitable adjustment in performance time shall be made for any increase in the time required for performance of any part of the work arising from exhaustion of funds or the reasonable anticipation of exhaustion of funds.

(i) If, upon the expiration of sixty (60) days after the beginning of the fiscal year following an exhaustion of funds, the Government has failed to reserve sufficient additional funds to cover payments otherwise due, the contractor, by written notice delivered to the Contracting Officer at any time before such additional funds are reserved, may elect to treat his right to proceed with the work as having been terminated. Such a termination shall be considered a termination for the convenience of the Government.

(j) If at any time it becomes apparent that the funds reserved for any fiscal year are in excess of the funds required to meet all payments due or to become due the contractor because of work performed and to be performed under the contract during the fiscal year, the Government reserves the right, after notice to the contractor, to reduce said reservation by the amount of such excess.

SC-7. PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984) (FAR 52.236-1): The Contractor shall perform on the site, and with its own organization, work equivalent to at least fifteen percent (15%) of the total amount of work to be performed under the Contract. The percentage may be reduced by a supplemental agreement to this Contract if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government.

SC-8. PHYSICAL DATA (APR 1984) (FAR 52.236-4): Data and information furnished or referred to below is for the Contractor's information. The Government will not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

(a) Physical Conditions: The indications of physical conditions on the drawings and in the specifications are the result of site investigations by test holes shown on the drawings.

(b) Weather Conditions: Each bidder shall be satisfied before submitting his bid as to the hazards likely to arise from weather conditions. Complete weather records and reports may be obtained from any National Weather Service Office.

(c) Transportation Facilities: Each bidder, before submitting his bid, shall make an investigation of the conditions of existing public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress at the jobsite. The unavailability of transportation facilities or limitations thereon shall not become a basis for claims for damages or extension of time for completion of the work.

(d) Right-of-Way: The right-of-way for the work covered by these specifications will be furnished by the Government, except that the Contractor shall provide right-of-way for ingress and egress across private property where necessary to gain access to the jobsite. The Contractor may use such portions of the land within the right-of-way not otherwise occupied as may be designated by the Contracting Officer. The Contractor shall, without expense to the Government, and at any time during the progress of the work when space is needed within the right-of-way for any other purposes, promptly vacate and clean up any part of the grounds that have been allotted to, or have been in use by, him when directed to do so by the Contracting Officer. The Contractor shall keep the buildings and grounds in use by him at the site of the work in an orderly and sanitary condition. Should the Contractor require additional working space or lands for material yards, job offices, or other purposes, he shall obtain such additional lands or easements at his expense.

(e) Condition of Area: The condition of the area when last surveyed is shown on the drawings. Topography is in feet and represents elevation with reference to National Geodetic Vertical Datum (N.G.V.D.).

(f) Datum and Bench Marks: The plane of reference of N.G.V.D. as used in these specifications is that determined by the bench marks, as shown on the drawings.

(g) Howard Hanson Dam and Reservoir Hydraulics and Hydrology: More information on conditions at the reservoir that will directly effect construction and the scheduling of construction is available attached to the end of Section 01005.

(h) Geotechnical Baseline Report. This report is attached to the end of this section. It provides available information on the Geotechnical properties of the site.

SC-9. DELETED.

SC-10. LAYOUT OF WORK (APR 1984) (FAR 52.236-17): The Contractor shall lay out its work from Government-established base lines and bench marks indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at its own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them. If such marks are destroyed by the Contractor or through its negligence

before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due, or to become due, to the Contractor.

SC-11. PAYMENT FOR MOBILIZATION AND DEMOBILIZATION. Payment No. 0002 (DEC 1991) (FAR 52.236-7004):

(a) The Government will pay all costs for the mobilization and demobilization of all of the Contractor's plant and equipment at the contract lump sum price for this item.

(1) Fifty percent (50%) of the lump sum price upon completion of the Contractor's mobilization at the work site.

(2) The remaining fifty percent (50%) upon completion of the demobilization.

(b) The Contracting Officer may require the Contractor to furnish cost data to justify this portion of the bid if the Contracting Officer believes that the percentages in paragraphs (a)(1) and (2) of this clause do not bear a reasonable relation to the cost of the work in this contract.

(1) Failure to justify such price to the satisfaction of the Contracting Officer will result in payment, as determined by the Contracting Officer, of --

(i) Actual mobilization costs at completion of mobilization;

(ii) Actual demobilization costs at completion of demobilization; and

(iii) The remainder of this item in the final payment under this contract.

(2) The Contracting Officer's determination of the actual costs in paragraph (b)(1) of this clause is not subject to appeal.

(c) This item is not to be confused with Emergency De-mobilization and Re-mobilization due to floods. See Specifications Section 01050 for more information.

SC-12 AND SC-13 DELETED.

SC-14. EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE (MAY 1999)-(EFARS 52.231-5000)

(a) This clause does not apply to terminations. See 52.249-5000, Basis for Settlement of Proposals and FAR Part 49.

(b) Allowable cost for construction and marine plant and equipment in sound workable condition owned or controlled and furnished by a contractor or subcontractor at any tier shall be based on actual cost data for each piece of equipment or groups of similar serial and series for which the Government can determine both ownership and operating costs from the contractor's accounting records. When both ownership and operating costs cannot be determined for any piece of equipment or groups of similar serial or series equipment from the contractor's accounting records, costs for that equipment shall be based upon the applicable provisions of EP 1110-1-8, Construction Equipment Ownership and Operating Expense Schedule, Region VIII. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the contracting officer. For equipment

not included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retroactive pricing, the schedule in effect at the time the work was performed shall apply.

(c) Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(ii) and FAR 31.205-36. Rates for equipment rented from an organization under common control, lease-purchase arrangements, and sale-leaseback arrangements, will be determined using the schedule, except that actual rates will be used for equipment leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees.

(d) When actual equipment costs are proposed and the total amount of the pricing action exceeds the small purchase threshold, the contracting officer shall request the contractor to submit either certified cost or pricing data, or partial/limited data, as appropriate. The data shall be submitted on Standard Form 1411, Contract Pricing Proposal Cover Sheet.

(e) Copies of EP1110-1-8 “Construction Equipment Ownership and Operating Expense Schedule” Volumes 1 through 12 are available in Portable Document Format (PDF) and can be viewed or downloaded at http://www.usace.army.mil/inet/usace-docs/eng-pamplets/cecw.htm. A CD-ROM containing (Volumes 1-12) is available through either the Superintendent of Documents or Government bookstores. For additional information telephone 202-512-2250, or access on the Internet at http://www.access.gpo.gov/su_docs.

SC-15. PAYMENT FOR MATERIALS DELIVERED OFF-SITE (MAY 1999)-(EFARS 52.232-5000)

(a) Pursuant to FAR clause 52.232-5, Payments Under Fixed Priced Construction Contracts, materials delivered to the contractor at locations other than the site of the work may be taken into consideration in making payments if included in payment estimates and if all the conditions of the General Provisions are fulfilled. Payment for items delivered to locations other than the work site will be limited to: (1) materials required by the technical provisions; or (2) materials that have been fabricated to the point where they are identifiable to an item of work required under this contract.

(b) Such payment will be made only after receipt of paid or receipted invoices or invoices with canceled check showing title to the items in the prime contractor and including the value of material and labor incorporated into the item.

SC-16 AND SC-17 DELETED.

SC-18. CONTRACT DRAWINGS, MAPS, AND SPECIFICATIONS (OCT 1996) (52.0236-4001 EBS)

(a) The Government--

(1) Will provide the Contractor, without charge, one set of contract drawings and one set of specifications in electronic format on a compact disk. The Government will not give the Contractor any hard copy paper drawings or specifications for any contract resulting from this solicitation.

(b) The Contractor shall--

(1) check all drawings furnished immediately upon receipt;

(2) Compare all drawings and verify the figures before laying out the work;

(3) Promptly notify the Contracting Officer of any discrepancies; and

(4) Be responsible for any errors which might have been avoided by complying with this paragraph (b).

(c) Large scale drawings shall, in general, govern small scale drawings. Figures marked on drawings shall, in general, be followed in preference to scale measurements.

(d) Omissions from the drawings or specifications or the misdescription of details of work which are manifestly necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work, but shall be performed as if fully and correctly set forth and described in the drawings and specifications.

(e) The work shall conform to the specifications and the contract drawings identified in the index of drawings attached at the end of the Special Clauses.

SC-19 THROUGH SC-21 DELETED.

SC-22. EPA ENERGY STAR: The Government requires that certain equipment be Energy Star compliant. Initially, the sole Energy Star requirement shall be the self certification by the bidder that the specified equipment is Energy Star compliant. Within 3 months of the availability of an EPA sanctioned test for Energy Star compliance, the Contractor shall submit all equipment upgrades and additions for testing and provide proof of compliance to the Government upon completion of testing. Testing shall be at the Contractor's expense.

SC-23. RECOVERED MATERIALS: The Corps of Engineers encourages all bidders to utilize recovered materials to the maximum extent practicable. The attached APPENDIX R contains procurement guidelines for products containing recovered materials.

APPENDIX R

PART 247 - COMPREHENSIVE PROCUREMENT GUIDELINE FOR PRODUCTS CONTAINING RECOVERED MATERIALS

40 CFR Ch. 1 (9-1-99 Edition)

Subpart B-Item Designations

§ 247.10 Paper and paper products.

Paper and paper products, excluding building and construction paper grades.

§ 247.11 Vehicular products.

(a) Lubricating oils containing re-refined oil, including engine lubricating oils, hydraulic fluids, and gear oils, excluding marine and aviation oils.
(b) Tires, excluding airplane tire
(e) Reclaimed engine coolants, excluding coolants used in non-vehicular applications.

247.12 Construction products.

(a) Building insulation product including the following items:
(1) Loose-fill insulation, including but not limited to cellulose fiber, mineral fibers (fiberglass and rock vermiculite, and perlite;
(2) Blanket and batt insulation, including but not limited to mineral fibers (fiberglass and rock wool).
(3) Board (sheathing, roof decking wall panel) insulation, including but not limited to structural fiberboard and laminated paperboard products perlite composite board, polyurethane, polyisocyanurate, polystyrene, phenolics, and composites; and
(4) Spray-in-place insulation, including but not limited to foam-in-place polyurethane and polyisocyanurate and spray-on cellulose.
(b) Structural fiberboard and laminated paperboard products for applications other than building insulation, including building board, sheathing shingle backer, sound deadening board, roof insulating board, insulating wallboard, acoustical and non-acoustical ceiling tile, acoustical and non-acoustical lay-in panels, floor underlayments, and roof overlay (cover board).
(c) Cement and concrete, including concrete products such as pipe and block, containing coal fly as ground granulated blast furnace (GGBF) slag.
(d) Carpet made of polyester fiber use in low- and medium-wear applications.
(e) Floor tiles and patio block containing recovered rubber or plastic.
(f) Shower and restroom dividers/partitions containing recovered plastic or steel.
(g) (1) Consolidated latex paint used for covering graffiti; and
(2) Reprocessed latex paint used for interior and exterior architectural applications such as wallboard, ceilings, and trim; gutter boards; and concrete, stucco, masonry, wood and metal surfaces.

§247.13 Transportation products.

(a) Traffic barricades and traffic cones used in controlling or restricting vehicular traffic.
(b) Parking stops made from concrete or containing recovered plastic or rubber.
(c) Channelizers containing recovered plastic or rubber.
(d) Delineators containing recovered plastic, rubber, or steel.

(e) Flexible delineators containing recovered plastic.

§ 247.14 Park and recreation products

(a) Playground surfaces and running tracks containing recovered rubber or plastic.
(b) Plastic fencing containing recovered plastic for use in controlling snow or sand drifting and as a warning/safety barrier in construction or other applications.

247.15 Landscaping products.

(a) Hydraulic mulch products containing recovered paper or recovered wood used for hydroseeding and as an over-spray for straw mulch in landscaping, erosion control, and soil reclamation.
(b) Compost made from yard trimmings, leaves, and/or grass clippings for use in landscaping, seeding of grass or other plants on roadsides and embankments, as a nutritious mulch under trees and shrubs, and in erosion control and soil reclamation.
(c) Garden and soaker hoses containing recovered plastic or rubber.
(d) Lawn and garden edging containing recovered plastic or rubber.

§ 247.16 Non-paper office product.

(a) Office recycling containers and office waste receptacles.
(b) Plastic desktop accessories.
(c) Toner cartridges.
(d) Binders.
(e) Plastic trash bags.
(f) Printer ribbons.
(g) Plastic envelopes.

§ 247.17 Miscellaneous products.

Pallets containing recovered wood, plastic, or paperboard.

INDEX OF DRAWINGS
FILE NUMBER E-56-14-17
COFFERDAM AND EXCAVATION
HOWARD HANSON DAM, GREEN RIVER, WASHINGTON

SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
1	G-1.1	Cover Sheet With Vicinity Map		27 JUN 03
2	G-1.2	Drawing Index, Abbreviations, & Legends		27 JUN 03
3	G-1.3	General Notes		27 JUN 03
4	G-1.4	Proposed Cofferdam Construction Sequence Sheet 1		27 JUN 03
5	G-1.5	Proposed Cofferdam Construction Sequence Sheet 2		27 JUN 03
6	GT-1.1	Boring Log 94-DD-80		27 JUN 03
7	GT-1.2	Boring Log 94-DD-81		27 JUN 03
8	GT-1.3	Boring Log 94-DD-85		27 JUN 03
9	GT-1.4	Boring Log 94-DD-86		27 JUN 03
10	GT-1.5	Boring Log 94-DD-87		27 JUN 03
11	GT-1.6	Boring Log 99-DD-200		27 JUN 03
12	GT-1.7	Boring Log 99-DD-201		27 JUN 03
13	GT-1.8	Boring Log 99-DD-202		27 JUN 03
14	GT-1.9	Boring Log 99-DD-203		27 JUN 03
15	GT-1.10	Boring Log 99-DD-204		27 JUN 03
16	GT-1.11	Boring Log 99-DD-205		27 JUN 03
17	GT-1.12	Boring Log 99-DD-206		27 JUN 03
18	GT-1.13	Boring Log 00-DD-207		27 JUN 03
19	GT-1.14	Boring Log 00-DD-208		27 JUN 03
20	GT-1.15	Boring Log 00-DD-209		27 JUN 03
21	GT-1.16	Boring Log 00-DD-210		27 JUN 03
22	GT-1.17	Boring Log 00-DD-211		27 JUN 03
23	GT-1.18	Boring Log 00-DD-212		27 JUN 03
24	GT-1.19	Boring Log 00-DD-213		27 JUN 03
25	GT-1.20	Boring Log 00-DD-214		27 JUN 03
26	GT-1.21	Boring Log 00-DD-215		27 JUN 03
27	GT-1.22	Boring Log 00-DD-216		27 JUN 03

SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
28	GT-1.23	Boring Log 00-DD-217		27 JUN 03
29	GT-1.24	Boring Log 00-DD-218		27 JUN 03
30	GT-1.25	Boring Log 01-DD-222		27 JUN 03
31	GT-1.26	Boring Log 01-DD-223		27 JUN 03
32	GT-1.27	Boring Log 01-DD-224		27 JUN 03
33	GT-1.28	Boring Log 01-DD-225		27 JUN 03
34	GT-1.29	Boring Log 01-DD-226		27 JUN 03
35	GT-1.30	Boring Log 01-DD-227		27 JUN 03
36	GT-1.31	Boring Log 01-DD-228		27 JUN 03
37	GT-1.32	Boring Log 01-DD-229		27 JUN 03
38	GT-1.33	Boring Log 01-DD-230		27 JUN 03
39	GT-1.34	Boring Log 03-DD-231, Sheet 1		27 JUN 03
40	GT-1.35	Boring Log 03-DD-231, Sheet 2		27 JUN 03
41	GT-1.36	Boring Log 03-DD-232, Sheet 1		27 JUN 03
42	GT-1.37	Boring Log 03-DD-232, Sheet 2		27 JUN 03
43	GT-1.38	Boring Log 03-DD-233, Sheet 1		27 JUN 03
44	GT-1.39	Boring Log 03-DD-233, Sheet 2		27 JUN 03
45	GT-1.40	Boring Log 03-DD-233, Sheet 3		27 JUN 03
46	GT-1.41	Boring Log 03-DD-234, Sheet 1		27 JUN 03
47	GT-1.42	Boring Log 03-DD-234, Sheet 2		27 JUN 03
48	GT-1.43	Boring Log 03-DD-235, Sheet 1		27 JUN 03
49	GT-1.44	Boring Log 03-DD-235, Sheet 2		27 JUN 03
50	GT-1.45	Boring Log 03-DD-236, Sheet 1		27 JUN 03
51	GT-1.46	Boring Log 03-DD-236, Sheet 2		27 JUN 03
52	GT-1.47	Boring Log 03-DD-237, Sheet 1		27 JUN 03
53	GT-1.48	Boring Log 03-DD-237, Sheet 2		27 JUN 03
54	GT-1.49	Boring Log 03-DD-238, Sheet 1		27 JUN 03
55	GT-1.50	Boring Log 03-DD-238, Sheet 2		27 JUN 03
56	GT-2.2	Project Bedrock Geology Map		27 JUN 03
57	GT-2.3	Geologic Section A-A'		27 JUN 03
58	GT-2.4	Geologic Section B-B'		27 JUN 03
59	GT-2.5	Geologic Section C-C'		27 JUN 03
60	GT-2.6	Geologic Section D-D'		27 JUN 03

SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
61	GT-2.7	Geologic Section E-E'-E"		27 JUN 03
62	GT-2.8	Geologic Section F-F'-F"		27 JUN 03
63	GT-1.10	Excavation Plan Showing Rock Bolt Configuration		27 JUN 03
64	GT-2.11	Excavation Rock Bolt Elevations, Sheet 1		27 JUN 03
65	GT-2.12	Excavation Rock Bolt Elevations, Sheet 2		27 JUN 03
66	GT-2.13	Excavation Rock Bolt Elevations, Sheet 3		27 JUN 03
67	GT-2.14	Excavation Rock Bolt Elevations, Sheet 4		27 JUN 03
68	GT-3.1	Instrumentation Plan		27 JUN 03
69	GT-3.2	Instrumentation Schedule		27 JUN 03
70	GT-3.3	Instrumentation Section, Sheet 1		27 JUN 03
71	GT-3.4	Instrumentation Section, Sheet 2		27 JUN 03
72	GT-3.5	Instrumentation Section, Sheet 3		27 JUN 03
73	GT-3.6	Instrumentation Section, Sheet 4		27 JUN 03
74	GT-3.7	Instrumentation Details, Sheet 1		27 JUN 03
75	GT- 4.1	Cofferdam Grouting Plan		27 JUN 03
76	GT-4.2	Cofferdam Grouting Sections		27 JUN 03
77	GT-4.3	Cofferdam Grouting Schedules, Sheet 1		27 JUN 03
78	GT-4.4	Cofferdam Grouting Schedules, Sheet 2		27 JUN 03
79	GT-4.5	Dewatering Plan		27 JUN 03
80	GT-4.6	Seismic Retrofit Grout Curtain Plan And Profiles		27 JUN 03
81	EP-1.1	Environmental Site Control General Site Layout And Keyplan Features		27 JUN 03
82	EP-1.2	Environmental Site Control Collection Basin Layout And Notes		27 JUN 03
83	EP-1.3	Environmental Site Controls Layout And Features-1		27 JUN 03
84	EP-1.4	Environmental Site Controls Layout And Features-2		27 JUN 03
85	EP-1.5	Environmental Site Controls Sedimentation Pond Layout		27 JUN 03
86	EP-2.1	Environmental Site Control Details		27 JUN 03
87	EP-2.3	Environmental Site Controls Details-1		27 JUN 03
88	EP-2.4	Environmental Site Controls Details-2		27 JUN 03

SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
89	S2.17	Environmental Site Control Sedimentation Pond Details		27 JUN 03
90	C1.1	General Site Plan		27 JUN 03
91	C1.2	Disposal Sites		27 JUN 03
92	C1.3	Demolition Plan		27 JUN 03
93	C1.4	Excavation Plan - Phase Ia & Ib		27 JUN 03
94	C1.5	Excavation Plan - Phase Ic		27 JUN 03
95	C1.6	Excavation Sections & Details I		27 JUN 03
96	C2.1	Temporary Access Road Plan And Profile I		27 JUN 03
97	C2.2	Temporary Access Road Plan And Profile Ii		27 JUN 03
98	C2.3	Temporary Access Road - Cross Sections I		27 JUN 03
99	C2.4	Temporary Access Road - Cross Sections Ii		27 JUN 03
100	C2.5	Tremie Concrete Infill And Miscellaneous Details		27 JUN 03
101	S1.1	Plans		27 JUN 03
102	S1.2	Elevation And Sections		27 JUN 03
103	S2.1	Precast Concrete Structure Layout, Sheet 1		27 JUN 03
104	S2.2	Precast Concrete Structure Layout, Sheet 2		27 JUN 03
105	S2.3	Precast Concrete Structure Segment A, Detail Sheet 1		27 JUN 03
106	S2.4	Precast Concrete Structure Segment A, Detail Sheet 2		27 JUN 03
107	S2.5	Precast Concrete Structure Segment B, Detail Sheet 1		27 JUN 03
108	S2.6	Precast Concrete Structure Segment B, Detail Sheet 2		27 JUN 03
109	S2.7	Precast Concrete Structure Segment C, Detail Sheet 1		27 JUN 03
110	S2.8	Precast Concrete Structure Segment C, Detail Sheet 2		27 JUN 03
111	S2.9	Precast Concrete Structure Segments D & E, Sheet 1		27 JUN 03
112	S2.10	Precast Concrete Structure Segments D & E, Sheet 2		27 JUN 03
113	S2.11	Precast Concrete Structure Segments F & G		27 JUN 03
114	S2.12	Precast Concrete Structure Segment H		27 JUN 03

SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
115	S2.13	Precast Concrete Structure Segment J & K		27 JUN 03
116	S2.14	Precast Concr. Structure Segments L, M, N, & P, Sheet 1		27 JUN 03
117	S2.15	Precast Concr. Structure Segments L, M, N, & P, Sheet 2		27 JUN 03
118	S2.16	Precast Concrete Structure Backflood Pipe		27 JUN 03
119	S2.17	Precast Concrete Structure Segment Anchor Details		27 JUN 03
120	S2.18	Typical Stoplog Bearing & Seal Surface And Segment Joint Details		27 JUN 03
121	S2.19	Precast Concrete Segment Support Frame Sheet 1		27 JUN 03
122	S2.20	Precast Concrete Segment Support Frame Sheet 2		27 JUN 03
123	S3.1	Cast-In-Place Concrete South Wall Detail Sheet 1		27 JUN 03
124	S3.2	Cast-In-Place Concrete South Wall Detail Sheet 2		27 JUN 03
125	S3.3	Cast-In-Place Concrete North Wall Detail Sheet 1		27 JUN 03
126	S3.4	Cast-In-Place Concrete North Wall Detail Sheet 2		27 JUN 03
127	S3.5	Cast-In-Place Concrete North Wall Detail Sheet 3		27 JUN 03
128	S3.6	Cast-In-Place Concrete Crane Rail Support Beams Sht. 1		27 JUN 03
129	S3.7	Cast-In-Place Concrete Crane Rail Support Beams Sht. 2		27 JUN 03
130	S3.8	South Wall Rock Anchors		27 JUN 03
131	S3.9	South Wall Rock Anchor Details		27 JUN 03
132	S3.10	South Counterfort Walls Elevations And Sections		27 JUN 03
133	S3.11	Waterproof Wall Joint Between Phase 1 And Phase 2		27 JUN 03
134	S4.1	Trash Rack Detail Sheet 1		27 JUN 03
135	S4.2	Trash Rack Detail Sheet 2		27 JUN 03
136	S4.3	Trash Rack Detail Sheet 3		27 JUN 03
137	S5.1	Stoplog Details Sheet 1		27 JUN 03

SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
138	S5.2	Stoplog Details Sheet 2		27 JUN 03
139	S5.3	Stoplog Details Sheet 3		27 JUN 03
140	S5.4	Stoplog Details Sheet 4		27 JUN 03
141	S5.5	Lifting Beam Plan & Elevation		27 JUN 03
142	S5.6	Lifting Beam Detail Sheet 1		27 JUN 03
143	S5.7	Lifting Beam Detail Sheet 2		27 JUN 03
144	S6.1	Flood / Retaining Walls, Sheet 1		27 JUN 03
145	S6.2	Flood / Retaining Walls, Sheet 2		27 JUN 03
146	S6.3	Personnel Stair Plan And Sections		27 JUN 03
147	S6.4	Personnel Stair Details		27 JUN 03
148	S7.1	Access Road Permanent Retaining Wall, Plan And Elevation		27 JUN 03
149	S7.2	Access Road Permanent Retaining Wall, Details		27 JUN 03
150	S8.1	Existing Intake Tower Seismic Retrofit Trashrack Beams		27 JUN 03
151	S8.2	Existing Intake Tower Seismic Retrofit Wingwalls		27 JUN 03
152	S8.3	Existing Intake Tower Seismic Retrofit Plan & Elevation		27 JUN 03
153	S8.4	Existing Intake Tower Seismic Retrofit Section And Detail 1		27 JUN 03
154	S8.5	Existing Intake Tower Seismic Retrofit Section And Detail 2		27 JUN 03
155	S8.6	Existing Intake Tower Seismic Retrofit Tremie Concrete		27 JUN 03

REFERENCE DRAWINGS

Reference drawings provided show conditions at time of construction. These drawings are furnished for information only and the Government does not warrant that conditions will be exactly as shown. Minor deviations can be anticipated and shall not be the basis for a claim for extra compensation.

DRAWING NUMBER	SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
	156	25	Spillway General Layout		23 AUG 59
	157	27	Spillway Intermediate Pier Plan, Elevations & Sections		12 SEP 58
	158	28	Spillway Intermediate Pier Reinforcement		12 SEP 58
	159	29	Spillway Left Abutment Pier Plan, Elevations & Sections		12 SEP 58
	160	33	Spillway Right Abutment		10 OCT 60
	161	42	Spillway Crest Gate Elevations & Sections		12 SEP 58
	162	43	Spillway Crest Gate Details		12 SEP 58
	163	44	Spillway Crest Gate Details		12 SEP 58
	164	48	General Layout		12 SEP 58
	165	49	Substructure Sectional Plans I		12 SEP 58
	166	50	Substructure Sectional Plans II	B	21 APR 65
	167	51	Substructure Sectional Elevations I	B	22 SEP 59
	168	52	Substructure Sectional Elevations II	B	22 SEP 59
	169	53	Substructure Elevations	C	22 SEP 59
	170	54	Substructure Plans & Sections	B	28 AUG 59
	171	55	Reinforcement I	B	27 OCT 58
	172	56A	Reinforcement IIA		28 AUG 58
	173	56B	Reinforcement IIB	A	21 APR 65

DRAWING NUMBER	SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
	174	57	Reinforcement III	B	21 APR 65
	175	58	Reinforcement IV	A	3 OCT 58
	176	59	Trash Rack Bars		12 SEP 58
	177	65	Equipment General Arrangement I		12 SEP 58
	178	66	Equipment General Arrangement II	A	21 APR 65
	179	67	Regulating Gate Plans & Sections	A	21 APR 65
	180	68	Regulating Gate Elevations & Sections	A	21 APR 65
	181	69	Regulating Gate Details		12 SEP 58
	182	70	Regulating Gate Details	A	21 APR 65
	183	71	Regulating Gate Seals	A	21 APR 65
	184	72	Regulating Gate Hoist Assembly	A	21 APR 65
	185	87	Tunnel Upstream Transition		12 SEP 58
	186	88A	Tunnel Sections & Details	A	27 OCT 58
	187	88B	Tunnel Downstream Transition	A	27 OCT 58
	188	89	Stilling Basin Plan & Section I	B	10 APR 61
	189	90	Stilling Basin Plan & Section II	C	21 APR 65
	190	91	Stilling Basin Sections	C	10 APR 61
	191	92	Stilling Basin Details	B	2 FEB 60
	192	93	Stilling Basin Bypass Outlet Gate	A	10 APR 61
	193	94	Bridge Plan, Elevation & Sections	D	10 APR 61
	194	95	Bridge Detail Plan, Elevation & Sections	B	10 OCT 60
	195	96	Bridge Details	A	3 OCT 58
	196	97	Bridge Piers	A	3 OCT 58

DRAWING NUMBER	SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
	197	G-1	Seismic Upgrade – Cover Sheet		1 NOV 96
	198	G-2	Seismic Upgrade – Index		1 NOV 96
	199	G-3	Seismic Upgrade – Site Map		1 NOV 96
	200	G-4	Existing Surface Topography		1 NOV 96
	201	S-1	Structural Notes And Rock Anchor Detail		1 NOV 96
	202	S-2	Modifications To The Existing Bridge And Tower		20 NOV 95
	203	S-3	Foundation		1 NOV 96
	204	S-4	Elevation & Section		1 NOV 96
	205	S-5	Details I		1 NOV 96
	206	S-6	Details II		1 NOV 96
	207	S-7	Footing Caps		1 NOV 96
	208	S-8	Shear Panels for Pier I		1 NOV 96
	209	S-9	Shear Panels For Piers 2 And 3		1 NOV 96
	210	S-10	Shear Panel Sections		1 NOV 96
	211	S-11	Deck Restraint Cable Details		1 NOV 96
	212	S-12	Deck Lateral Restraint		1 NOV 96
	213	M-1	Hoist Carriage Restraint		1 NOV 96
	214	GT-1A	Instrumentation On Existing Structures, Site Plan	`	3 JUL 03
	215	GT-1B	Instrumentation On Existing Structures, Outlet Tunnel Plan		3 JUL 03
	216	GT-2	Instrumentation On Existing Structures, Instrumentation Schedule		3 JUL 03
	217	GT-3	Instrumentation On Existing		3 JUL 03

DRAWING NUMBER	SHEET NUMBER	PLATE NUMBER	TITLE	REVISION NUMBER	DATE
			Structures, Structure Elevation		
	218	Gt-4	Instrumentation On Existing Structures, Liquid Level Gages		3 JUL 03
	219	GT-5	Instrumentation On Existing Structures, Intake Tower Instruments, Seismic Retrofit		3 JUL 03
	220	GT-6	Instrumentation On Existing Structures, North Wall Cofferdam Instruments		3 JUL 03
	221	P-1	Existing Intake Tower Photograph		26 JUN 03

STANDARD DETAILS BOUND IN THE SPECIFICATIONS

DRAWING NUMBER	SHEET NUMBER	TITLE	DATE
SECTION 01501 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS			
	1, 2	Civil Works Project Identification Sign	REV 07APR88
	1	Hard Hat Sign	10SEP90

END OF SECTION

HOWARD HANSON DAM
COFFERDAM FOUNDATION AND EXCAVATION CONTRACT – FISH PASSAGE FACILITY, ADDITIONAL WATER STORAGE PROJECT

GEOTECHNICAL BASELINE REPORT

HOWARD HANSON DAM
COFFERDAM FOUNDATION AND EXCAVATION CONTRACT
- FISH PASSAGE FACILITY, ADDITIONAL WATER STORAGE PROJECT

GEOTECHNICAL BASELINE REPORT

TABLE OF CONTENTS

List of Figures

HOWARD HANSON DAM
COFFERDAM FOUNDATION AND EXCAVATION CONTRACT
- FISH PASSAGE FACILITY, ADDITIONAL WATER STORAGE PROJECT

GEOTECHNICAL BASELINE REPORT

PART 1 – GENERAL

1.1 General Information

This report is part of the contract documents for the Howard Hanson Dam Cofferdam Foundation and Excavation Contract – Fish Passage Facility, Additional Water Storage Project.

This Geotechnical Baseline Report (GBR) presents the Government's interpretation of the anticipated subsurface conditions to be encountered during the execution of this contract and to record the basis of the design developed in the Drawings and Specifications. This report, and documents and drawings incorporated by reference, shall be considered to be the sole source of the Government's interpretation of the geotechnical conditions for this contract. This report also establishes the geotechnical baseline that serves as a basis for the identification of differing site conditions. The sources of the geotechnical data on which this report is based are referenced in Paragraph 1.6.

In developing the geotechnical criteria used in the design and preparation of the Contract Documents, certain assumptions have been made concerning the contractor's construction methods and performance capabilities. The actual procedures, techniques and craftsmanship employed by the Contractor may result in ground behavior different from that postulated herein.

This report is prepared in three parts: Part 1 provides background information regarding this document, Part 2 gives general background information regarding the project site conditions, and Part 3 establishes the geotechnical baseline and some construction considerations.

1.2 Description of Work

Geotechnical work to be performed under this contract is outlined in the contract Drawings and Specifications. Some, but not all, of the work to be performed includes rock excavation, overburden excavation, foundation preparation, foundation grouting, installation and operation of a dewatering system, installation of geotechnical instruments, design and construction of retaining walls/berms, and rock mass stabilization.

1.3 Intended Methods

Activities conducted under this contract shall be carried out in accordance with the procedures and practices outlined in the contract. Required specifications for materials and equipment are also included in the contract Drawings and Specifications.

1.4 References

The following references were used in the preparation of this document or in the evaluation of the data presented in this document (to include Appendix A):

- American Society for Testing and Materials, 1995, Standard Test Method for Unconfined Compressive Strength of Intact Rock Core Specimens (D2938-95)
- American Society for Testing and Materials, 1998, Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass (D2216-98)
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- Hammond, P.E., 1963, Structure and stratigraphy of the Keechelus volcanic group and associated Tertiary rocks in the West-Central Cascade Range, Washington, Ph.D. dissertation, University of Washington, 264 p.
- Hoek, E. and Bray, J., 1981, Rock Slope Engineering, Third Edition, Chapman & Hall, Inc.
- International Society of Rock Mechanics, 1981, Suggested Method for Laboratory Determination of direct Shear Strength
- Neuman, S.P., 1975, Analysis of pumping test data from anisotropic unconfined aquifers concerning delayed gravity response: Water Resources research, v. 11, No. 2, p. 329-342.
- U. S. Army Corps of Engineers, 1983, Earthquake Analysis of Howard Hanson Dam, Design Memorandum No. 26: Seattle District, Seattle, Washington.
- U.S. Army Corps of Engineers, 1994, Rock Foundations (EM 1110-1-2908)
- U. S. Army Corps of Engineers, 1998, Additional Water Supply Project, Final Feasibility Study Report and Final Environmental Impact Statement (EIS), Howard Hanson Dam, Green River, Washington: Seattle District, Seattle, Washington.
- U.S. Department of the Interior, Bureau of Reclamation, 1985, Ground Water Manual, Third Edition, A Water Resources Technical Publication

1.5 Definitions

Definitions are primarily taken from the Dictionary of Geological Terms, edited by Bates and Jackson.

Aphanitic	Textural term applied to any fine-grained igneous rock whose constituents are too small to be distinguished by the unaided eye.
Ash	Pyroclastic material under 2 mm in diameter.
Autobreccia	Syn-depositional texture developed through the non-uniform cooling of a volcanic flow. The outer margins of the flow cool more rapidly and are subsequently incorporated into the remainder of the flow as solid fragments from 2 mm to greater than 64 mm.
Blocks/Bombs	Pyroclastic material greater than 64 mm in diameter.
Glaciolacustrine	General classification of sediments derived from or deposited in glacial lakes.
Hypabyssal	General adjective applied to minor intrusions such as sills and dikes which have crystallized under conditions intermediate between plutonic and extrusive.
Lapilli	Pyroclastic material between 2 mm and 64 mm.
Lapilli Tuff	Pyroclastic rock composed of roughly equal parts of lapilli and ash.
Moraine	Unstratified sediments deposited directly by the actions of glacial ice. Sediments typically include a mixture of clay, silt, sand, gravel, and boulders.
Porphyritic	Textural term applied to an igneous rock which contains some constituents which are visible to the naked eye. The remainder of the constituents are aphanitic.
Pyroclastic Rock	Any primary rock composed of solid materially explosively or aerially ejected from a volcanic vent.
Tuff	Pyroclastic rock predominately composed of volcanic ash.
Tuff Breccia	Pyroclastic rock composed of roughly equal parts blocks/bombs and lapilli or ash.

1.6 Sources of Information

Geotechnical data used in the preparation of this report is presented in Appendix A and in the following documents:

- NORCAL Geophysical Consultants, 2001, Borehole Geophysical Logging Survey, Cofferdam and Fish Collection Facility, Howard Hanson Dam, King county, Green River, Washington. Contract No. DACW67-99-M-0436.
- NORCAL Geophysical Consultants, 2000, Borehole Geophysical Logging Survey, Cofferdam and Fish Collection Facility, Howard Hanson Dam, King county, Green River, Washington. Contract No. DACW67-99-M-0436.
- Shannon & Wilson, Inc., 2002, 95% Draft Geotechnical Report, Howard Hanson Dam Fish Bypass Facility, Excavation and Tunnel Rock Support Analyses and Recommendations, Eagle Gorge, Washington. Contract No. DACW67-00-D-2002, Task Order Nos. 8, 9, and 11.
- Shannon & Wilson, Inc., 2000, Geotechnical Report: Cofferdam Rock Mass Study, Howard Hanson Dam, Eagle Gorge, Washington, Contract No. DACW67-00-D-2002, Task Order No. 2.

- U. S. Army Corps of Engineers, 1963, Howard A. Hanson Dam Foundation Report, Rock Fill Dam, Spillway and Outlet Works, Green River, Washington: Seattle District, Seattle, Washington

1.7 Design Team

The Seattle District Corps of Engineers, in conjunction with Shannon & Wilson, Inc. and Inca Engineers Inc., performed the design work for this contract. The project manager for this project is Mike Padilla, Seattle District Corps of Engineers, phone number 206-764-6734. The senior geologist for this contract is Richard Smith, Seattle District Corps of Engineers, phone number 206-764-3309.

1.8 Geotechnical Explorations

Between 1994 and 2003, United States Army Corps of Engineers personnel conducted a series of exploration programs in support of the Howard Hanson Dam – Fish Passage Facility project. These programs included field and laboratory based investigations. Field investigations included geologic mapping of surface outcrops, drilling and logging of 41 core borings, borehole packer and groundwater pumping tests, topographic and sediment bathymetry of the left abutment, excavation of four shallow test pits, and borehole geophysics. Acoustic televiewer, optical televiewer, caliper, temperature-fluid conductivity, heat-pulse flow meter, and sonic profile surveys were the geophysical methods employed.

Laboratory investigations included petrographic analyses of thin sections and laboratory tests on select rock core samples. Laboratory tests included unconfined compressive strength, splitting tensile strength, and direct shear tests.

Borehole locations and logs are presented in the Drawings (plate GT2.2 and GT1.1 thru GT1.50, respectively).

PART 2 – GENERAL SITE CONDITIONS

2.1 Location and Access

The Howard Hanson Dam (HHD) is located on the Green River, within the Green River Watershed, approximately 35 miles southeast of Seattle, Washington. Access to the Green River Watershed, and therefore the project site, is restricted. Information on arranging access to the project site can be found in the contract Specifications, section 01005. A discussion of general access requirements and availability of access roads is also included in section 01005 of the contract Specifications. Information on widths and locations of access roads is included in the contract Drawings. Directions to the site are included on the cover of the contract Drawings.

2.2 Geologic Background

The dam spans a narrow rock canyon located 5 miles inside the western Cascade margin. To the east, the Cascade Range rises sharply to elevations over 7,000 feet. The Cascades in this part of Washington are largely composed of a complex assemblage of lava flows, pyroclastic deposits, and fluvial sedimentary deposits. Intrusive igneous rocks are present, but to a lesser extent than

those mentioned above. Most of these rocks were deposited during the upper Eocene to Miocene (10 to 40 million years ago) and were later uplifted during the Pliocene (5 million years ago) to form the Cascade Range. This uplift was accompanied by Pliocene and Pleistocene (1 million years ago) volcanism that formed the major Cascade volcanoes such as Mt. Rainier.

The ancestral Green River was tributary to the Cedar River drainage prior to the glaciation of the Puget Sound Lowland. Before the last glacial event the river flowed out of the North Fork Valley to the Cedar. During the Pleistocene, glacial ice extended eastward up into the alpine valley headwaters. The ice and associated glacial deposits (moraine and glaciolacustrine) diverted the proto-Green River from its North Fork Valley. The diverted river flowed on a bedrock floor at elevation 1,000 feet in the river gorge. This gorge is presently buried north of the dam site. The nearest (southwest) rim of the ancestral valley is located several hundred feet northeast of the right abutment of HHD.

During subsequent interglacial periods, the Green River cut its channel approximately 150 feet deeper resulting in over steepened side slopes and collapse of the eastern valley side. Several episodes of deposition, erosion, and landsliding may have followed. The present gorge beneath the dam was cut as a result of river blockage by the last massive slide off the northeast valley wall. Today this landslide is a major landform forming part of the right abutment of HHD.

The present North Cascade Range was uplifted during the Pliocene by a series of complex folds and faults. One such fault is the west-northwest trending Green River fault (also mapped as the Lemolo fault) located approximately 1,500 feet north of the dam (Figure 1). Active during the Miocene and/or Pliocene, the fault shows about 4,000 feet of right-lateral, oblique slip displacement. The width of the fault zone is unknown, although between the area of the dam site and the mountain front, the Green River preferentially follows the weak/fractured zone of this fault trace. Several structural folds are present along the south side of the Green River fault. A landslide at the right (north) abutment obscures the fault trace at the dam. The fault zone probably contributed to the landslide based on the proximity of hydrothermally altered, weaker rock comprising the fault zone. In this area of the Washington Cascades, most major faults strike northwest and dip southwest. Although the strike of the Green River fault west of the dam site reflects this trend, east of the dam site the Green River fault exhibits an east-west trend.

The project site is underlain by bedrock composed of a series of Tertiary age volcanic rocks. Locally, these rocks are known as the Eagle Gorge Andesite, and regionally they correlate with the Fifes Peak formation of early Miocene age. Geologic maps of the area suggest the dam site lies within the western extent of a structural nose of an east-west trending, eastward plunging syncline. The axis of the syncline generally trends parallel to the Green River fault. Regional dip of the bedrock is roughly 45 to 50 degrees to the east.

2.3 Surface and Subsurface Materials

Both bedrock and unconsolidated materials are located on-site. Results from the geotechnical explorations identified in Section 1.8 were used to characterize the properties of these materials. The characteristics of these materials are outlined in the following section.

2.3.1 Bedrock Materials

Bedrock within the project area is entirely igneous in origin and includes volcanic flows, shallow intrusions, and pyroclastic deposits. A top-of-rock contour map is included as Figure 2 for excavation estimation purposes. For the purposes of this project, three informal units have been differentiated: andesite, pyroclastite, and basaltic andesite. A description of each unit and the adopted rock properties are discussed below. Rock mass characterization is discussed in section 2.3.2.

1) Andesite. The Andesite unit accounts for approximately 70 percent of the bedrock volume and is comprised of aphanitic and porphyritic flows and hypabyssal intrusions of intermediate composition. The unit is largely unweathered, of moderate strength, moderately hard to hard, dense, and light to dark grey to dark green. Autobreccia textures are commonly (greater than 50% by volume) displayed within the unit. Discontinuities within the unit include both primary and secondary features. Primary discontinuities are limited to occasional flow banding which does not affect unit stability. Secondary discontinuities are limited to the moderately abundant to abundant fractures. Fracture characteristics are discussed in the closing paragraph of this section.

Adopted Rock Properties (Andesite)

Property	Range	Average (One Std Deviation)
Specific Gravity (Bulk Dry)	2.50 to 2.60	
Moist Unit Weight (pcf)	136.1 to 205.1	
Unconfined Compressive Strength (psi)	2,230 to 27,130	7,363 (4,260)
Shear Strength at 50 psi Normal (psi/phi)	27/29 to 95/62	52(19)/45(10)
Tensile Strength (psi)	413 to 2,540	1,360 (807)
Poisson's Ratio	0.0019 to 0.4325	0.2661 (0.0873)

pcf – pounds per cubic foot
phi – internal angle of friction
psi – pounds per square inch

2) Pyroclastite. The bedrock component attributable to the Pyroclastite unit is roughly 19 percent of the volume. The unit is comprised of basaltic andesite to andesite pyroclastic deposits (tuffs, lapilli tuffs, and tuff breccias). Deposits are light gray to dark gray to buff, soft to moderately hard, and of low to moderate strength. Weathering has strongly impacted surface outcrops but has had little impact on subsurface rocks. The pervasive alteration present within the unit can be inferred as the reason for the unit's rapid deterioration upon exposure to the atmosphere. Discontinuities within the unit include primary depositional features and secondary structures. Primary features do not affect the unit's stability. Secondary fractures within the Pyroclastite unit share the same characteristics as the other units but are more difficult to discern due to the nature of the unit. Fracture characteristics are discussed in the closing paragraph of this section.

Adopted Rock Properties (Pyroclastite)

Property	Range	Average (One Std Deviation)
Specific Gravity (Bulk Dry)	2.25 to 2.35	
Moist Unit Weight (pcf)		not available

Unconfined Compressive Strength (psi)		not available
Shear Strength at 50 psi Normal (psi/phi)		not available
Tensile Strength (psi)		not available

pcf – pounds per cubic foot
phi – internal angle of friction
psi – pounds per square inch

3) Basaltic Andesite. The Basaltic Andesite unit, the youngest bedrock unit in the project area, makes up approximately 11 percent of the bedrock volume. Occurrences of the unit are in the form of dikes, sills, and thin flows. Rocks within the unit are dark gray to black, of moderate to high strength, moderately hard to hard, dense, and blocky. Weathering is minimal and alteration is minimal to moderate. Discontinuities are limited to the abundant secondary fractures. Fracture characteristics are discussed in the closing paragraph of this section.

Adopted Rock Properties (Basaltic Andesite)

Property	**Range**	**Average (One Std Deviation)**
Specific Gravity (Bulk Dry)	2.60 to 2.65	
Moist Unit Weight (pcf)	159.2 to 170.4	
Unconfined Compressive Strength (psi)	4,730 to 10,390	8,140 (3,003)
Shear Strength at 50 psi Normal (psi/phi)	31/31	31/31
Tensile Strength (psi)		not available

pcf – pounds per cubic foot
phi – internal angle of friction
psi – pounds per square inch

Secondary structures within all three bedrock units share common characteristics. Fracture spacing ranges from tenths of inches to several feet. Fracture aperture ranges from less than 0.1 mm to greater than 5.0 mm with some fractures healed or partially healed with calcite. Chlorite, calcite, and pyrite are the three most common fracture coatings. Slickenside fractures have been identified in all three units but are most common within the Basaltic Andesite unit.

2.3.2 Rock Mass Classification and Slope Stability

The following section addresses the anticipated excavation rock slope stability and the parameters used in anticipating slope stability.

2.3.2.1 Discontinuities – Orientation and Condition

Throughout the course of the exploration programs identified in section 1.8, data has been collected regarding the frequency, orientation, and condition of discontinuities in the rock mass.

Orientations of discontinuities were measured in core borings using geophysical logging techniques (optical and acoustic borehole televiewers) and along surface outcrops and drill core using conventional mapping and logging techniques. To assess the uniformity of joint orientations, approximately 1,200 discontinuities were analyzed using stereonets following the recommendations by Call, et al. Although a broad spectrum of discontinuity orientations were observed, only statistically significant clusterings of data points were selected as preferred joint

orientations. The selected preferred joint orientations are listed here and the mean pole orientations are shown in Figure 3.

Approximate Preferred Orientations of Discontinuities

Joint Set Designation	Dip Direction (degrees)	Dip (degrees)
J1	215	90
J2	135	45
J3	75	50
J4	10	25
J5	240	53
J6	295	55
J7	155	20

2.3.2.2 Rock Mass Ratings

Three rock mass classification methods were used to determine the overall quality of the rock mass for engineering purposes. The methods used were the Rock Quality Designation (RQD), Rock Mass Rating (RMR), and Tunnel Quality Index (Q-system) methods. Each of these methods is discussed in the following sections.

1) RQD. The RQD method is expressed as a ratio of the sum of intact core pieces greater than four inches in length to the total length of the core run. This is a quick and easy way to quantify the frequency and intensity of discontinuities within a rock mass and is used as a parameter in the other classification methods discussed here. Bedrock within the project area has an average RQD of 74.08%. Average RQD by unit is as follows: Andesite – 86.17%, Pyroclastite – 83.63%, Basaltic Andesite – 55.08%.

RQD Values

RQD (%)	≤ 25	25 ≤ 50	50 ≤ 75	75 ≤ 90	90 ≤ 100
Rock Quality	Very Poor	Poor	Fair	Good	Excellent

2) RMR. The RMR system was proposed by Bieniawski (1973) and initially used for tunneling conditions. The RMR system considers six parameters:

- Uniaxial compressive strength of the intact rock
- RQD
- Spacing of discontinuities
- Condition of discontinuities
- Ground water conditions
- Orientation of discontinuities

The above parameters are dependent on the rock mass condition and quality. The last two parameters, however, are also dependent on the location and orientation of the proposed structure with respect to depth of the groundwater table and the orientation of the discontinuities. For this

report, 'completely dry' groundwater conditions and 'very favorable' joint orientations have been assumed. There are five rock mass classes, ranging from class I for 'very good rock' (RMR of 81 to 100) to class V for 'very poor rock' (RMR less than 20). The average RMR for bedrock at the project site is 65.92. By unit, the average RMR are 68.99 for the Andesite, 67.42 for the Pyroclastite, and 60.36 for the Basaltic Andesite. For all units, the minimum RMR is 39.69 and the maximum RMR is 83.84.

Rock Mass Rating Values

Rating	100 - 81	80 - 61	60 - 41	40 - 21	< 20
Class No.	I	II	III	IV	V
Description	Very good rock	Good rock	Fair rock	Poor rock	Very poor rock

3) Q-System. The Q-system was proposed by Barton, Lien, and Lunde (1974) and was developed specifically for tunnel support systems, but has been expanded for other rock excavation applications. The Q-system uses the following equation:

$$\mathbf{Q = (RQD/J_n) * (J_r/J_a) * (J_w/SRF)}$$

where RQD - Rock Quality Designation
J_n - Joint set number dependent on the number of discontinuity sets
J_r - Joint roughness number dependent on roughness of the most unfavorable discontinuity
J_a - Joint alteration number dependent on the degree of alteration or filling along the weakest discontinuity
J_w - Joint water reduction number dependent on water flow
SRF - Stress reduction factor.

Within the Q-system, rock mass quality is divided into nine classes ranging from "exceptionally poor" to "exceptionally good". Modified Q* system was used for this project. Modified Q* does not consider J_w or SRF, as these two factors can vary significantly depending on the type, size and location of the structure. Q values for bedrock within the project area averaged 84.12 with a data range between 0.22 and 533.33. The Andesite unit averaged the highest Q value with an average of 84.87. The Pyroclastite and Basaltic Andesite units averaged Q values of 76.84 and 11.67, respectively.

Q-System Values

Rating	**Description**
0.001-0.01	Exceptionally Poor
0.01-0.1	Extremely Poor
0.1-1	Very Poor
1-6	Poor
6-10	Fair
10-60	Good
60-100	Very Good
100-600	Extremely Good

600-1000	Exceptionally Good

The three rock mass classifications were conducted for each exploratory borings core run. Rock mass ratings were developed from boring log, core photograph, and geophysical data. These ratings, and associated rock classes and descriptions, are presented in Appendix A.

2.3.2.3 Excavation Slope Stability (Rock Block Stability)

During construction of the excavation, discrete rock blocks with dimensions that are much less than the height of the slope will daylight in the slope. The stability of these blocks and the necessity for the installation of rock reinforcement were evaluated by performing both kinematic and limiting equilibrium analyses. Kinematic analyses were performed to evaluate whether the potential rock blocks will fall out of the slope due only to geometry and the limiting equilibrium analyses were conducted to evaluate the stability of the rock blocks and estimate rock reinforcement requirements. Modes of potential rock slope instability, results of the kinematic analyses, and results of the limiting equilibrium analyses are discussed here.

1) Modes of Rock Slope Instability. The typical modes of rock slope instability are described below.

a) *Circular Failures*. Circular failures occur in highly weathered, altered, or fractured rock masses. In this failure mode, the rock mass behaves as a soil and shear planes do not follow a single discrete structure or combination of discrete structures.
b) *Plane Shear Failures*. Plane shear failures consist of a block of rock sliding on a single discontinuity, such as a joint, bedding plane, geologic contact, or fault dipping into the excavation. The stability of the slope is dependent upon the following: (i) the orientation of the discontinuity with respect to that of the excavation, (ii) the shear strength of the discontinuity, (iii) the weight of the block, and (iv) the pressure due to water on the base of the block or in joints that could form tension cracks behind the rock face.
c) *Simple Wedge Failures*. A simple wedge failure consists of a block of rock sliding on two discontinuities that intersect such that the intersection of the discontinuities plunges into the excavation. The stability of the slope is dependent upon the same factors that determine stability for the plane shear type failure.
d) *Toppling Failures*. Blocks of rocks that are formed by vertical or high angle discontinuities, such as joints that dip into the slope form toppling failures. Toppling can also occur where overhangs are created by poor blasting practice or the disintegration of weak, non-durable rock at the toe of the slope.

Possible modes of failure at the project site are plane shear, simple wedge and toppling. Circular failure within the rock excavation is unlikely.

2) Kinematic Analyses. The results of the kinematic analyses are listed in the table below and indicate the following:

a) For the north slope, the principal failure modes would likely consist of toppling and wedge failure.

b) For the west and south slopes, all modes of failure are possible.
c) For the intake channel slopes, the most likely failures would be plane shear and wedge failures.

Potential Slope Stability Failures Based on Kinematic Analyses

Slope Face	Slope Orientation		Permissible Failure Mechanisms	Joint Sets	Factor of Safety (dry conditions)
	Dip Direction (degrees)	Slope Angle (degrees)			
North	203	85	Toppling	J1	--
			Wedge	J2 & J5	1.51
			Wedge	J7 & J5	2.41
West	135	85	Toppling	J6	--
			Plane Shear	J2	0.84
			Wedge	J2 & J3	0.96
			Wedge	J7 & J3	2.37
South	23	85	Toppling	J1	--
			Plane Shear	J4	1.80
			Wedge	J6 & J3	2.83
Intake Channel	0	85	Plane Shear	J4	1.80
			Wedge	J6 & J3	2.83

These potential modes of failure are based on the preferred joint orientations discussed in section 2.3.2.1 of this document.

3) Limiting Equilibrium Analysis. Based on the predominant joint orientations, a limiting equilibrium analysis was conducted for each of the potential failure mechanisms identified in item number 2 of this section. In general, when the expected water condition in the slope is not known, rock wedges and plane shear failure surfaces with a dry factor of safety equal to approximately 2.0 will remain stable even under the most severe groundwater pressure conditions (Hoek and Bray, 1980). Wedges and plane shear failure surfaces with factors of safety of less than 2.0 are potentially unstable, and rock wedges with factors of safety less than 1.0 for assumed dry conditions would be unstable under even the most favorable groundwater conditions.

Rock blocks in either the wedge or plane shear failure modes with computed factors of safety less than 2.0 are likely to occur in all excavation slopes. In addition, the west slope may contain rock blocks in orientations that have computed factors of safety equal to or less than 1.0. This indicates that for the west slope, rock blocks could be expected to be unstable, even if there were no water pressure in joints that bound the rock blocks.

2.3.3 Unconsolidated Materials

Unconsolidated materials within the project area are limited to the slope above the existing access road and in the area of the contract wastewater recycling setup and include both fill and native materials. The fill consists of randomly placed silty, sandy, gravels (GP-GM). Native materials are moderately dense silty, sandy gravels (GP-GM) and soft to medium stiff clayey silts (ML). Figure 4 shows the location of excavated test pits and figure 5 shows the test pit logs.

Standard penetration test (SPT) blow counts for all unconsolidated materials averaged 7.8 blows per foot. The minimum and maximum SPT blow counts per foot are 6.5 and 10.5, respectively.

Adopted Unconsolidated Materials Properties

Type	Classification	Unit Weight (dry)	Shear Strength (ϕ, c)[1]
Fill Materials	GP-GM	125 lb/ft3	35°, 0
Native Materials	GP-GM	133 lb/ft3	37°, 0
Native Materials	ML	100 lb/ft3	27°, 100

[1] estimated values based on material classification

ϕ – internal angle of friction (phi)

c – cohesion (in pounds per square foot)

2.4 Hydrogeologic Conditions

Groundwater within the project area primarily originates from the south slope and flows towards the north. The dam reservoir makes little impact on the area groundwater volume or flow direction. Groundwater is located within the relatively impervious bedrock and flow is therefore largely controlled by discontinuities. Permeability within the rock depends on the spacing, orientation, width, filling, and interconnectivity of these discontinuities. Packer tests were conducted to measure the hydraulic conductivity of discrete zones within boreholes. Long-term pumping tests were conducted to measure bulk hydraulic conductivity of the rock mass.

1) Packer Testing. Upon completion of exploration boreholes, each borehole was hydraulically pressure tested. Each pressure test consisted of two phases. The first phase consisted of a flow test that was immediately followed by a duration test – the second phase. Results of the pressure tests were used in estimating the bedrock hydraulic conductivity. Testing was performed using a double packer assembly separated by 20 feet, a water pressure gauge and a flow meter. The lower-most zone for each boring was tested with a single packer assembly. Calculated values of hydraulic conductivity varied considerably and included a number of horizons with artesian conditions. Hydraulic conductivity calculations followed the procedures outlined on page 259 of the Bureau of Reclamation's Ground Water Manual. The hydraulic conductivity for zones without artesian conditions ranged from 0.001 ft/day to 9.80 ft/day with an average hydraulic conductivity of 0.74 ft/day.

2) Pumping Tests. Two pumping tests, on separate wells, were conducted to determine bulk bedrock hydraulic conductivity. One pumping test was conducted over a 48-hour period and the other over a 72-hour period. Prior to each pumping test, a step test was conducted to determine the optimum pumping rate. Test wells were then pumped for 48/72 hours with a 48/72 hours recovery test. The pumping well and selected available open boreholes were monitored for every segment of the tests. Test results were analyzed using the Neuman (1975) unconfined method and the Cooper-Jacob (1946) method to determine the hydraulic conductivity (ft/day) for the rock mass between the pumped well and observation wells. Based on the methods of Neuman, the average rock mass hydraulic conductivity is 1.87 ft/day. Based on the Cooper-Jacob methods, the average rock mass hydraulic conductivity is 1.80 ft/day.

Average hydraulic conductivity values for both the packer testing and the pumping tests are on the same order of magnitude indicating that at the scale of the distance between boreholes, the fracture connectivity may approximate a porous medium.

Artesian conditions have been encountered within the project area during geotechnical explorations. Artesian conditions are encountered over discrete intervals and are typically relieved by further drilling. The majority of the artesian conditions encountered have been between the 1,070 ft. and 1,130 ft. elevations. Discrete zones of moderately pressurized groundwater can be expected during the excavation process.

PART 3 – GEOTECHNICAL BASELINE AND CONSTRUCTION CONSIDERATIONS

3.1 Geotechnical Baseline

The following section summarizes the geotechnical baseline properties identified in Part 2 of this document.

Summary – Geotechnical Baseline Properties

Property	Andesite	Pyro-clastite	Basaltic Andesite	GP-GM - Fill	GP-GM - Native	ML - Native
Specific Gravity (bulk dry)	2.55[1]	2.30[1]	2.63[1]	--	--	--
Weight (dry, pcf)	--	--	--	125.0	133.0	100.0
Weight (moist, pcf)	170.6[1]	--	164.8[1]	--	--	--
Unconfined Compressive Strength (psi)	7,363[1]	--	8,140[1]	--	--	--
Shear Strength at 50 psi (psi/phi)	52/45[1]	--	31/31[1]	--	--	--
Shear Strength (phi/c)	--	--	--	35°/0[2]	37°/0[2]	27°/100[2]
Tensile Strength (psi)	1,360[1]	--	--	--	--	--
Poisson's Ratio	0.266[1]	--	--	--	--	--
RQD (%)	86.17[1]	83.63[1]	55.08[1]	n/a	n/a	n/a
RMR	68.99[1]	67.42[1]	60.36[1]	n/a	n/a	n/a
Q	84.87[1]	76.84[1]	11.67[1]	n/a	n/a	n/a
Hydraulic Conductivity (ft/day)	<2	<2	<2	--	--	--

[1] Average values – actual values my vary as much as 20 percent
[2] Estimated values based on material classification
pcf – pounds per cubic foot
phi – internal angle of friction
psi – pounds per square inch

c – cohesion (in pounds per square foot)

3.2 Construction Considerations

This section addresses some of the construction considerations affected by the geotechnical properties identified in Part 2 and Section 3.1 of this document. This includes only a very limited number of considerations and should not be viewed as the extent of potential considerations.

3.2.1 Rock Mass Reinforcement

Based on the nature of the bedrock in the area of excavation and the presence of existing critical structures, a number of soil and rock mass reinforcement measures are required. These are briefly discussed here and in detail in the contract Drawings and Specifications.

1) *Scaling*. Rock scaling will be conducted immediately following excavation of a given area. Scaling will remove any loose, hanging, or potentially dangerous rock that may create a dangerous environment. Due to the nearly random orientation of fractures within the rock mass, scaling is a particularly important, and perhaps difficult, step in the rock mass reinforcement. Where encountered, rocks of the Pyroclastite unit degrade very rapidly upon exposure and increase the difficulty in preparing a suitable rock surface, both for engineered slopes and foundation preparation.

2) *Rock Anchors*. Tensioned and grouted rock anchors will be used during construction to anchor the permanent soldier pile, tie down the cofferdam structure, and support the left abutment cofferdam slope. Information regarding anchor materials, location, installation methods and tolerances, and stressing is included in the contract Drawings and section 02490 of the Specifications.

3) *Rock Bolts*. Untensioned rock bolts will be used in the excavation rock slope support. Based on the results of the Watertightness Test, rock bolts may or may not be required to be grouted. The government estimates that 40% of the rock bolt borings will require grouting and redrilling prior to the installation of the rock bolts. Requirements regarding the specifications for the materials, locations, and installation methods and tolerances are included in the contract Drawings and section 02491 of the Specifications.

4) *Shotcrete*. Shotcrete will be used as a slope stability measure on soil and rock slopes. The required materials, preparation and placement methods, and curing and testing requirements are outlined in section 03371 of the contract Specifications.

5) *Welded Wire Fabric*. Welded wire fabric will be used as a slope stability measure on those slopes that will be removed during a later contract.

6) *Weep Holes*. Weep holes will be used to mitigate pore water pressures in the excavation slopes. Section 02491 of the contract Specifications provides details on the location, orientation and tolerances required.

3.2.2 Existing Rock Mass Reinforcement

Rock mass reinforcement measures, primarily rock bolts, are present in areas to be excavated. The vast majority of the rock bolts encountered will be between the 1,070 and 1,140 foot elevations, as represented in figures 6 and 7.

3.2.3 Dewatering

The dewatering system outlined in the contract Drawings and Specifications was designed to serve a threefold purpose: 1) keep the excavation dry for excavation and construction, 2) reduce the hydrostatic pressure on rock discontinuities intersecting excavation slopes, and 3) reduce uplift pressures under the cofferdam.

Estimated flows into the excavation have been calculated from the hydraulic conductivity values calculated from the packer and pumping tests. These flows may be anywhere from 80-2,800 gallons per minute (gpm). An analysis of data collected from the pumping tests indicates that water is moving from the south towards the dam. Contributions of water from the reservoir itself were relatively insignificant during pumping tests.

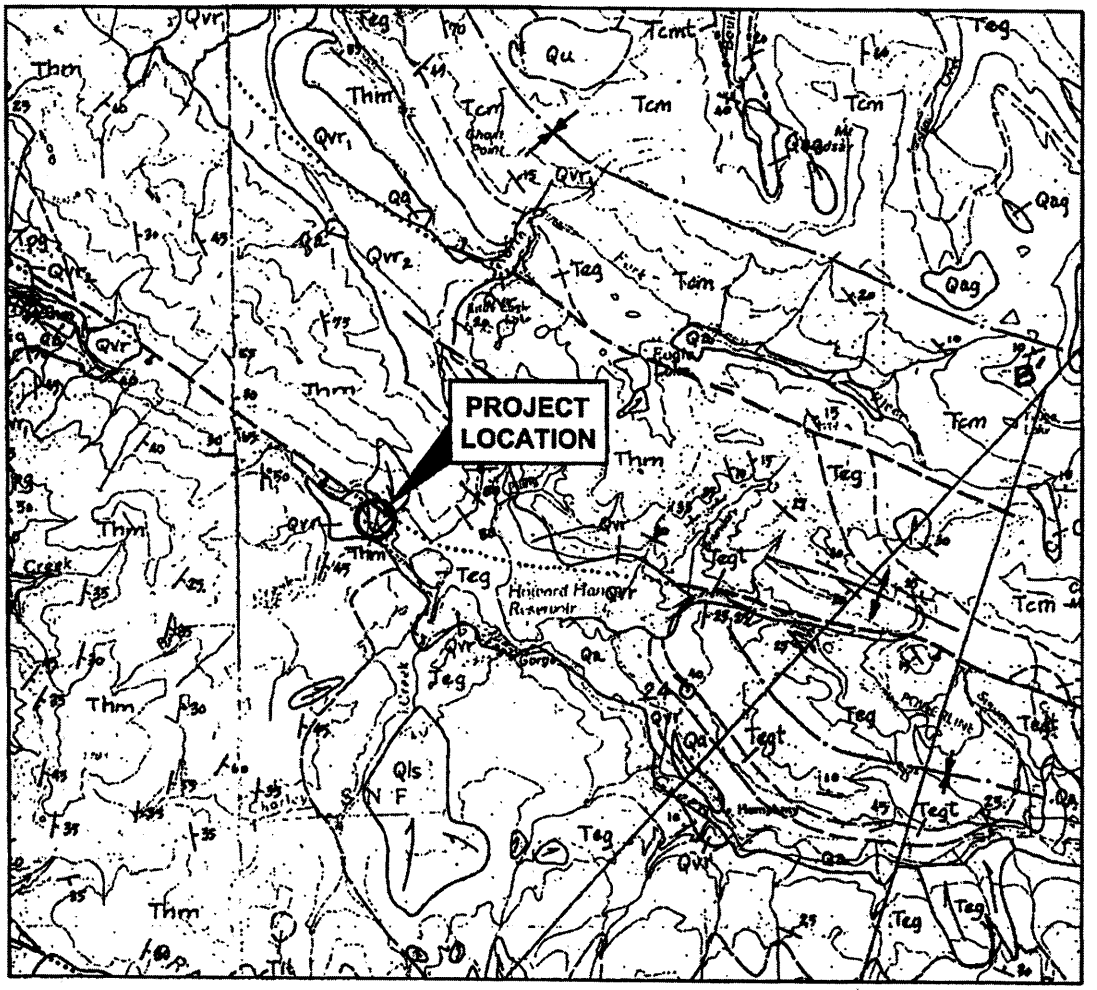
The dewatering system is conservatively designed in that it is designed to stop flows into the excavation assuming a flow rate of 2,800 gpm. Eight deep dewatering wells can each accommodate up to 300 gpm (for a total of 2,400 gpm), and the 10 relief wells can accommodate an additional 400 gpm. The proposed grouting program adjacent to the cofferdam and existing intake tower will further reduce seepage flow into the excavation from the reservoir.

Specifications regarding the construction of water wells and relief wells are presented in the contract Drawings and Specifications, sections 02521a and 02525a, respectively.

3.2.4 Grouting

Grouting is an integral part of the contract. Grouting will reduce seepage into the excavation and will enhance the stability of the left abutment, intake structure foundation, and cofferdam foundation. Details regarding the grouting materials and methods can be found in the contract Drawings and Specifications, section 02251a.

Based on original dam construction grouting activities, average rock grout takes for the construction foundation and left abutment were 0.1 and 0.2 sacks of Portland cement (94 lbs.) per linear foot, respectively. Grout takes are based on an assumed borehole outside diameter of four inches. Cement to water content within the original grout varied from 4:1 to 1:1 depending on the results of borehole water pressure tests. Rock grout takes encountered during the execution of this contract are expected to be consistent with the above grout takes.



LEGEND

Qa	Alluvium
Qvr	Vashon Recessional Outwash
Qag	Alpine Glacial Deposits
Qls	Landslide Deposit
Tcm	Volcanic Rocks of Cougar Mountain
Teg	Volcanic Rocks of Eagle Gorge
Thm	Volcanic Rocks of Huckleberry Mountain
Tit	Tonalite Intrusive

0 2 4

Scale in Miles

NOTE

Map adapted from "Preliminary Geologic Map of Snoqualmie Pass 1:100,000 Quadrangle, WA", Frizzell, Jr. et. Al., USGS OF Map OF-84-693, 1984.

High-angle fault, dashed where inferred, dotted. where concealed. Ball and bar on down thrown side.

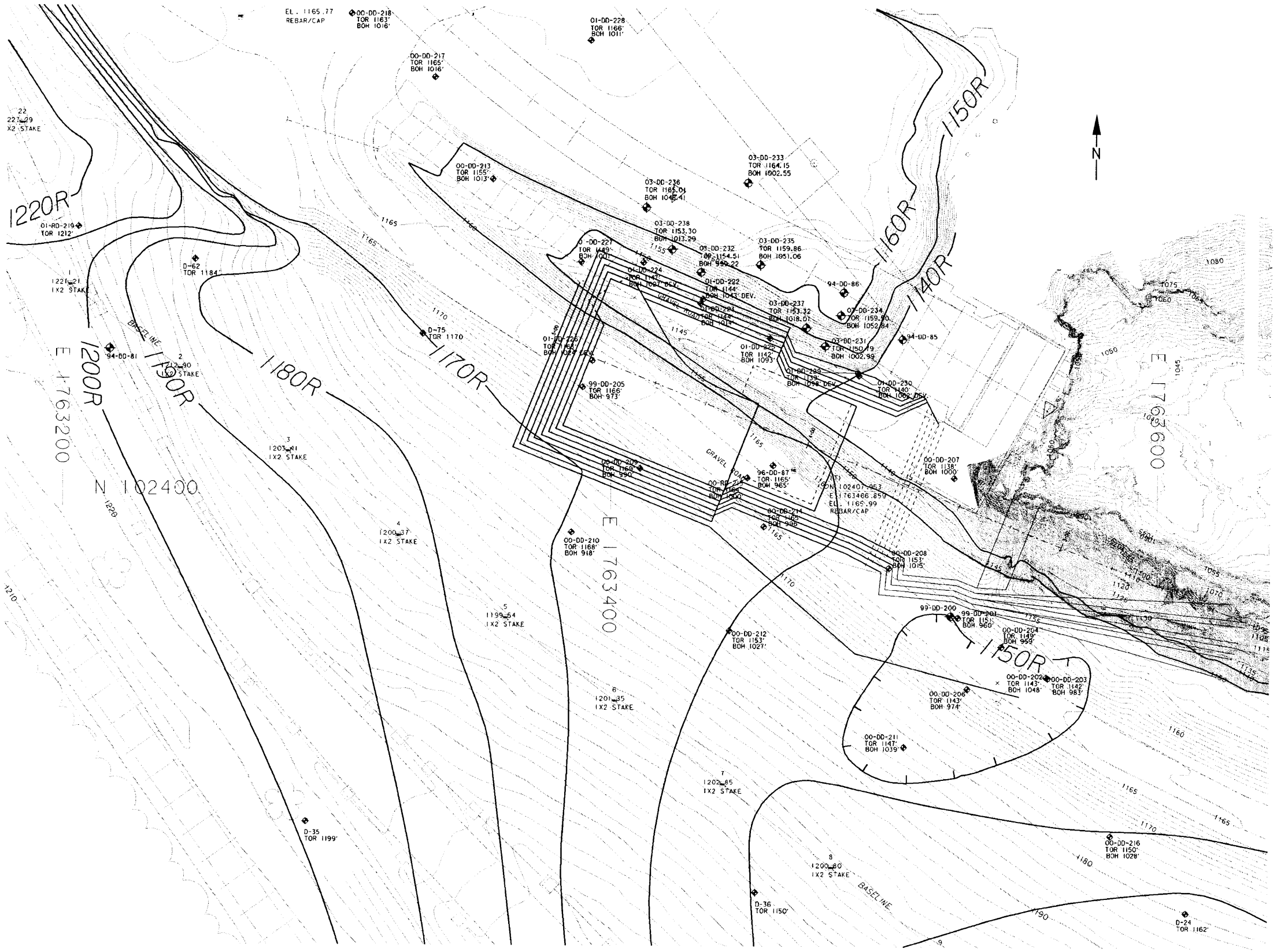
Anticline Axis

Syncline Axis

60 Strike and dip of bedding

U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	
FIGURE 1. REGIONAL GEOLOGIC MAP IN THE AREA OF HHD HOWARD HANSON DAM EAGLE GORGE WASHINGTON	
DATE 31 JULY 2002	CHECKED BY HESS

REVISIONS			
SYMBOL	DESCRIPTION	DATE	BY



LEGEND

1150R — APPROXIMATE BEDROCK CONTOURS (CONTOURS EVERY 10.0')

10 1203.81 1X2 STAKE — EXPLORATION BASELINE FROM INITIAL PROJECT LAYOUT

Sta 15+00 — EXISTING OUTLET TUNNEL CENTERLINE W/STATIONING EVERY 100.0' [STATIONS 15+00 - 19+00]

01-DD-224 TOR 1147' BOH 1027' DEV. — EXPLORATION HOLE YEAR, TYPE AND NUMBER

(RB) — REBAR/CAP

BOH — BOTTOM OF HOLE (FEET)
DEV. — DEVIATED FROM VERTICAL
TOR — TOP OF ROCK (FEET)

NOTES:

CONTOURS ARE PROVIDED FOR VISUALIZATION PURPOSES ONLY. EVALUATIONS OF TOP OF ROCK ELEVATIONS SHALL BE BASED UPON ACTUAL VALUES MEASURED AT EACH DATA POINT.

SCALE IN FEET

20' 10' 0 20' 40'

This project was designed by the Seattle District U.S. Army Corps of Engineers. The initials or signatures and registration designations of individuals appear within the specifications or on these project documents within the scope of their employment as required by ER 1110-1-8152, Professional Registration.

DATE AND TIME PLOTTED: 10-SEP-2003 07:41
DESIGN FILE: I:\DESIGNS\HHAWN\GEOTECH\DBR\HHAWFS0A_3.DGN

Computer Aided Design & Drafting

U.S. ARMY ENGINEER DISTRICT, SEATTLE
CORPS OF ENGINEERS
SEATTLE, WASHINGTON

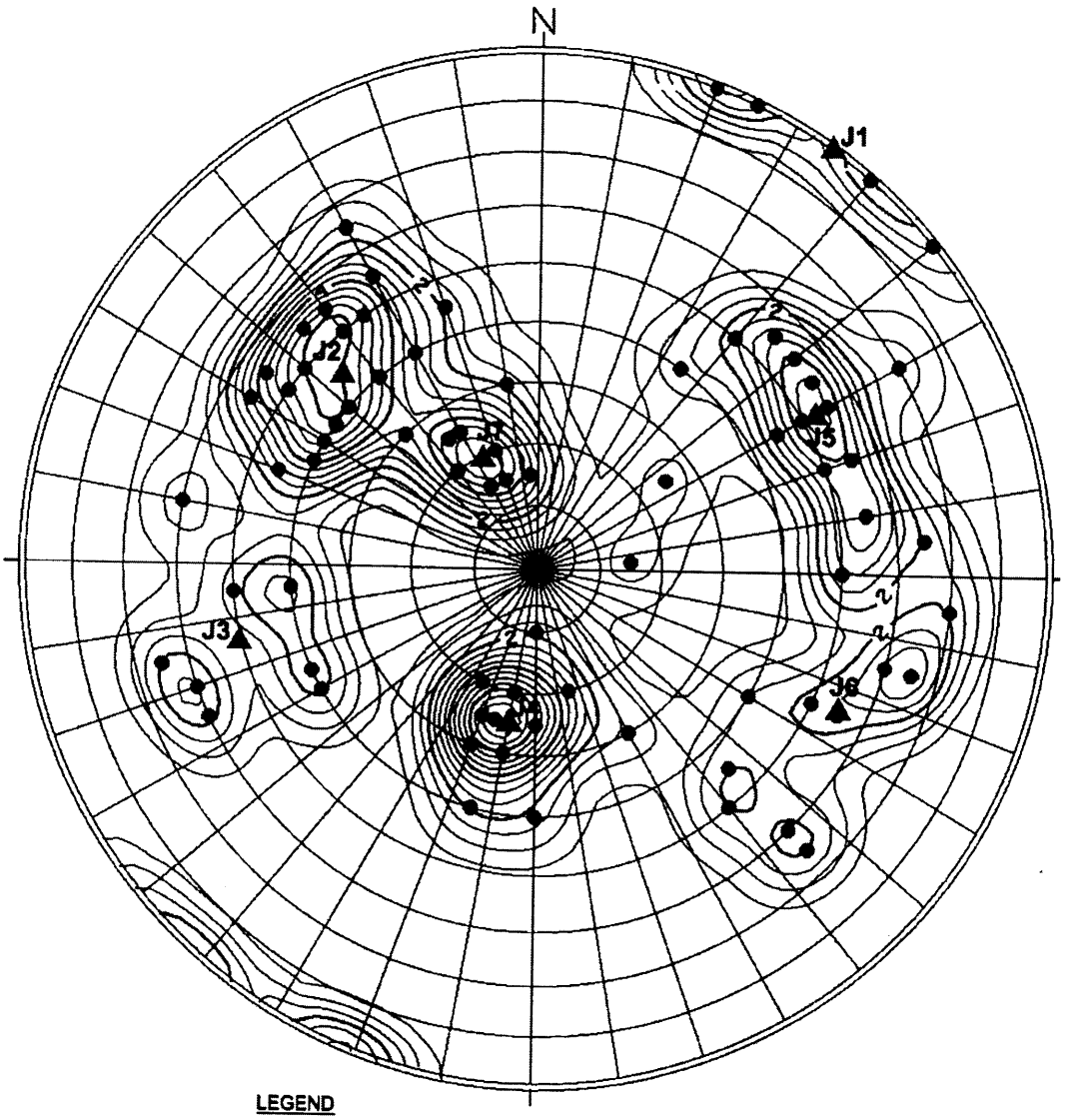
HOWARD HANSON DAM - AWS

CONTOURS ON BEDROCK SURFACE AND EXPLORATION MAP (LOCATIONS OF EXPLORATIONS)

HOWARD HANSON DAM — WASHINGTON

SIZE	INVITATION NO.	FILE NO.	DATE:	PLATE
D				
DSGN. DANIELSON/HESS		CHK. SMITH	SHEET FIGURE 2	

DACW67-03-R-0001



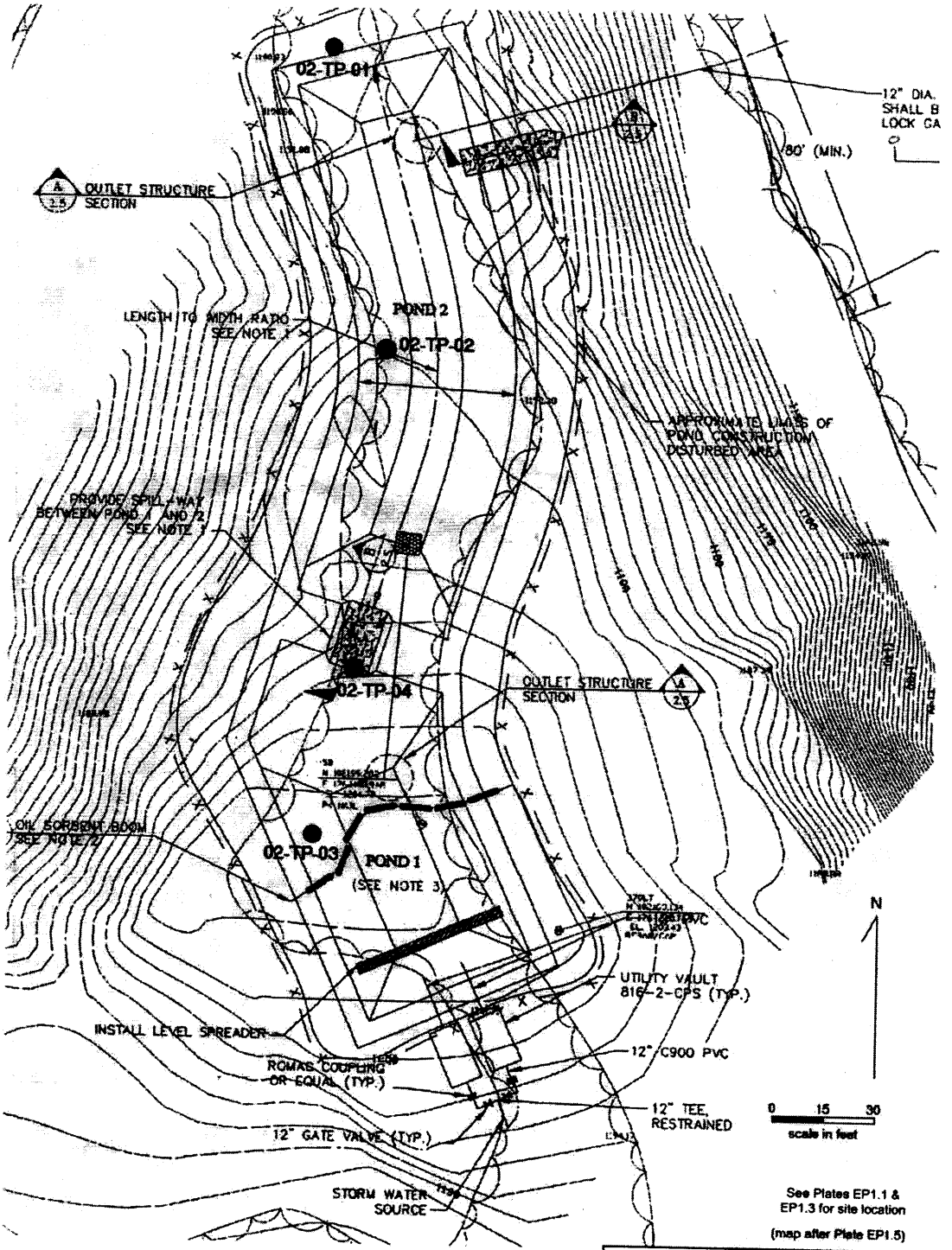
LEGEND

- ● Average of Orientation Measurement from BHTV data
- ▲ Approximate Mean Orientation from BHTV data

NOTES

1. Contour interval is 0.5 percent.
2. Data is based on average joint clusters selected from BHTV and surface data.
3. Symbols represent poles to planes.
4. Stereonet is equal area projection of lower hemisphere of reference sphere.

U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	
FIGURE 3. AVERAGE ORIENTATIONS OF DISCONTINUITY CLUSTERS MEASURED IN BHTV SURVEYS EAGLE GORGE — HOWARD HANSON DAM — WASHINGTON	
DATE 31 JULY 2002	CHECKED BY HESS



See Plates EP1.1 & EP1.3 for site location

(map after Plate EP1.5)

U.S. ARMY ENGINEER DISTRICT, SEATTLE
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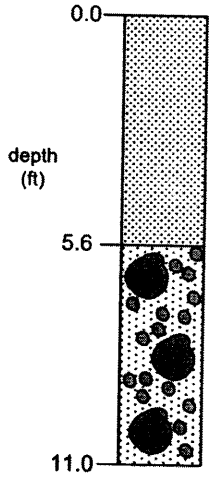
SEATTLE, WASHINGTON

FIGURE 4.
Test Pit Location Map

HOWARD HANSON DAM
EAGLE GORGE WASHINGTON

DATE 3 Nov 2002 | CHECKED BY HESS

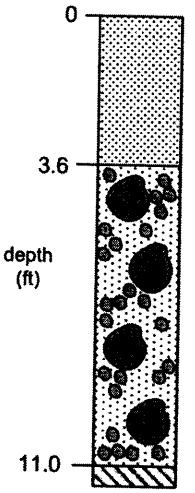
02-TP-01



SM-ML, silty SAND-sandy SILT, lt brown, dry, medium dense/ stiff, organics. Sand is very fine grained.
[Fill]

GP, sandy Gravel w/silt, brown, dry-damp, medium dense. Gravels and cobbles 1"+/- up to 4"+/-, sub-rounded to rounded. Sand is fine to medium grained. Becomes darker brown with depth.
[Glacial Outwash Deposit]

02-TP-02

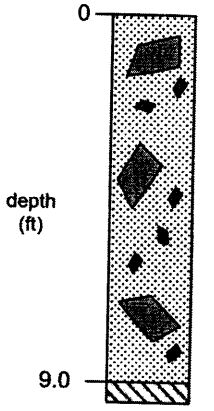


SP, Sand w/silt, light brown, dry, medium dense, organics. Sooty woody material in upper foot of test pit.
[Fill]

GP, sandy Gravel w/silt, brown, dry, medium dense. Gravels and cobbles 1"+/- up to 4"+/-, sub-rounded to rounded. Sand is fine to medium grained. Becomes darker brown with depth.
[Glacial Outwash Deposit]

Bedrock @ 11.0 feet depth.

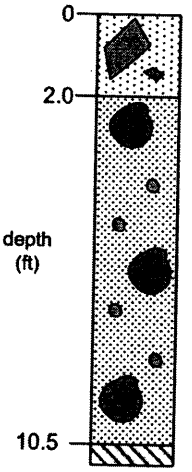
02-TP-03



SP-GP, gravelly Sand-sandy Gravel w/silt and clay, gray-green, damp, medium dense, organics near surface. Gravels 1"=/-, angular. Grades laterally into SP, Sand w/gravel and silt, brown, medium dense.
[Fill]

Bedrock

02-TP-04



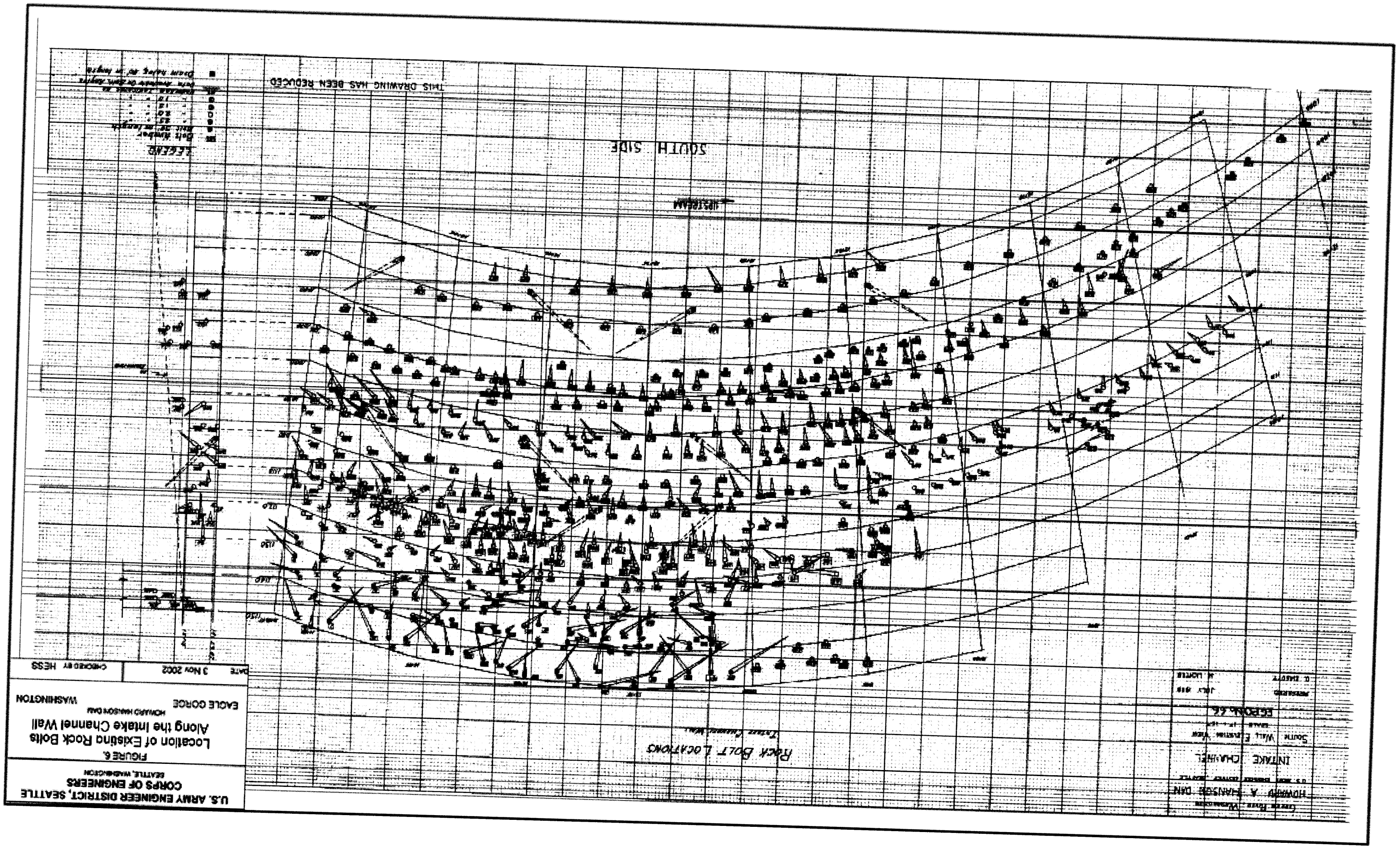
GP, sandy Gravel w/silt, gray-brown, dry-damp, medium dense, organics near surface.
[Fill]

SP, silty Sand w/ gravel, brown, dry-damp, medium dense. Gravel 1" +/- sub-rounded to rounded. Sand is fine to medium grained.
[Glacial Outwash Deposits]

Bedrock

U.S. ARMY ENGINEER DISTRICT, SEATTLE CORPS OF ENGINEERS SEATTLE, WASHINGTON	
FIGURE 5. Test Pit Logs	
EAGLE GORGE HOWARD HANSON DAM WASHINGTON	
DATE 3 Nov 2002	CHECKED BY HESS

DACW67-03-R-0001



U.S. ARMY ENGINEER DISTRICT, SEATTLE
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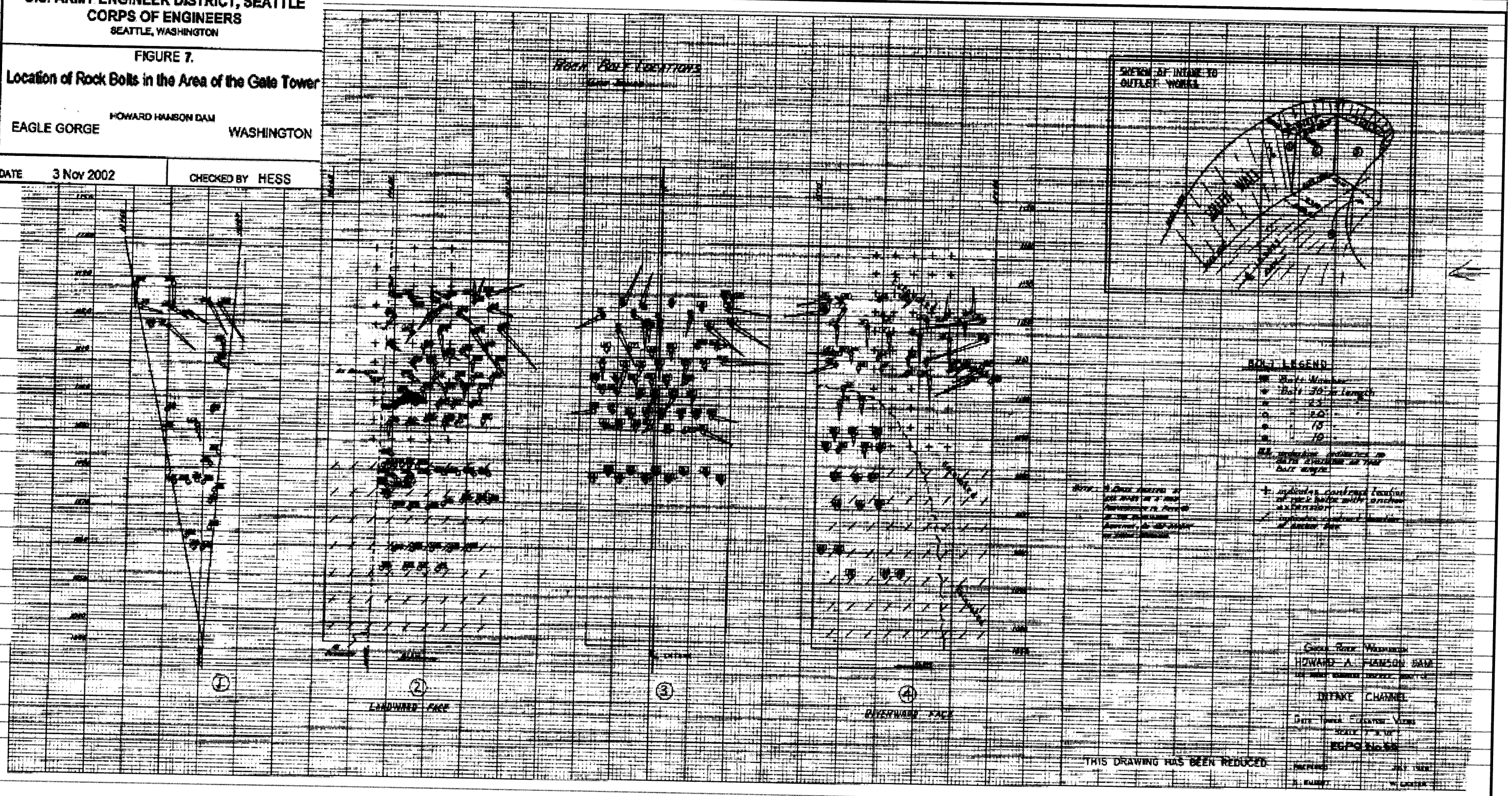
FIGURE 7.

Location of Rock Bolts in the Area of the Gate Tower

HOWARD HANSON DAM
EAGLE GORGE WASHINGTON

DATE 3 Nov 2002 CHECKED BY HESS



DACW67-03-R-0001

HOWARD HANSON DAM
COFFERDAM FOUNDATION AND EXCAVATION CONTRACT
- FISH PASSAGE FACILITY, ADDITIONAL WATER STORAGE PROJECT

GEOTECHNICAL BASELINE REPORT – APPENDIX A

This appendix contains much of the geotechnical data collected during the explorations mentioned in section 1.8 of the Geotechnical Baseline Report. Some of the geotechnical data associated with the 2003 exploration program has not yet been incorporated into this appendix. The data is presented in the following tables:

Table A1	Unconfined Compressive Strength Test Results
Table A2	Direct Shear Test Results
Table A3	Splitting Tensile Strength Results
Table A4	Compression (P) and Shear (S) Wave Velocities and Poisson's Ratio
Table A5	Joint Condition Data
Table A6	Rock Mass Ratings
Table A7	Packer Test Hydraulic Conductivity Calculations
Table A8	Pumping Test Hydraulic Conductivity Averages

Tables A1 through A3 provide data obtained through laboratory testing of selected rock core samples. Consult the references in section 1.4 of the Geotechnical Baseline Report for information on the laboratory procedures involved.

Table A4 displays full waveform sonic geophysical data collected during borehole geophysical surveys. Measured compressional (P) and shear (S) wave velocities were selected at four foot intervals within each borehole and were used in the calculation of Poisson's Ratio (ν) as follows.

$$\nu = (V_p^2 - 2V_s^2) / 2(V_p^2 - V_s^2)$$

Where V_p and V_s equal the compressional and shear wave velocities, respectively, in feet per second.

Tables A5 through A8 provide field based observations regarding rock mass competency and project area hydrogeology. This data is discussed in parts 2 and 3 of the Geotechnical Baseline Report.

TABLE A1 - Unconfined Compressive Strength Test Results

Boring ID	Depth (ft bgs)		Rock Type	Moist Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Young's Modulus (ksi)
	from	to				
94-DD-80	139.3	-	Andesite	150.8	5410	-
94-DD-81	175.2	-	Andesite	162.6	8790	-
94-DD-81	187.5	-	Andesite	165.1	9170	-
94-DD-85	6.5	6.8	Andesite	-	3670*	670
94-DD-85	13.6	13.9	Andesite	-	4630*	2110
94-DD-85	15	15.4	Andesite	-	8740	-
94-DD-85	19	19.4	Andesite	-	27130	-
94-DD-85	24.7	25	Andesite	-	12440	3260
94-DD-85	25	25.3	Andesite	-	12060	3420
94-DD-86	24	24.7	Andesite	-	6830	-
94-DD-86	39.3	40	Andesite	-	7870	-
99-DD-201	49.6	52	Andesite	-	6391	214
99-DD-201	83.5	85.8	Andesite	-	4743	132
99-DD-201	114.2	115.5	Andesite	-	3542	167
99-DD-201	164.3	165.7	Andesite	-	11721	563
99-DD-203	142.2	144	Andesite	-	3021	127
99-DD-203	155.6	157.3	Andesite	-	5829	261
99-DD-203	173.3	174.9	Andesite	-	8838	357
99-DD-204	141.7	143.6	Andesite	-	4369	245
99-DD-204	147.6	148.6	Andesite	-	6104	300
99-DD-204	152	152.9	Andesite	-	8326	435
99-DD-204	158	159.5	Andesite	-	10560	406
99-DD-204	169.9	171.6	Andesite	-	3995	233
99-DD-204	178.3	179.9	Andesite	-	8576	327
99-DD-204	181.7	183.2	Andesite	-	12170	561
99-DD-204	185.5	186.9	Andesite	-	13107	625
99-DD-205	162.95	163.44	Andesite	-	7910	-
99-DD-205	163.45	163.9	Andesite	-	7426	-
99-DD-205	163.9	164.35	Andesite	-	5452	-
99-DD-205	166	166.45	Andesite	-	9415	-
99-DD-205	171.95	172.45	Andesite	-	6893	-
99-DD-205	172.45	172.9	Andesite	-	5670	-
00-DD-207	29.8	29.1	Andesite	146.5	3070	-
00-DD-207	40.6	41.2	Andesite	145.9	6810	-
00-DD-207	75.7	76.5	Andesite	154	11170	-
00-DD-207	91.75	92.7	Andesite	166.9	5390	-
00-DD-209	7.8	8.6	Andesite	155.4	7310	-
99-DD-209	30.8	31.4	Andesite	136.1	4830	-
99-DD-209	59	59.8	Andesite	173.3	9730	-
99-DD-209	85.75	86.4	Andesite	148.3	2230	-
99-DD-209	100	100.5	Andesite	147.6	4280	-
01-DD-222	61.33	62.01	Andesite	155.9	20360	-
01-DD-223	15.6	16.7	Andesite	154	5710	-
01-DD-223	48.7	49.5	Andesite	160.3	6130	-
01-DD-223	70.5	71	Andesite	148.8	4580	-
01-DD-223	107.3	108.6	Andesite	138	3170	-
01-DD-224	120.9	121.5	Basaltic Andesite	168.7	9300	-

Boring ID	Depth (ft bgs)		Rock Type	Moist Unit Weight (pcf)	Unconfined Compressive Strength (psi)	Young's Modulus (ksi)
	from	to				
01-DD-224	135.4	136.5	Basaltic Andesite	159.2	4730	-
01-DD-226	39.4	40.1	Andesite	142.7	3750	-
01-DD-226	58.9	59.5	Andesite	147	4720	-
01-DD-226	82.25	83	Andesite	153.2	7630	-
01-DD-227	105	105.5	Andesite	148.5	6120	-
01-DD-227	119.5	120.3	Andesite	150.1	7110	-
01-DD-227	129.3	129.8	Andesite	145.4	3840	-
01-DD-227	142.6	143.3	Andesite	147.4	6370	-
01-DD-228	115.1	116.6	Andesite	205.1	2730	-
01-DD-228	128.8	129.8	Andesite	167.7	5020	-
01-DD-228	142	142.9	Andesite	158.8	7220	-
01-DD-230	41.5	42	Andesite	157.4	3160	-
01-DD-230	100	100.5	Basaltic Andesite	170.4	10390	-

Notes:
*Specimen had hairline crack before test.

bgs - below ground surface

Unconfined Compressive Strength corrected in accordance with ASTM D-2938 for cores with a length to diameter ratio of less than 2.

Boring 94-DD-80 is not located on any of the drawings or figures and is located at WA State coordinates 1763725.70 E and 102238.22 N.

TABLE A2 - Direct Shear Test Results

Borehole	Interval (ft bgs)		Bedrock Material	Normal	Shear	Friction
	from	to		Stress (psi)	Stress (psi)	Angle (phi)
99-DD-205	153.3	154	Andesite	50	66	52.64
99-DD-205	153.3	154	Andesite	100	100	44.89
99-DD-205	153.3	154	Andesite	150	178	49.82
99-DD-205	179.5	180	Andesite	50	46	42.8
99-DD-205	179.5	180	Andesite	100	84	39.86
99-DD-205	179.5	180	Andesite	150	111	36.48
99-DD-205	183.5	184	Andesite	50	44	41.54
99-DD-205	183.5	184	Andesite	100	79	38.17
99-DD-205	183.5	184	Andesite	150	107	35.6
99-DD-205	184.5	185.5	Andesite	50	95	62.14
99-DD-205	184.5	185.5	Andesite	100	146	55.55
99-DD-205	184.5	185.5	Andesite	150	180	50.13
00-DD-209	172.5	173	Andesite	50	50	45.23
00-DD-209	172.5	173	Andesite	100	84	40.16
00-DD-209	172.5	173	Andesite	150	115	37.5
00-DD-209	161.5	-	Andesite	50	53	46.61
00-DD-209	161.5	-	Andesite	100	76	37.27
00-DD-209	161.5	-	Andesite	150	98	33.16
01-DD-223	49.4	50.3	Andesite	15	31	64.18
01-DD-223	49.4	50.3	Andesite	50	73	55.59
01-DD-223	49.4	50.3	Andesite	150	167	48.07
01-DD-222	21.4	22.3	Andesite	15	12	38.66
01-DD-222	21.4	22.3	Andesite	50	27	28.37
01-DD-222	21.4	22.3	Andesite	150	69	24.7
01-DD-222	47	48	Andesite	15	23	56.89
01-DD-222	47	48	Andesite	50	47	43.23
01-DD-222	47	48	Andesite	150	125	39.81
01-DD-226	21.15	21.5	Andesite	15	10	33.69
01-DD-226	21.15	21.5	Andesite	50	40	38.66
01-DD-226	21.15	21.5	Andesite	150	145	44.03
01-DD-228	142	142.9	Andesite	15	9	30.96
01-DD-228	142	142.9	Andesite	50	35	34.99
01-DD-228	142	142.9	Andesite	150	79	27.77
01-DD-224	135.4	136.5	Basaltic Andesite	15	9	30.96
01-DD-224	135.4	136.5	Basaltic Andesite	50	31	31.8
01-DD-224	135.4	136.5	Basaltic Andesite	150	79	27.77

TABLE A3 - Splitting Tensile Strength Test Results

Borehole	Interval (ft bgs)		Bedrock Material	Tensile Strength (psi)
	from	to		
94-DD-85*	10.1	10.5	Andesite	500
94-DD-85	10.5	10.8	Andesite	440
94-DD-85*	11.7	12	Andesite	110
99-DD-201	144	145.8	Andesite	2438
99-DD-201	154	155.6	Andesite	2540
99-DD-201	169.2	171	Andesite	2538
99-DD-201	187.2	188.7	Andesite	933
99-DD-203	137	138	Andesite	413
99-DD-203	142.2	144	Andesite	741
99-DD-203	155.6	157.3	Andesite	755
99-DD-203	173.3	174.9	Andesite	1059
99-DD-204	118.3	179.9	Andesite	993
99-DD-204	141.7	143.6	Andesite	641
99-DD-204	152	152.9	Andesite	2008
99-DD-204	158	159.5	Andesite	1358
99-DD-204	169.9	171.6	Andesite	1056
99-DD-204	185.5	186.9	Andesite	2476

*Specimen had a hyperbolic open seam before test.

TABLE A4 - Compresional (P) and Shear (S) Wave Velocities and Poisson's Ratio

Borehole	Depth (ft bgs)	Bedrock Material	P-wave Vp (ft/s)	S-wave Vs (ft/s)	Poisson's Ratio
99-DD-201	96	Andesite	11400	6500	0.2591
99-DD-201	100	Andesite	11100	6500	0.2391
99-DD-201	104	Andesite	12800	6100	0.3531
99-DD-201	108	Andesite	14200	5900	0.3957
99-DD-201	112	Andesite	13250	6850	0.3176
99-DD-201	124	Andesite	12800	5950	0.3622
99-DD-201	128	Andesite	13500	6050	0.3743
99-DD-201	132	Andesite	12750	7100	0.2753
99-DD-201	136	Andesite	14250	7900	0.2781
99-DD-201	140	Andesite	17250	8500	0.3397
99-DD-201	144	Andesite	16600	7300	0.3801
99-DD-201	148	Andesite	15400	6800	0.3789
99-DD-201	152	Andesite	17600	8550	0.3456
99-DD-201	156	Andesite	16600	9400	0.264
99-DD-201	160	Andesite	16250	8250	0.3264
99-DD-201	164	Andesite	15600	7600	0.3444
99-DD-201	168	Andesite	14600	7500	0.3208
99-DD-201	172	Andesite	11500	7150	0.1849
99-DD-201	176	Andesite	12100	7100	0.2374
99-DD-201	180	Andesite	12850	7900	0.1962
99-DD-201	184	Andesite	12250	7850	0.1516
99-DD-204	68	Andesite	9900	5400	0.2882
99-DD-204	72	Andesite	10400	5750	0.2799
99-DD-204	76	Andesite	10600	5750	0.2915
99-DD-204	80	Andesite	10700	7000	0.1259
99-DD-204	84	Andesite	13250	7900	0.2242
99-DD-204	88	Andesite	17150	9500	0.2787
99-DD-204	92	Andesite	13400	7900	0.2336
99-DD-204	108	Andesite	9800	6700	0.0612
99-DD-204	124	Andesite	14700	7400	0.3303
99-DD-204	128	Andesite	16400	8100	0.3387
99-DD-204	132	Andesite	17200	8750	0.3254
99-DD-204	136	Andesite	15600	5500	0.429
99-DD-204	140	Andesite	9700	6400	0.1145
99-DD-204	148	Andesite	12900	7750	0.2176
99-DD-204	152	Andesite	14500	8350	0.2519
99-DD-204	156	Andesite	14300	7500	0.3103
99-DD-204	160	Andesite	14250	9200	0.1426
99-DD-204	164	Andesite	15100	9750	0.1425
99-DD-204	168	Andesite	13850	7500	0.2925
99-DD-204	172	Andesite	14500	8350	0.2519
99-DD-204	176	Andesite	14900	8300	0.275
99-DD-204	180	Andesite	14950	8900	0.2255
99-DD-204	184	Andesite	14000	8100	0.2484
99-DD-204	188	Andesite	12200	6300	0.3182
99-DD-204	192	Andesite	12100	6450	0.3015
99-DD-204	196	Andesite	13350	7600	0.2603
99-DD-205	16	Andesite	10200	5150	0.3289

Borehole	Depth (ft bgs)	Bedrock Material	P-wave Vp (ft/s)	S-wave Vs (ft/s)	Poisson's Ratio
99-DD-205	20	Andesite	9500	5100	0.2976
99-DD-205	24	Andesite	9950	5050	0.3265
99-DD-205	28	Andesite	11000	7450	0.0763
99-DD-205	36	Andesite	13400	7850	0.2387
99-DD-205	40	Andesite	13300	6050	0.3695
99-DD-205	44	Andesite	13400	7500	0.2719
99-DD-205	52	Andesite	12750	7800	0.201
99-DD-205	60	Andesite	11200	7600	0.0733
99-DD-205	64	Andesite	12200	7350	0.2151
99-DD-205	72	Andesite	11000	7450	0.0763
99-DD-205	76	Andesite	11300	6950	0.1958
99-DD-205	80	Andesite	11050	6850	0.1879
99-DD-205	88	Andesite	12500	6500	0.3147
99-DD-205	92	Andesite	13300	7800	0.2379
99-DD-205	96	Andesite	12250	7200	0.2361
99-DD-205	100	Andesite	11800	7100	0.2163
99-DD-205	104	Andesite	12400	7200	0.2457
99-DD-205	108	Andesite	14200	6500	0.3675
99-DD-205	112	Andesite	12700	6100	0.3501
99-DD-205	116	Andesite	11150	5650	0.3273
99-DD-205	120	Andesite	11300	5800	0.3212
99-DD-205	128	Andesite	10100	6500	0.1465
99-DD-205	132	Andesite	10700	6600	0.1929
99-DD-205	136	Andesite	11100	6900	0.1851
99-DD-205	140	Andesite	11250	6950	0.1914
99-DD-205	144	Andesite	11250	6850	0.2054
99-DD-205	148	Andesite	11100	6750	0.2066
99-DD-205	152	Andesite	10950	6800	0.1861
99-DD-205	156	Andesite	11550	6650	0.2521
99-DD-205	160	Andesite	10900	7700	0.0019
99-DD-205	168	Andesite	11650	7000	0.2175
99-DD-205	172	Andesite	12050	7350	0.2038
99-DD-205	176	Andesite	11700	7800	0.1
99-DD-205	184	Andesite	10750	6500	0.2118
00-DD-209	12	Andesite	10050	5450	0.2917
00-DD-209	16	Andesite	10000	5450	0.2887
00-DD-209	20	Andesite	10200	5500	0.295
00-DD-209	24	Andesite	10150	5500	0.2922
00-DD-209	28	Andesite	10050	5500	0.2862
00-DD-209	32	Andesite	9900	5450	0.2826
00-DD-209	36	Andesite	10000	5750	0.253
00-DD-209	40	Andesite	9650	5650	0.2392
00-DD-209	44	Andesite	10300	6750	0.1236
00-DD-209	56	Andesite	14500	8150	0.2691
00-DD-209	60	Andesite	14250	7700	0.2938
00-DD-209	64	Andesite	14500	5000	0.4325
00-DD-209	68	Andesite	14450	5700	0.4079
00-DD-209	72	Andesite	13600	5800	0.3888
00-DD-209	76	Andesite	12800	6200	0.3467
00-DD-209	80	Andesite	12000	6000	0.3333

Borehole	Depth (ft bgs)	Bedrock Material	P-wave Vp (ft/s)	S-wave Vs (ft/s)	Poisson's Ratio
00-DD-209	84	Andesite	12350	5950	0.3489
00-DD-209	88	Andesite	13150	5550	0.3916
00-DD-209	92	Andesite	10850	5600	0.3184
00-DD-209	96	Andesite	10450	5850	0.2718
00-DD-209	100	Andesite	11950	7050	0.2331
00-DD-209	104	Andesite	10750	6700	0.1824
00-DD-209	108	Andesite	10850	6750	0.1843
00-DD-209	112	Andesite	11100	6900	0.1851
00-DD-209	116	Andesite	11450	7050	0.1947
00-DD-209	120	Andesite	11350	7000	0.1931
00-DD-209	124	Andesite	11650	7150	0.1979
00-DD-209	128	Andesite	11500	7100	0.192
00-DD-209	132	Andesite	12000	7850	0.126
00-DD-209	140	Andesite	10800	6850	0.1635
00-DD-209	144	Andesite	11050	6900	0.1804
00-DD-209	148	Andesite	11100	6850	0.1925
00-DD-209	152	Andesite	12000	7200	0.2188
00-DD-209	156	Andesite	13650	8100	0.2282
00-DD-209	160	Andesite	16700	6900	0.3971
00-DD-209	164	Andesite	16350	6950	0.3897
00-DD-217	40	Andesite	13050	7900	0.2108
00-DD-217	44	Andesite	13500	7850	0.2446
00-DD-217	48	Andesite	14650	8550	0.2417
00-DD-217	52	Andesite	14600	8350	0.257
00-DD-217	56	Andesite	15250	6850	0.3736
00-DD-217	60	Andesite	15950	7150	0.3743
00-DD-217	64	Andesite	15350	6750	0.3801
00-DD-217	68	Andesite	14750	6450	0.3818
00-DD-217	72	Andesite	13900	5800	0.3946
00-DD-217	76	Andesite	15250	5700	0.4188
00-DD-217	80	Andesite	13600	6450	0.3549
00-DD-217	84	Andesite	13350	6500	0.3446
00-DD-217	88	Andesite	13550	6450	0.3535
00-DD-217	92	Andesite	15250	6750	0.3782
00-DD-217	96	Andesite	13100	6450	0.34
00-DD-217	100	Andesite	12050	5900	0.3423
00-DD-217	104	Andesite	12650	5400	0.3886
00-DD-217	108	Andesite	12050	5800	0.3492
00-DD-217	112	Andesite	11150	6700	0.2174
00-DD-217	116	Andesite	11350	6750	0.2264
00-DD-217	132	Andesite	14000	9050	0.1411

TABLE A5 - Joint Condition Data

Boring ID	Depth, ft		Persistance		Separation		Roughness		Infilling		Weathering		Total Rating
	From	To	Length	Rating	Aperture	Rating	Description	Rating	Description	Rating	Class	Rating	
99-DD-205	0	6	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	SW	5	21
99-DD-205	6	11	3 -10 m	2	<0.1 mm	5	Rough	5	Soft, <5mm	2	SW	5	19
99-DD-205	11	13	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	SW	5	21
99-DD-205	13	18	3 -10 m	2	<0.1 mm	5	Sl R/Sm	2	Hard, >5mm	2	SW	5	16
99-DD-205	18	23	3 -10 m	2	<0.1 mm	5	Sl R/Sm	2	Hard, <5mm	4	SW	5	18
99-DD-205	23	25	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
99-DD-205	25	30	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, >5mm	2	U	6	20
99-DD-205	30	32	3 -10 m	2	<0.1 mm	5	Sl. Rough	3	Hard, >5mm	2	U	6	18
99-DD-205	32	37	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
99-DD-205	37	38	3 -10 m	2	<0.1 mm	5	Sl R/Sm	2	Hard, >5mm	2	U	6	17
99-DD-205	38	43	3 -10 m	2	<0.1 mm	5	Sl R/Sm	2	Hard, <5mm	4	U	6	19
99-DD-205	43	48	3 -10 m	2	<0.1 mm	5	Sl R/Sm	2	Hard, >5mm	2	U	6	17
99-DD-205	48	53	3 -10 m	2	<0.1 mm	5	Sl R/Sm	2	Hard, <5mm	4	U	6	19
99-DD-205	53	58	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, >5mm	2	U	6	20
99-DD-205	58	63	3 -10 m	2	<0.1 mm	5	Sl R/Sm	2	Hard, <5mm	4	U	6	19
99-DD-205	63	68	3 -10 m	2	<0.1 mm	5	Sl. Rough	3	Hard, >5mm	2	U	6	18
99-DD-205	68	73	3 -10 m	2	<0.1 mm	5	Sl R/Sm	2	Hard, <5mm	4	U	6	19
99-DD-205	73	78	3 -10 m	2	<0.1 mm	5	V. Rough	6	None	6	U	6	25
99-DD-205	78	83	3 -10 m	2	<0.1 mm	5	V. Rough	6	None	6	U	6	25
99-DD-205	83	88	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, >5mm	2	U	6	20
99-DD-205	88	93	3 -10 m	2	<0.1 mm	5	Sl R/Sm	2	Hard, <5mm	4	U	6	19
99-DD-205	93	98	3 -10 m	2	<0.1 mm	5	Sl R/Sm	2	Hard, <5mm	4	U	6	19
99-DD-205	98	103	3 -10 m	2	<0.1 mm	5	Smooth	1	Hard, <5mm	4	U	6	18
99-DD-205	103	108	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
99-DD-205	108	113	3 -10 m	2	<0.1 mm	5	Sl R/Sm	2	None	6	U	6	21
99-DD-205	113	118	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, >5mm	2	U	6	20
99-DD-205	118	123	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, >5mm	2	U	6	20
99-DD-205	123	128	3 -10 m	2	<0.1 mm	5	Sl R/Sm	2	Hard, >5mm	2	U	6	17
99-DD-205	128	133	3 -10 m	2	<0.1 mm	5	Sl R/Sm	2	Hard, <5mm	4	U	6	19
99-DD-205	133	138	3 -10 m	2	<0.1 mm	5	Sl. Rough	3	Hard, <5mm	4	U	6	20
99-DD-205	138	143	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
99-DD-205	143	148	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
99-DD-205	148	153	3 -10 m	2	<0.1 mm	5	Sl. Rough	3	Hard, >5mm	2	U	6	18

Boring	Depth, ft		Persistance		Separation		Roughness		Infilling		Weathering		Total
ID	From	To	Length	Rating	Aperture	Rating	Description	Rating	Description	Rating	Class	Rating	Rating
99-DD-205	153	158	3 -10 m	2	<0.1 mm	5	Sl R/Sm	2	Hard, <5mm	4	U	6	19
99-DD-205	158	162.9	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, >5mm	2	U	6	20
99-DD-205	162.9	168	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
99-DD-205	168	173	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
99-DD-205	173	178	3 -10 m	2	<0.1 mm	5	Sl R/Sm	2	Hard, <5mm	4	U	6	19
99-DD-205	178	183	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
99-DD-205	183	188	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, >5mm	2	U	6	20
99-DD-205	188	193	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
99-DD-209	0	5	3 -10 m	2	<0.1 mm	5	Smooth	1	None	6	U	6	20
99-DD-209	5	10	3 -10 m	2	<0.1 mm	5	Rough	5	Soft, <5mm	2	SW	5	19
99-DD-209	10	15	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	SW	5	21
99-DD-209	15	20	3 -10 m	2	<0.1 mm	5	Smooth	1	None	6	MW	3	17
99-DD-209	20	25	3 -10 m	2	<0.1 mm	5	Smooth	1	None	6	MW	3	17
99-DD-209	25	30	3 -10 m	2	<0.1 mm	5	Smooth	1	None	6	U	6	20
99-DD-209	30	35	3 -10 m	2	<0.1 mm	5	Sl. Rough	3	None	6	U	6	22
99-DD-209	35	40	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
99-DD-209	40	45	3 -10 m	2	<0.1 mm	5	Sl. Rough	3	None	6	SW	5	21
99-DD-209	45	50	3 -10 m	2	<0.1 mm	5	Sl. Rough	3	Soft, <5mm	2	SW	5	17
99-DD-209	50	55	3 -10 m	2	<0.1 mm	5	Rough	5	Soft, <5mm	2	SW	5	19
99-DD-209	55	60	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23
99-DD-209	60	65	3 -10 m	2	1-5 mm	1	Sl R/Sm	2	None	6	SW	5	16
99-DD-209	65	70	3 -10 m	2	1-5 mm	1	Rough	5	Hard, >5mm	2	U	6	16
99-DD-209	70	75	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	SW	5	21
99-DD-209	75	80	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	SW	5	21
99-DD-209	80	85	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23
99-DD-209	85	90	3 -10 m	2	<0.1 mm	5	Rough	5	Soft, <5mm	2	SW	5	19
99-DD-209	90	95	3 -10 m	2	<0.1 mm	5	Rough	5	Soft, <5mm	2	U	6	20
99-DD-209	95	100	3 -10 m	2	1-5 mm	1	Rough	5	Hard, <5mm	4	U	6	18
99-DD-209	100	105	3 -10 m	2	None	6	Rough	5	None	6	SW	5	24
99-DD-209	105	110	3 -10 m	2	None	6	Rough	5	None	6	SW	5	24
99-DD-209	110	115	3 -10 m	2	None	6	Rough	5	None	6	SW	5	24
99-DD-209	115	120	3 -10 m	2	None	6	Rough	5	None	6	U	6	25
99-DD-209	120	125	3 -10 m	2	None	6	Rough	5	None	6	U	6	25
99-DD-209	125	130	3 -10 m	2	None	6	Rough	5	None	6	U	6	25
99-DD-209	130	135	3 -10 m	2	None	6	Rough	5	Soft, <5mm	2	SW	5	20

Boring ID	Depth, ft		Persistance		Separation		Roughness		Infilling		Weathering		Total Rating
	From	To	Length	Rating	Aperture	Rating	Description	Rating	Description	Rating	Class	Rating	
99-DD-209	135	140	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
99-DD-209	140	145	3 -10 m	2	<0.1 mm	5	Rough	5	Soft, <5mm	2	MW	3	17
99-DD-209	145	150	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	SW	5	21
99-DD-209	150	155	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	SW	5	21
99-DD-209	155	160	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	SW	5	21
99-DD-209	160	164	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	SW	5	21
99-DD-209	164	169	3 -10 m	2	.1 -1 mm	4	Rough	5	Soft, >5mm	0	SW	5	16
99-DD-209	169	174	3 -10 m	2	.1 -1 mm	4	Rough	5	Soft, >5mm	0	SW	5	16
99-DD-209	174	175	3 -10 m	2	.1 -1 mm	4	Rough	5	Soft, >5mm	0	SW	5	16
99-DD-209	174	180	3 -10 m	2	.1 -1 mm	4	Rough	5	Soft, <5mm	2	SW	5	18
00-DD-213	0	2.1	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	MW	3	19
00-DD-213	2.1	5	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
00-DD-213	5	8.9	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
00-DD-213	8.9	13.9	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
00-DD-213	13.9	15	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
00-DD-213	15	20	3 -10 m	2	<0.1 mm	5	Sl. Rough	3	Soft, <5mm	2	U	6	18
00-DD-213	20	20.8	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Soft, <5mm	2	U	6	17
00-DD-213	20.8	25	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Soft, <5mm	2	U	6	17
00-DD-213	25	27.7	3 -10 m	2	1-5 mm	1	Smooth	1	Soft, <5mm	2	U	6	12
00-DD-213	27.7	32.8	3 -10 m	2	.1 -1 mm	4	Rough	5	Soft, <5mm	2	U	6	19
00-DD-213	32.8	35	3 -10 m	2	.1 -1 mm	4	Rough	5	Soft, <5mm	2	U	6	19
00-DD-213	35	39.7	3 -10 m	2	1-5 mm	1	Smooth	1	Soft, <5mm	2	U	6	12
00-DD-213	39.7	43	3 -10 m	2	1-5 mm	1	Smooth	1	Soft, <5mm	2	U	6	12
00-DD-213	43	45	3 -10 m	2	1-5 mm	1	Smooth	1	Soft, <5mm	2	U	6	12
00-DD-213	45	49.3	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Hard, <5mm	4	U	6	19
00-DD-213	49.3	54.4	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, >5mm	2	U	6	20
00-DD-213	54.4	59.4	3 -10 m	2	<0.1 mm	5	Sl. Rough	3	Hard, >5mm	2	U	6	18
00-DD-213	59.4	64.4	3 -10 m	2	<0.1 mm	5	Sl. Rough	3	Hard, <5mm	4	U	6	20
00-DD-213	64.4	69.2	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, >5mm	2	U	6	20
00-DD-213	69.2	74.2	3 -10 m	2	None	6	Rough	5	Hard, <5mm	4	U	6	23
00-DD-213	74.2	75	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
00-DD-213	75	80	3 -10 m	2	None	6	Rough	5	None	6	U	6	25
00-DD-213	80	84.7	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
00-DD-213	84.7	89.8	3 -10 m	2	.1 -1 mm	4	Rough	5	Hard, <5mm	4	U	6	21
00-DD-213	89.8	94.9	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22

Boring ID	Depth, ft		Persistance		Separation		Roughness		Infilling		Weathering		Total Rating
	From	To	Length	Rating	Aperture	Rating	Description	Rating	Description	Rating	Class	Rating	
00-DD-213	94.9	100	3 -10 m	2	.1 -1 mm	4	Rough	5	Hard, >5mm	2	U	6	19
00-DD-213	100	105	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
00-DD-213	105	110	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
00-DD-213	110	115	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
00-DD-213	115	120	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
00-DD-213	120	125	3 -10 m	2	1-5 mm	1	Rough	5	Soft, <5mm	2	U	6	16
00-DD-213	125	130	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
00-DD-213	130	135	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
00-DD-213	135	140	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
00-DD-213	140	145	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	U	6	22
00-DD-214	0	5	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	MW	3	21
00-DD-214	5	10	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-214	10	15	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	MW	3	21
00-DD-214	15	20	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23
00-DD-214	20	25	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-214	25	30	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-214	30	35	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-214	35	40	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-214	40	45	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-214	45	50	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-214	50	55	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23
00-DD-214	55	60	3 -10 m	2	.1 -1 mm	4	Rough	5	Hard, <5mm	4	SW	5	20
00-DD-214	60	65	3 -10 m	2	.1 -1 mm	4	Rough	5	Hard, <5mm	4	SW	5	20
00-DD-214	65	70	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23
00-DD-214	70	75	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23
00-DD-214	75	78.9	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23
00-DD-214	78.9	84.1	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23
00-DD-214	84.1	89.3	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23
00-DD-214	89.3	94.4	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	SW	5	21
00-DD-214	94.4	99.4	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	SW	5	21
00-DD-214	99.4	103.2	3 -10 m	2	.1 -1 mm	4	Rough	5	Hard, <5mm	4	SW	5	20
00-DD-214	103.2	105.7	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23
00-DD-214	105.7	110.8	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23
00-DD-214	110.8	115	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23
00-DD-214	115	120	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23

Boring ID	Depth, ft		Persistance		Separation		Roughness		Infilling		Weathering		Total Rating
	From	To	Length	Rating	Aperture	Rating	Description	Rating	Description	Rating	Class	Rating	
00-DD-214	120	125	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23
00-DD-214	125	130	3 -10 m	2	None	6	Rough	5	Soft, <5mm	2	U	6	21
00-DD-214	130	135	3 -10 m	2	.1 -1 mm	4	Rough	5	Soft, <5mm	2	SW	5	18
00-DD-214	135	140	3 -10 m	2	<0.1 mm	5	Rough	5	Hard, <5mm	4	SW	5	21
00-DD-214	140	145	3 -10 m	2	.1 -1 mm	4	Rough	5	Soft, <5mm	2	SW	5	18
00-DD-214	145	150	3 -10 m	2	.1 -1 mm	4	Rough	5	Soft, <5mm	2	SW	5	18
00-DD-214	150	155	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23
00-DD-214	155	160	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23
00-DD-214	160	165	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	SW	5	23
00-DD-214	165	170	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	0	5	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	5	10	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	10	15	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	15	20	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	20	24.5	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	24.5	29.6	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	29.6	34.9	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	34.9	39.9	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	39.9	45	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	45	50	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	50	54.6	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	54.6	55	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	55	60	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	60	65	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	65	70	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	70	75	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	75	80	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	80	85	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	85	90	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	90	95	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	95	100	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	100	105	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	105	110	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	110	115	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	115	120	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24

Boring ID	Depth, ft		Persistance		Separation		Roughness		Infilling		Weathering		Total Rating
	From	To	Length	Rating	Aperture	Rating	Description	Rating	Description	Rating	Class	Rating	
00-DD-217	120	125	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	125	130	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	130	135	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	135	140	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	140	143.5	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	143.5	145	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	145	150	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-217	150	150	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	2.1	5	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	5	10	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	10	15	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	15	20	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	20	25	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	25	30	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	30	35	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	35	40	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	40	45	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	45	50	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	50	55	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	55	60	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	60	65	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	65	70	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	70	75	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	75	80	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	80	85	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	85	90	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	90	95	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	95	100	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	100	103	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	103	105	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	105	110	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	110	115	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	115	120	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	120	125	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	125	130	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24

Boring ID	Depth, ft		Persistance		Separation		Roughness		Infilling		Weathering		Total Rating
	From	To	Length	Rating	Aperture	Rating	Description	Rating	Description	Rating	Class	Rating	
00-DD-218	130	135	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	135	140	3 -10 m	2	<0.1 mm	5	Sl. Rough	3	None	6	U	6	22
00-DD-218	140	144.5	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	144.5	145	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
00-DD-218	145	150	3 -10 m	2	<0.1 mm	5	Rough	5	None	6	U	6	24
01-DD-222	0	1.9											
01-DD-222	1.9	4.6	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Hard, <5mm	4	U	6	19
01-DD-222	4.6	5.7	3 -10 m	2	None	6	Sl R/R	4	None	6	U	6	24
01-DD-222	5.7	7.8	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-222	7.8	12	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-222	12	17	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-222	17	21.1	3 -10 m	2	.1 -1 mm	4	Sl R/R	4	Hard, <5mm	4	U	6	20
01-DD-222	21.1	26.3	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-222	26.3	31.4	3 -10 m	2	None	6	Sl R/R	4	None	6	U	6	24
01-DD-222	31.4	36.5	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-222	36.5	41.6	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-222	41.6	46.7	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-222	46.7	51.8	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-222	51.8	56.9	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-222	56.9	62	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-222	62	67.1	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-222	67.1	72	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-222	72	77.2	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-222	77.2	82	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-222	82	85.8	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Soft, <5mm	2	U	6	17
01-DD-222	85.8	91	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Soft, <5mm	2	U	6	16
01-DD-222	91	95.1	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-222	95.1	100.3	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-222	100.3	105.4	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-222	105.4	106.9	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-222	106.9	109.5	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-222	109.5	110.3	3 -10 m	2	.1 -1 mm	4	Slick.	0	Hard, <5mm	4	U	6	16
01-DD-222	110.3	115.5	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-222	115.5	117.7	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-222	117.7	122	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22

Boring ID	Depth, ft		Persistance		Separation		Roughness		Infilling		Weathering		Total Rating
	From	To	Length	Rating	Aperture	Rating	Description	Rating	Description	Rating	Class	Rating	
01-DD-222	122	125.4	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-223	0	2.1											0
01-DD-223	2.1	6.5	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-223	6.5	10.6	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-223	10.6	13.5	3 -10 m	2	.1 -1 mm	4	Rough	5	Hard, <5mm	4	U	6	21
01-DD-223	13.5	18.6	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-223	18.6	23.5	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-223	23.5	28.5	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Soft, <5mm	2	U	6	17
01-DD-223	28.5	33.5	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-223	33.5	38.7	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-223	38.7	43.5	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-223	43.5	48.7	3 -10 m	2	.1 -1 mm	4	Sl R/R	4	Soft, <5mm	2	U	6	18
01-DD-223	48.7	53.5	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	None	6	U	6	20
01-DD-223	53.5	58.7	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-223	58.7	63.5	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-223	63.5	68.6	3 -10 m	2	>5 mm	0	Sl R/Sm	2	Hard, >5mm	2	U	6	12
01-DD-223	68.6	73.2	3 -10 m	2	None	6	V. Rough	6	None	6	U	6	26
01-DD-223	73.2	78.4	3 -10 m	2	.1 -1 mm	4	Sl R/R	4	Hard, <5mm	4	U	6	20
01-DD-223	78.4	83.5	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-223	83.5	88.6	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Soft, <5mm	2	U	6	16
01-DD-223	88.6	93.5	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-223	93.5	98.6	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Hard, <5mm	4	U	6	19
01-DD-223	98.6	103.5	3 -10 m	2	.1 -1 mm	4	V. Rough	6	None	6	U	6	24
01-DD-223	103.5	108.6	3 -10 m	2	None	6	Sl R/R	4	Hard, <5mm	4	U	6	22
01-DD-223	108.6	113.3	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Soft, <5mm	2	U	6	17
01-DD-223	113.3	118.3	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Hard, <5mm	4	U	6	19
01-DD-223	118.3	123.5	3 -10 m	2	.1 -1 mm	4	Sl R/R	4	Hard, <5mm	4	U	6	20
01-DD-223	123.5	128.7	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-223	128.7	131.4	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-224	1.1	1.5											0
01-DD-224	1.5	4.3	3 -10 m	2	.1 -1 mm	4	Rough	5	None	6	U	6	23
01-DD-224	4.3	9	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-224	9	12.5	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Hard, <5mm	4	U	6	19
01-DD-224	12.5	17.5	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-224	17.5	22.5	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22

Boring ID	Depth, ft		Persistance		Separation		Roughness		Infilling		Weathering		Total Rating
	From	To	Length	Rating	Aperture	Rating	Description	Rating	Description	Rating	Class	Rating	
01-DD-224	22.5	27.5	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-224	27.5	32.5	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-224	32.5	37.5	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	None	6	U	6	20
01-DD-224	37.5	42.5	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-224	42.5	47.5	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-224	47.5	52.7	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	None	6	U	6	20
01-DD-224	52.7	57.7	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-224	57.7	62.5	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-224	62.5	67.4	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-224	67.4	72.5	3 -10 m	2	None	6	Sl R/Sm	2	Hard, <5mm	4	U	6	20
01-DD-224	72.5	77.7	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-224	77.7	82.5	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Hard, <5mm	4	U	6	19
01-DD-224	82.5	87.7	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-224	87.7	92.5	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-224	92.5	97.7	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-224	97.7	102.5	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-224	102.5	107.6	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	None	6	U	6	20
01-DD-224	107.6	112.5	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-224	112.5	115.4	3 -10 m	2	None	6	Sl R/Sm	2	Soft, <5mm	2	U	6	18
01-DD-224	115.4	120.6	3 -10 m	2	None	6	Smooth	1	None	6	U	6	21
01-DD-224	120.6	124.4	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-224	124.4	129.6	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-224	129.6	134.6	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-224	134.6	139.8	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-224	139.8	145	3 -10 m	2	None	6	Smooth	1	None	6	U	6	21
01-DD-224	145	150.2	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-225	0	1.3											0
01-DD-225	1.3	3.3	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-225	3.3	5.4	3 -10 m	2	.1 -1 mm	4	Sl R/R	4	Soft, <5mm	2	SW	5	17
01-DD-225	5.4	8.1	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-225	8.1	10.4	3 -10 m	2	.1 -1 mm	4	Smooth	1	Hard, <5mm	4	U	6	17
01-DD-225	10.4	15	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-225	15	20.2	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	None	6	U	6	20
01-DD-225	20.2	25.3	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-225	25.3	28.5	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18

Boring ID	Depth, ft		Persistance		Separation		Roughness		Infilling		Weathering		Total Rating
	From	To	Length	Rating	Aperture	Rating	Description	Rating	Description	Rating	Class	Rating	
01-DD-225	28.5	33.5	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Soft, <5mm	2	U	6	16
01-DD-225	33.5	38.4	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-225	38.4	41	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-225	41	46.2	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	None	6	U	6	20
01-DD-225	46.2	47.8	3 -10 m	2	None	6	Sl. Rough	3	Hard, <5mm	4	SW	5	20
01-DD-225	47.8	50.5	3 -10 m	2	None	6	Sl R/Sm	2	None	6	HW	1	17
01-DD-225	50.5	55.4	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-225	55.4	60.4	3 -10 m	2	.1 -1 mm	4	Slick.	0	None	6	U	6	18
01-DD-225	60.4	65.5	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Soft, <5mm	2	U	6	17
01-DD-225	65.5	70.5	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-225	70.5	75.7	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-225	75.7	79.6	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-225	79.6	81.9	3 -10 m	2	None	6	Smooth	1	None	6	U	6	21
01-DD-225	81.9	85.6	3 -10 m	2	None	6	Slick.	0	None	6	U	6	20
01-DD-225	85.6	90.8	3 -10 m	2	None	6	Sl R/Sm	2	Soft, >5mm	0	U	6	16
01-DD-225	90.8	92.2	3 -10 m	2	.1 -1 mm	4	Smooth	1	Hard, <5mm	4	U	6	17
01-DD-225	92.2	94.7	3 -10 m	2	None	6	Smooth	1	None	6	U	6	21
01-DD-225	94.7	95.7	3 -10 m	2	None	6	Smooth	1	None	6	U	6	21
01-DD-225	95.7	98.7	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-225	98.7	100.1	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Soft, <5mm	2	U	6	16
01-DD-225	100.1	104.6	3 -10 m	2	None	6	V. Rough	6	Soft, <5mm	2	U	6	22
01-DD-225	104.6	106.1	3 -10 m	2	None	6	V. Rough	6	None	6	U	6	26
01-DD-225	106.1	108	3 -10 m	2	None	6	Smooth	1	None	6	U	6	21
01-DD-225	108	110.6	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-225	110.6	115.7	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-225	115.7	120.7	3 -10 m	2	None	6	Smooth	1	None	6	U	6	21
01-DD-225	120.7	123.4	3 -10 m	2	None	6	Smooth	1	None	6	U	6	21
01-DD-225	123.4	127.3	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-225	127.3	130.4	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-225	130.4	135.1	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-225	135.1	139.7	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-225	139.7	144.6	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-225	144.6	149.6	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-226	0	1											0
01-DD-226	1	1.7	3 -10 m	2	None	6	V. Rough	6	None	6	U	6	26

Boring ID	Depth, ft		Persistance		Separation		Roughness		Infilling		Weathering		Total Rating
	From	To	Length	Rating	Aperture	Rating	Description	Rating	Description	Rating	Class	Rating	
01-DD-226	1.7	4.3	3 -10 m	2	None	6	V. Rough	6	None	6	U	6	26
01-DD-226	4.3	7.7	3 -10 m	2	None	6	V. Rough	6	None	6	U	6	26
01-DD-226	7.7	12.5	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	None	6	U	6	21
01-DD-226	12.5	17.6	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	None	6	U	6	20
01-DD-226	17.6	22.7	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-226	22.7	27.8	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	None	6	U	6	21
01-DD-226	27.8	33	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-226	33	38.1	3 -10 m	2	None	6	V. Rough	6	None	6	U	6	26
01-DD-226	38.1	43	3 -10 m	2	None	6	V. Rough	6	None	6	U	6	26
01-DD-226	43	48.2	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Hard, <5mm	4	U	6	19
01-DD-226	48.2	53	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Hard, <5mm	4	U	6	19
01-DD-226	53	58	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	None	6	U	6	21
01-DD-226	58	63	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-226	63	68.2	3 -10 m	2	None	6	Sl R/R	4	None	6	U	6	24
01-DD-226	68.2	73	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	None	6	U	6	20
01-DD-226	73	78	3 -10 m	2	None	6	Sl R/Sm	2	Hard, <5mm	4	U	6	20
01-DD-226	78	83	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-226	83	88.2	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-226	88.2	93	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Hard, <5mm	4	U	6	19
01-DD-226	93	98	3 -10 m	2	None	6	V. Rough	6	None	6	U	6	26
01-DD-226	98	103	3 -10 m	2	None	6	V. Rough	6	None	6	U	6	26
01-DD-226	103	108.1	3 -10 m	2	None	6	V. Rough	6	None	6	U	6	26
01-DD-226	108.1	113	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Soft, <5mm	2	U	6	16
01-DD-226	113	118.2	3 -10 m	2	.1 -1 mm	4	V. Rough	6	None	6	U	6	24
01-DD-226	118.2	123	3 -10 m	2	.1 -1 mm	4	V. Rough	6	None	6	U	6	24
01-DD-226	123	128	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Soft, <5mm	2	U	6	17
01-DD-226	128	133	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Soft, <5mm	2	U	6	16
01-DD-226	133	138.2	3 -10 m	2	.1 -1 mm	4	Rough	5	Hard, <5mm	4	U	6	21
01-DD-226	138.2	143	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	None	6	U	6	21
01-DD-226	143	148	3 -10 m	2	None	6	V. Rough	6	None	6	U	6	26
01-DD-226	148	153	3 -10 m	2	None	6	V. Rough	6	None	6	U	6	26
01-DD-226	153	158.1	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-226	158.1	163.2	3 -10 m	2	.1 -1 mm	4	Sl R/R	4	Soft, <5mm	2	U	6	18
01-DD-226	163.2	165	3 -10 m	2	None	6	V. Rough	6	None	6	U	6	26
01-DD-227	0	2.3											0

Boring ID	Depth, ft		Persistance		Separation		Roughness		Infilling		Weathering		Total Rating
	From	To	Length	Rating	Aperture	Rating	Description	Rating	Description	Rating	Class	Rating	
01-DD-227	2.3	4.6	3 -10 m	2	None	6	Slick.	0	None	6	U	6	20
01-DD-227	4.6	8.5	3 -10 m	2	.1 -1 mm	4	Smooth	1	Hard, <5mm	4	U	6	17
01-DD-227	8.5	11.1	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	None	6	U	6	20
01-DD-227	11.1	14	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-227	14	19	3 -10 m	2	.1 -1 mm	4	Slick.	0	Hard, <5mm	4	U	6	16
01-DD-227	19	22.9	3 -10 m	2	None	6	Slick.	0	None	6	U	6	20
01-DD-227	22.9	27.9	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-227	27.9	33.1	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Soft, <5mm	2	U	6	16
01-DD-227	33.1	38.3	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-227	38.3	43.3	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-227	43.3	48.5	3 -10 m	2	.1 -1 mm	4	Slick.	0	Soft, <5mm	2	U	6	14
01-DD-227	48.5	53.7	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Soft, <5mm	2	U	6	17
01-DD-227	53.7	58.9	3 -10 m	2	.1 -1 mm	4	Sl R/R	4	Hard, <5mm	4	U	6	20
01-DD-227	58.9	64	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	None	6	U	6	21
01-DD-227	64	69.1	3 -10 m	2	.1 -1 mm	4	Smooth	1	Hard, <5mm	4	U	6	17
01-DD-227	69.1	74.1	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-227	74.1	79.3	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Soft; <5mm	2	U	6	17
01-DD-227	79.3	84.4	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Soft, <5mm	2	U	6	16
01-DD-227	84.4	89.5	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Hard, <5mm	4	U	6	19
01-DD-227	89.5	94.5	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-227	94.5	99.6	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Hard, <5mm	4	U	6	19
01-DD-227	99.6	104.5	3 -10 m	2	.1 -1 mm	4	Smooth	1	Soft, <5mm	2	U	6	15
01-DD-227	104.5	109.6	3 -10 m	2	.1 -1 mm	4	V. Rough	6	None	6	U	6	24
01-DD-227	109.6	114.5	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	None	6	U	6	20
01-DD-227	114.5	119.5	3 -10 m	2	.1 -1 mm	4	Smooth	1	Hard, <5mm	4	U	6	17
01-DD-227	119.5	122.5	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Hard, <5mm	4	U	6	19
01-DD-227	122.5	127.7	3 -10 m	2	None	6	Smooth	1	None	6	U	6	21
01-DD-227	127.7	132.9	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-227	132.9	138.1	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Soft, <5mm	2	U	6	16
01-DD-227	138.1	143.3	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Hard, <5mm	4	U	6	19
01-DD-227	143.3	148.3	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Hard, <5mm	4	U	6	19
01-DD-227	148.3	150	3 -10 m	2	.1 -1 mm	4	Smooth	1	Soft, <5mm	2	U	6	15
01-DD-228	0	2.6	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	None	6	MW	3	17
01-DD-228	2.6	2.8	3 -10 m	2	None	6	V. Rough	6	None	6	MW	3	23
01-DD-228	2.8	3.9	3 -10 m	2	.1 -1 mm	4	Rough	5	None	6	SW	5	22

Boring ID	Depth, ft		Persistance		Separation		Roughness		Infilling		Weathering		Total Rating
	From	To	Length	Rating	Aperture	Rating	Description	Rating	Description	Rating	Class	Rating	
01-DD-228	3.9	9	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	None	6	U	6	20
01-DD-228	9	13.3	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-228	13.3	18.4	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-228	18.4	23.6	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-228	23.6	27.3	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	None	6	U	6	21
01-DD-228	27.3	32.3	3 -10 m	2	None	6	V. Rough	6	None	6	U	6	26
01-DD-228	32.3	37.4	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	None	6	U	6	21
01-DD-228	37.4	42.6	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	None	6	U	6	21
01-DD-228	42.6	47.7	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-228	47.7	52.7	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Soft, <5mm	2	U	6	17
01-DD-228	52.7	57.7	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-228	57.7	62.9	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Soft, <5mm	2	U	6	17
01-DD-228	62.9	68.1	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Soft, <5mm	2	U	6	17
01-DD-228	68.1	73.2	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-228	73.2	78.4	3 -10 m	2	None	6	V. Rough	6	None	6	U	6	26
01-DD-228	78.4	83.6	3 -10 m	2	None	6	Slick.	0	None	6	U	6	20
01-DD-228	83.6	87.3	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-228	87.3	92.5	3 -10 m	2	None	6	Smooth	1	None	6	U	6	21
01-DD-228	92.5	94.9	3 -10 m	2	None	6	Sl R/Sm	2	Soft, <5mm	2	U	6	18
01-DD-228	94.9	98.7	3 -10 m	2	None	6	Smooth	1	None	6	U	6	21
01-DD-228	98.7	99.7	3 -10 m	2	None	6	V. Rough	6	Soft, <5mm	2	U	6	22
01-DD-228	99.7	104	3 -10 m	2	None	6	Rough	5	None	6	U	6	25
01-DD-228	104	106.6	3 -10 m	2	.1 -1 mm	4	Slick.	0	Soft, <5mm	2	U	6	14
01-DD-228	106.6	111.8	3 -10 m	2	None	6	Smooth	1	None	6	U	6	21
01-DD-228	111.8	113.7	3 -10 m	2	.1 -1 mm	4	Slick.	0	None	6	U	6	18
01-DD-228	113.7	118.7	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-228	118.7	121.9	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-228	121.9	127	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-228	127	131.8	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Hard, <5mm	4	U	6	19
01-DD-228	131.8	136.3	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-228	136.3	141.5	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-228	141.5	146.7	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-228	146.7	151.9	3 -10 m	2	.1 -1 mm	4	Sl R/R	4	Soft, <5mm	2	U	6	18
01-DD-228	151.9	157	3 -10 m	2	None	6	Slick.	0	None	6	U	6	20
01-DD-228	157	162	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22

Boring ID	Depth, ft		Persistance		Separation		Roughness		Infilling		Weathering		Total Rating
	From	To	Length	Rating	Aperture	Rating	Description	Rating	Description	Rating	Class	Rating	
01-DD-228	162	164.5	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	None	6	U	6	20
01-DD-229	0	1.5											0
01-DD-229	1.5	2.5	3 -10 m	2	None	6	V. Rough	6	None	6	SW	5	25
01-DD-229	2.5	4.7	3 -10 m	2	None	6	V. Rough	6	None	6	SW	5	25
01-DD-229	4.7	5.3	3 -10 m	2	None	6	V. Rough	6	None	6	SW	5	25
01-DD-229	5.3	8.5	3 -10 m	2	None	6	Sl R/R	4	None	6	U	6	24
01-DD-229	8.5	11	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-229	11	16.1	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-229	16.1	21	3 -10 m	2	None	6	Sl R/R	4	None	6	U	6	24
01-DD-229	21	26	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-229	26	31	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-229	31	35	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-229	35	40	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-229	40	45.1	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Soft, <5mm	2	U	6	16
01-DD-229	45.1	47.7	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-229	47.7	51	3 -10 m	2	None	6	Sl R/R	4	None	6	U	6	24
01-DD-229	51	55.3	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-230	0	4.1	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	Hard, <5mm	4	U	6	19
01-DD-230	4.1	8.3	3 -10 m	2	.1 -1 mm	4	Sl. Rough	3	None	6	U	6	21
01-DD-230	8.3	13.3	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-230	13.3	17.6	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-230	17.6	21	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-230	21	26	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	None	6	U	6	20
01-DD-230	26	27.3	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-230	27.3	31	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-230	31	36.1	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-230	36.1	41	3 -10 m	2	.1 -1 mm	4	Sl R/R	4	Hard, <5mm	4	U	6	20
01-DD-230	41	46.2	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-230	46.2	51	3 -10 m	2	.1 -1 mm	4	Sl R/R	4	Soft, <5mm	2	U	6	18
01-DD-230	51	56.2	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-230	56.2	61	3 -10 m	2	None	6	Sl. Rough	3	None	6	U	6	23
01-DD-230	61	65.9	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-230	65.9	71	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-230	71	76.2	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22
01-DD-230	76.2	81	3 -10 m	2	None	6	Sl R/Sm	2	None	6	U	6	22

Boring ID	Depth, ft		Persistance		Separation		Roughness		Infilling		Weathering		Total
	From	To	Length	Rating	Aperture	Rating	Description	Rating	Description	Rating	Class	Rating	Rating
01-DD-230	81	86	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Soft, <5mm	2	U	6	16
01-DD-230	86	89.9	3 -10 m	2	.1 -1 mm	4	Smooth	1	Soft, <5mm	2	U	6	15
01-DD-230	89.9	95	3 -10 m	2	.1 -1 mm	4	Sl R/Sm	2	Hard, <5mm	4	U	6	18
01-DD-230	95	97.1	3 -10 m	2	None	6	Smooth	1	None	6	U	6	21
01-DD-230	97.1	101	3 -10 m	2	.1 -1 mm	4	Smooth	1	Soft, <5mm	2	U	6	15
01-DD-230	101	104.8	3 -10 m	2	.1 -1 mm	4	Smooth	1	Soft, <5mm	2	U	6	15
01-DD-230	104.8	107	3 -10 m	2	None	6	Sl R/Sm	2	Soft, <5mm	2	U	6	18
01-DD-230	107	109.9	3 -10 m	2	.1 -1 mm	4	Smooth	1	Soft, <5mm	2	U	6	15

Legend

Boring ID: Year - (i.e. 01 for 2001)
Drilling Method - (i.e. DD for diamond drilling)
Borehole Number - (i.e. 230)

Roughness: R - Rough
SM - Smooth
Sl - Slightly
V - Very

Weathering: U - Unweathered
SW - Slightly Weathered
MW - Moderately Weathered

Measures: m - meters
mm - millimeters

TABLE A6 - Rock Mass Ratings

Boring ID	Depth (ft)		RQD (%)	Q* Value	Rock Mass Rating (RMR)		
	From	To			Rating	Class Number	Description
01-DD-222	0.0	1.9					
01-DD-222	1.9	4.6	57	42.8	58.41	III	fair
01-DD-222	4.6	5.7	54	40.5	63.53	II	good
01-DD-222	5.7	7.8	81	81.0	66.77	II	good
01-DD-222	7.8	12.0	93	69.8	71.55	II	good
01-DD-222	12.0	17.0	71	23.7	66.30	II	good
01-DD-222	17.0	21.1	73	9.1	60.92	III	fair
01-DD-222	21.1	26.3	50	4.2	57.16	III	fair
01-DD-222	26.3	31.4	100	50.0	71.08	II	good
01-DD-222	31.4	36.5	86	35.8	62.78	II	good
01-DD-222	36.5	41.6	84	7.0	65.32	II	good
01-DD-222	41.6	46.7	85	17.7	70.14	II	good
01-DD-222	46.7	51.8	85	21.3	67.98	II	good
01-DD-222	51.8	56.9	86	17.9	66.78	II	good
01-DD-222	56.9	62.0	75	9.4	64.77	II	good
01-DD-222	62.0	67.1	94	94.0	70.46	II	good
01-DD-222	67.1	72.0	100	41.7	72.98	II	good
01-DD-222	72.0	77.2	79	39.5	64.27	II	good
01-DD-222	77.2	82.0	100	75.0	75.20	II	good
01-DD-222	82.0	85.8	92	138.0	69.66	II	good
01-DD-222	85.8	91.0	75	12.5	59.65	III	fair
01-DD-222	91.0	95.1	49	16.3	59.90	III	fair
01-DD-222	95.1	100.3	58	3.6	62.00	II	good
01-DD-222	100.3	105.4	33	4.4	58.49	III	fair
01-DD-222	105.4	106.9	0	1.0	54.13	III	fair
01-DD-222	106.9	109.5	35	7.3	58.25	III	fair
01-DD-222	109.5	110.3	0	0.8	46.80	III	fair
01-DD-222	110.3	115.5	62	3.9	63.54	II	good
01-DD-222	115.5	117.7	82	41.0	66.79	II	good
01-DD-222	117.7	122.0	76	31.7	66.62	II	good
01-DD-222	122.0	125.4	94	15.7	69.05	II	good
01-DD-223	0.0	2.1					
01-DD-223	2.1	6.5	95	7.9	69.89	II	good
01-DD-223	6.5	10.6	99	115.5	70.86	II	good
01-DD-223	10.6	13.5	76	76.0	64.42	II	good
01-DD-223	13.5	18.6	81	13.5	65.84	II	good
01-DD-223	18.6	23.5	100	75.0	71.76	II	good
01-DD-223	23.5	28.5	94	31.3	64.58	II	good
01-DD-223	28.5	33.5	96	16.0	70.06	II	good
01-DD-223	33.5	38.7	83	34.6	67.60	II	good
01-DD-223	38.7	43.5	98	98.0	73.39	II	good
01-DD-223	43.5	48.7	96	56.0	68.28	II	good
01-DD-223	48.7	53.5	88	22.0	65.49	II	good
01-DD-223	53.5	58.7	100	75.0	69.25	II	good
01-DD-223	58.7	63.5	100	133.3	79.20	II	good
01-DD-223	63.5	68.6	100	75.0	69.67	II	good
01-DD-223	68.6	73.2	89	178.0	80.26	II	good

Boring ID	Depth (ft)		RQD (%)	Q* Value	Rock Mass Rating (RMR)		
	From	To			Rating	Class Number	Description
01-DD-223	73.2	78.4	96	144.0	76.86	II	good
01-DD-223	78.4	83.5	84	21.0	64.16	II	good
01-DD-223	83.5	88.6	73	4.1	58.39	III	fair
01-DD-223	88.6	93.5	85	28.3	68.43	II	good
01-DD-223	93.5	98.6	96	72.0	75.70	II	good
01-DD-223	98.6	103.5	100	533.3	81.36	I	v. good
01-DD-223	103.5	108.6	96	144.0	78.70	II	good
01-DD-223	108.6	113.3	100	33.3	67.79	II	good
01-DD-223	113.3	118.3	88	44.0	64.18	II	good
01-DD-223	118.3	123.5	100	100.0	77.84	II	good
01-DD-223	123.5	128.7	72	12.0	63.78	II	good
01-DD-223	128.7	131.4	78	26.0	59.51	III	fair
01-DD-224	1.1	1.5					
01-DD-224	1.5	4.3	96	112.0	71.32	II	good
01-DD-224	4.3	9.0	94	94.0	70.15	II	good
01-DD-224	9.0	12.5	57	11.9	56.70	III	fair
01-DD-224	12.5	17.5	56	9.3	55.58	III	fair
01-DD-224	17.5	22.5	70	7.3	63.28	II	good
01-DD-224	22.5	27.5	72	4.5	59.69	III	fair
01-DD-224	27.5	32.5	88	11.0	64.42	II	good
01-DD-224	32.5	37.5	74	12.3	63.09	II	good
01-DD-224	37.5	42.5	98	65.3	72.92	II	good
01-DD-224	42.5	47.5	96	32.0	71.63	II	good
01-DD-224	47.5	52.7	60	6.7	61.43	II	good
01-DD-224	52.7	57.7	85	70.8	64.50	II	good
01-DD-224	57.7	62.5	94	62.7	70.46	II	good
01-DD-224	62.5	67.4	88	36.7	64.70	II	good
01-DD-224	67.4	72.5	98	49.0	69.60	II	good
01-DD-224	72.5	77.7	88	16.5	68.85	II	good
01-DD-224	77.7	82.5	100	66.7	70.26	II	good
01-DD-224	82.5	87.7	94	141.0	71.46	II	good
01-DD-224	87.7	92.5	100	75.0	74.45	II	good
01-DD-224	92.5	97.7	88	29.3	69.85	II	good
01-DD-224	97.7	102.5	100	66.7	72.88	II	good
01-DD-224	102.5	107.6	88	11.0	65.67	II	good
01-DD-224	107.6	112.5	63	10.5	58.82	III	fair
01-DD-224	112.5	115.4	76	7.9	60.96	III	fair
01-DD-224	115.4	120.6	73	9.1	63.74	II	good
01-DD-224	120.6	124.4	63	7.9	63.16	II	good
01-DD-224	124.4	129.6	85	21.3	67.34	II	good
01-DD-224	129.6	134.6	52	10.8	62.08	II	good
01-DD-224	134.6	139.8	98	40.8	72.51	II	good
01-DD-224	139.8	145.0	90	45.0	67.78	II	good
01-DD-224	145.0	150.2	94	58.8	70.72	II	good
01-DD-225	0.0	1.3					
01-DD-225	1.3	3.3	80	33.3	64.58	II	good
01-DD-225	3.3	5.4	0	4.2	48.60	III	fair
01-DD-225	5.4	8.1	41	13.7	53.30	III	fair
01-DD-225	8.1	10.4	83	6.9	59.78	III	fair

Boring ID	Depth (ft)		RQD (%)	Q* Value	Rock Mass Rating (RMR)		
	From	To			Rating	Class Number	Description
01-DD-225	10.4	15.0	78	6.5	64.00	II	good
01-DD-225	15.0	20.2	96	6.0	68.19	II	good
01-DD-225	20.2	25.3	61	15.3	60.95	III	fair
01-DD-225	25.3	28.5	75	31.3	60.63	III	fair
01-DD-225	28.5	33.5	98	163.3	67.63	II	good
01-DD-225	33.5	38.4	100	50.0	67.97	II	good
01-DD-225	38.4	41.0	100	133.3	73.28	II	good
01-DD-225	41.0	46.2	87	21.8	65.08	II	good
01-DD-225	46.2	47.8	31	7.8	56.23	III	fair
01-DD-225	47.8	50.5	41	1.4	55.81	III	fair
01-DD-225	50.5	55.4	69	23.0	64.01	II	good
01-DD-225	55.4	60.4	100	100.0	75.51	II	good
01-DD-225	60.4	65.5	90	22.5	62.69	II	good
01-DD-225	65.5	70.5	82	41.0	61.83	II	good
01-DD-225	70.5	75.7	79	5.5	64.45	II	good
01-DD-225	75.7	79.6	51	12.8	60.99	III	fair
01-DD-225	79.6	81.9	26	3.3	56.42	III	fair
01-DD-225	81.9	85.6	32	0.3	56.20	III	fair
01-DD-225	85.6	90.8	83	5.8	62.02	II	good
01-DD-225	90.8	92.2	64	1.3	59.35	III	fair
01-DD-225	92.2	94.7	44	29.3	58.21	III	fair
01-DD-225	94.7	95.7	0	2.7	51.19	III	fair
01-DD-225	95.7	98.7	13	3.3	58.06	III	fair
01-DD-225	98.7	100.1	36	9.0	50.45	III	fair
01-DD-225	100.1	104.6	36	1.5	67.42	II	good
01-DD-225	104.6	106.1	33	1.4	64.83	II	good
01-DD-225	106.1	108.0	32	5.3	55.83	III	fair
01-DD-225	108.0	110.6	15	1.3	55.51	III	fair
01-DD-225	110.6	115.7	67	16.8	63.30	II	good
01-DD-225	115.7	120.7	32	0.7	55.98	III	fair
01-DD-225	120.7	123.4	52	11.6	59.75	III	fair
01-DD-225	123.4	127.3	62	7.8	62.02	II	good
01-DD-225	127.3	130.4	48	6.0	60.35	III	fair
01-DD-225	130.4	135.1	62	31.0	63.79	II	good
01-DD-225	135.1	139.7	70	70.0	68.51	II	good
01-DD-225	139.7	144.6	100	6.3	72.54	II	good
01-DD-225	144.6	149.6	100	83.3	68.60	II	good
01-DD-226	0.0	1.0					
01-DD-226	1.0	1.7	100	533.3	70.49	II	good
01-DD-226	1.7	4.3	0	53.3	61.74	II	good
01-DD-226	4.3	7.7	100	533.3	80.90	II	good
01-DD-226	7.7	12.5	98	32.7	73.41	II	good
01-DD-226	12.5	17.6	86	19.1	66.61	II	good
01-DD-226	17.6	22.7	63	10.5	61.94	II	good
01-DD-226	22.7	27.8	98	522.7	78.19	II	good
01-DD-226	27.8	33.0	100	150.0	80.84	II	good
01-DD-226	33.0	38.1	100	533.3	83.67	I	v. good
01-DD-226	38.1	43.0	100	533.3	82.35	I	v. good
01-DD-226	43.0	48.2	92	20.4	66.07	II	good

Boring ID	Depth (ft)		RQD (%)	Q* Value	Rock Mass Rating (RMR)		
	From	To			Rating	Class Number	Description
01-DD-226	48.2	53.0	98	49.0	70.41	II	good
01-DD-226	53.0	58.0	100	150.0	77.51	II	good
01-DD-226	58.0	63.0	94	47.0	71.61	II	good
01-DD-226	63.0	68.2	98	147.0	80.34	II	good
01-DD-226	68.2	73.0	100	33.3	72.90	II	good
01-DD-226	73.0	78.0	100	16.7	68.46	II	good
01-DD-226	78.0	83.0	88	0.4	64.99	II	good
01-DD-226	83.0	88.2	83	27.7	62.60	II	good
01-DD-226	88.2	93.0	90	18.0	66.30	II	good
01-DD-226	93.0	98.0	100	533.3	83.51	I	v. good
01-DD-226	98.0	103.0	100	533.3	83.51	I	v. good
01-DD-226	103.0	108.1	100	533.3	83.67	I	v. good
01-DD-226	108.1	113.0	90	10.0	63.37	II	good
01-DD-226	113.0	118.2	100	533.3	81.84	I	v. good
01-DD-226	118.2	123.0	96	512.0	80.22	II	good
01-DD-226	123.0	128.0	100	75.0	74.51	II	good
01-DD-226	128.0	133.0	98	49.0	68.64	II	good
01-DD-226	133.0	138.2	100	150.0	78.84	II	good
01-DD-226	138.2	143.0	100	150.0	78.20	II	good
01-DD-226	143.0	148.0	100	533.3	83.51	I	v. good
01-DD-226	148.0	153.0	98	522.7	83.03	I	v. good
01-DD-226	153.0	158.1	100	25.0	73.16	II	good
01-DD-226	158.1	163.2	100	37.5	75.67	II	good
01-DD-226	163.2	165.0	100	533.3	77.43	II	good
01-DD-227	0.0	2.3					
01-DD-227	2.3	4.6	65	32.5	63.91	II	good
01-DD-227	4.6	8.5	100	75.0	71.75	II	good
01-DD-227	8.5	11.1	27	6.8	52.30	III	fair
01-DD-227	11.1	14.0	97	72.8	71.23	II	good
01-DD-227	14.0	19.0	100	75.0	69.12	II	good
01-DD-227	19.0	22.9	100	150.0	75.76	II	good
01-DD-227	22.9	27.9	96	48.0	72.10	II	good
01-DD-227	27.9	33.1	92	17.3	67.42	II	good
01-DD-227	33.1	38.3	62	4.6	61.80	II	good
01-DD-227	38.3	43.3	98	5.4	71.35	II	good
01-DD-227	43.3	48.5	98	36.8	65.85	II	good
01-DD-227	48.5	53.7	98	147.0	73.34	II	good
01-DD-227	53.7	58.9	87	10.9	64.49	II	good
01-DD-227	58.9	64.0	73	7.3	62.38	II	good
01-DD-227	64.0	69.1	94	15.7	73.22	II	good
01-DD-227	69.1	74.1	100	75.0	71.12	II	good
01-DD-227	74.1	79.3	100	37.5	74.84	II	good
01-DD-227	79.3	84.4	100	25.0	69.23	II	good
01-DD-227	84.4	89.5	100	75.0	68.92	II	good
01-DD-227	89.5	94.5	98	147.0	75.03	II	good
01-DD-227	94.5	99.6	100	150.0	76.67	II	good
01-DD-227	99.6	104.5	92	34.5	70.43	II	good
01-DD-227	104.5	109.6	100	533.3	81.67	I	v. good
01-DD-227	109.6	114.5	84	9.3	66.01	II	good

Boring ID	Depth (ft)		RQD (%)	Q* Value	Rock Mass Rating (RMR)		
	From	To			Rating	Class Number	Description
01-DD-227	114.5	119.5	100	100.0	74.51	II	good
01-DD-227	119.5	122.5	100	75.0	73.16	II	good
01-DD-227	122.5	127.7	100	75.0	72.25	II	good
01-DD-227	127.7	132.9	96	16.0	73.28	II	good
01-DD-227	132.9	138.1	90	11.3	63.61	II	good
01-DD-227	138.1	143.3	100	400.0	72.34	II	good
01-DD-227	143.3	148.3	98	147.0	76.03	II	good
01-DD-227	148.3	150.0	100	25.0	63.52	II	good
01-DD-228	0.0	2.6	0	5.0	47.93	III	fair
01-DD-228	2.6	2.8	0	1.5	52.98	III	fair
01-DD-228	2.8	3.9	36	5.4	60.06	III	fair
01-DD-228	3.9	9.0	96	24.0	67.54	II	good
01-DD-228	9.0	13.3	88	11.0	67.12	II	good
01-DD-228	13.3	18.4	71	35.5	63.20	II	good
01-DD-228	18.4	23.6	94	141.0	76.46	II	good
01-DD-228	23.6	27.3	22	4.4	52.95	III	fair
01-DD-228	27.3	32.3	74	16.4	77.59	II	good
01-DD-228	32.3	37.4	49	16.3	57.54	III	fair
01-DD-228	37.4	42.6	77	25.7	63.01	II	good
01-DD-228	42.6	47.7	61	7.6	63.52	II	good
01-DD-228	47.7	52.7	74	24.7	59.11	III	fair
01-DD-228	52.7	57.7	98	16.3	69.95	II	good
01-DD-228	57.7	62.9	100	33.3	66.17	II	good
01-DD-228	62.9	68.1	83	27.7	60.54	III	fair
01-DD-228	68.1	73.2	94	94.0	69.65	II	good
01-DD-228	73.2	78.4	100	150.0	83.84	I	v. good
01-DD-228	78.4	83.6	100	16.7	73.34	II	good
01-DD-228	83.6	87.3	89	59.3	70.73	II	good
01-DD-228	87.3	92.5	87	9.7	67.01	II	good
01-DD-228	92.5	94.9	42	1.8	54.26	III	fair
01-DD-228	94.9	98.7	63	1.3	59.98	III	fair
01-DD-228	98.7	99.7	0	0.4	55.00	III	fair
01-DD-228	99.7	104.0	88	22.0	72.27	II	good
01-DD-228	104.0	106.6	62	1.3	54.54	III	fair
01-DD-228	106.6	111.8	71	1.2	64.60	II	good
01-DD-228	111.8	113.7	53	3.3	57.29	III	fair
01-DD-228	113.7	118.7	86	7.2	68.54	II	good
01-DD-228	118.7	121.9	88	22.0	68.49	II	good
01-DD-228	121.9	127.0	69	3.5	61.73	II	good
01-DD-228	127.0	131.8	98	13.1	66.85	II	good
01-DD-228	131.8	136.3	82	10.9	68.53	II	good
01-DD-228	136.3	141.5	88	7.3	69.85	II	good
01-DD-228	141.5	146.7	100	33.3	74.25	II	good
01-DD-228	146.7	151.9	98	16.3	70.85	II	good
01-DD-228	151.9	157.0	100	200.0	79.25	II	good
01-DD-228	157.0	162.0	100	100.0	81.09	I	v. good
01-DD-228	162.0	164.5	88	19.6	71.84	II	good
01-DD-229	0.0	1.5					
01-DD-229	1.5	2.5	90	67.5	70.64	II	good

Boring ID	Depth (ft)		RQD (%)	Q* Value	Rock Mass Rating (RMR)		
	From	To			Rating	Class Number	Description
01-DD-229	2.5	4.7	32	24.0	62.94	II	good
01-DD-229	4.7	5.3	0	0.8	51.52	III	fair
01-DD-229	5.3	8.5	53	13.3	61.04	II	good
01-DD-229	8.5	11.0	100	11.1	69.70	II	good
01-DD-229	11.0	16.1	96	21.3	70.13	II	good
01-DD-229	16.1	21.0	35	7.0	57.71	III	fair
01-DD-229	21.0	26.0	66	5.5	61.21	II	good
01-DD-229	26.0	31.0	92	20.4	64.11	II	good
01-DD-229	31.0	35.0	95	23.8	64.29	II	good
01-DD-229	35.0	40.0	72	16.0	62.56	II	good
01-DD-229	40.0	45.1	25	4.2	50.59	III	fair
01-DD-229	45.1	47.7	73	18.3	62.83	II	good
01-DD-229	47.7	51.0	97	97.0	73.28	II	good
01-DD-229	51.0	55.3	65	8.1	61.19	II	good
01-DD-230	0.0	4.1	51	25.5	60.70	III	fair
01-DD-230	4.1	8.3	90	67.5	70.81	II	good
01-DD-230	8.3	13.3	92	69.0	64.54	II	good
01-DD-230	13.3	17.6	63	10.5	62.90	II	good
01-DD-230	17.6	21.0	88	29.3	68.61	II	good
01-DD-230	21.0	26.0	76	8.4	61.55	II	good
01-DD-230	26.0	27.3	77	115.5	66.71	II	good
01-DD-230	27.3	31.0	81	40.5	66.36	II	good
01-DD-230	31.0	36.1	65	10.8	62.00	II	good
01-DD-230	36.1	41.0	69	17.3	61.80	II	good
01-DD-230	41.0	46.2	73	4.9	58.99	III	fair
01-DD-230	46.2	51.0	85	5.7	63.15	II	good
01-DD-230	51.0	56.2	94	20.9	69.72	II	good
01-DD-230	56.2	61.0	42	5.6	58.06	III	fair
01-DD-230	61.0	65.9	82	10.3	66.20	II	good
01-DD-230	65.9	71.0	80	13.3	63.62	II	good
01-DD-230	71.0	76.2	92	15.3	67.65	II	good
01-DD-230	76.2	81.0	69	6.9	62.97	II	good
01-DD-230	81.0	86.0	76	14.3	58.96	III	fair
01-DD-230	86.0	89.9	69	2.9	57.89	III	fair
01-DD-230	89.9	95.0	55	1.7	56.72	III	fair
01-DD-230	95.0	97.1	43	1.8	57.25	III	fair
01-DD-230	97.1	101.0	64	1.6	55.27	III	fair
01-DD-230	101.0	104.8	71	1.5	56.95	III	fair
01-DD-230	104.8	107.0	55	1.4	56.11	III	fair
01-DD-230	107.0	109.9	69	1.4	57.15	III	fair

NOTES
RQD = Rock Quality Designation
Q* = Modified Tunneling Quality Index
RMR = Rock Mass Rating

TABLE A7 - Packer Test Hydraulic Conductivity Calculations

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)	(psi)	K (ft/sec)	K (ft/min)	K (ft/day)
94-DD-80	0.3	11	1A	156	165	1.6	0.0036	40	2.61E-06	1.57E-04	0.2256
94-DD-80	0.3	11	1B	156	165	5.7	0.0127	80	4.91E-06	2.95E-04	0.4242
94-DD-80	0.3	11	2A	144	158	1.4	0.0031	40	1.51E-06	9.07E-05	0.1305
94-DD-80	0.3	11	2B	144	158	5.3	0.0118	80	3.02E-06	1.81E-04	0.2609
94-DD-80	0.3	11	3A	128	144	0	0.0000	40	0.00E+00	0.00E+00	0.0000
94-DD-80	0.3	11	3B	128	144	0	0.0000	80	0.00E+00	0.00E+00	0.0000
94-DD-80	0.3	11	4A	117	131	0	0.0000	40	0.00E+00	0.00E+00	0.0000
94-DD-80	0.3	11	4B	117	131	0	0.0000	80	0.00E+00	0.00E+00	0.0000
94-DD-80	0.3	11	5A	103	117	0	0.0000	40	0.00E+00	0.00E+00	0.0000
94-DD-80	0.3	11	5B	103	117	0	0.0000	80	0.00E+00	0.00E+00	0.0000
94-DD-80	0.3	11	6A	88	103	0	0.0000	40	0.00E+00	0.00E+00	0.0000
94-DD-80	0.3	11	6B	88	103	0	0.0000	80	0.00E+00	0.00E+00	0.0000
94-DD-80	0.3	11	7A	75	90	0.5	0.0011	40	5.40E-07	3.24E-05	0.0466
94-DD-80	0.3	11	7B	75	90	1.5	0.0033	80	8.54E-07	5.12E-05	0.0738
94-DD-80	0.3	11	8A	64	77	3.2	0.0071	40	3.65E-06	2.19E-04	0.3158
94-DD-80	0.3	11	8B	64	77	9.7	0.0216	80	5.85E-06	3.51E-04	0.5057
94-DD-80	0.3	11	9A	50	64	6.3	0.0140	40	6.81E-06	4.09E-04	0.5886
94-DD-80	0.3	11	9B	50	64	8	0.0178	80	4.56E-06	2.74E-04	0.3940
94-DD-80	0.3	11	10A	37	52	8.1	0.0181	40	8.70E-06	5.22E-04	0.7515
94-DD-80	0.3	11	10B	37	52	4.7	0.0105	80	2.66E-06	1.59E-04	0.2296
94-DD-80	0.3	11	11A	24	38	15.5	0.0346	40	1.68E-05	1.01E-03	1.4531
94-DD-80	0.3	11	11B	24	38	21.9	0.0488	80	1.25E-05	7.52E-04	1.0822
94-DD-80	0.3	11	12A	13	25	6.7	0.0149	40	7.67E-06	4.60E-04	0.6626
94-DD-80	0.3	11	12B	13	25	3	0.0067	20	6.21E-06	3.72E-04	0.5363
94-DD-81	0.3	30.6	1A	178	190	1.3	0.0029	40	1.21E-06	7.24E-05	0.1043
94-DD-81	0.3	30.6	1B	178	190	12.9	0.0288	80	6.88E-06	4.13E-04	0.5941
94-DD-81	0.3	30.6	2A	170	179	18.3	0.0408	40	2.61E-05	1.57E-03	2.2592
94-DD-81	0.3	30.6	2B	170	179	25.7	0.0573	80	2.09E-05	1.25E-03	1.8068
94-DD-81	0.3	30.6	3A	156	170	17.5	0.0390	40	1.61E-05	9.67E-04	1.3928
94-DD-81	0.3	30.6	3B	156	170	30.7	0.0685	80	1.62E-05	9.73E-04	1.4006
94-DD-81	0.3	30.6	4A	143	156	19.7	0.0439	40	1.93E-05	1.16E-03	1.6640
94-DD-81	0.3	30.6	4B	143	156	27.8	0.0620	80	1.55E-05	9.29E-04	1.3375

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)	(psi)	K (ft/sec)	K (ft/min)	K (ft/day)
94-DD-81	0.3	30.6	5A	130	144	0	0.0000	40	0.00E+00	0.00E+00	0.0000
94-DD-81	0.3	30.6	5B	130	144	0	0.0000	80	0.00E+00	0.00E+00	0.0000
96-DD-87	0.3	11.8	1A	114	130	1.3	0.0029	45	1.19E-06	7.12E-05	0.1026
96-DD-87	0.3	11.8	2A	104	120	1.1	0.0025	45	1.04E-06	6.21E-05	0.0895
96-DD-87	0.3	11.8	3A	94	110	2.6	0.0058	50	2.23E-06	1.34E-04	0.1923
96-DD-87	0.3	11.8	3B	94	110	1.3	0.0029	25	2.04E-06	1.22E-04	0.1763
96-DD-87	0.3	11.8	4A	84	100	3.1	0.0069	64	2.11E-06	1.27E-04	0.1827
96-DD-87	0.3	11.8	4B	84	100	1.4	0.0031	32	1.78E-06	1.07E-04	0.1539
96-DD-87	0.3	11.8	5A	74	90	2.4	0.0054	65	1.61E-06	9.68E-05	0.1394
96-DD-87	0.3	11.8	5B	74	90	0.8	0.0018	30	1.08E-06	6.46E-05	0.0930
96-DD-87	0.3	11.8	6A	64	80	0.65	0.0014	55	5.10E-07	3.06E-05	0.0441
96-DD-87	0.3	11.8	6B	64	80	0.38	0.0008	35	4.47E-07	2.68E-05	0.0386
96-DD-87	0.3	11.8	7A	55	71	0.58	0.0013	52	4.79E-07	2.87E-05	0.0414
96-DD-87	0.3	11.8	7B	55	71	0.18	0.0004	36	2.07E-07	1.24E-05	0.0179
96-DD-87	0.3	11.8	8A	44	60	0.19	0.0004	50	1.63E-07	9.76E-06	0.0141
96-DD-87	0.3	11.8	8B	44	60	0.1	0.0002	25	1.57E-07	9.42E-06	0.0136
96-DD-87	0.3	11.8	9A	33	48	0.23	0.0005	52	1.90E-07	1.14E-05	0.0164
96-DD-87	0.3	11.8	9B	33	48	0.1	0.0002	26	1.52E-07	9.11E-06	0.0131
96-DD-87	0.3	11.8	10A	22	38	26.1	0.0582	20	5.03E-05	3.02E-03	4.3428
96-DD-87	0.3	11.8	11A	11	26	27	0.0602	15	6.55E-05	3.93E-03	5.6628
99-DD-200	0.3	-17.6	1A	190	205	0	0.0000	31	0.00E+00	0.00E+00	0.0000
99-DD-200	0.3	-17.6	1B	190	205	0.1	0.0002	80	6.51E-08	3.91E-06	0.0056
99-DD-200	0.3	-17.6	2A	175	195	0	0.0000	30	0.00E+00	0.00E+00	0.0000
99-DD-200	0.3	-17.6	2B	175	195	0	0.0000	82	0.00E+00	0.00E+00	0.0000
99-DD-200	0.3	-17.6	3A	161	180	1	0.0022	34	1.55E-06	9.33E-05	0.1343
99-DD-200	0.3	-17.6	3B	161	180	1.6	0.0036	80	9.03E-07	5.42E-05	0.0780
99-DD-200	0.3	-17.6	4A	146	165	0	0.0000	24	0.00E+00	0.00E+00	0.0000
99-DD-200	0.3	-17.6	4B	146	165	0.7	0.0016	52	6.45E-07	3.87E-05	0.0558
99-DD-200	0.3	-17.6	5A	131	151	1.6	0.0036	35	2.40E-06	1.44E-04	0.2070
99-DD-200	0.3	-17.6	5B	131	151	3.1	0.0069	80	1.75E-06	1.05E-04	0.1512
99-DD-200	0.3	-17.6	6A	117	136	24.5	0.0546	64	1.76E-05	1.06E-03	1.5246
99-DD-200	0.3	-17.6	6B	117	136	14.8	0.0330	22	4.18E-05	2.51E-03	3.6131
99-DD-200	0.3	-17.6	6C	117	136	19.2	0.0428	52	1.76E-05	1.06E-03	1.5200
99-DD-200	0.3	-17.6	7A	102	122	0.8	0.0018	20	2.67E-06	1.60E-04	0.2303

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure (psi)	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)		K (ft/sec)	K (ft/min)	K (ft/day)
99-DD-200	0.3	-17.6	7B	102	122	2.6	0.0058	51	2.45E-06	1.47E-04	0.2119
99-DD-200	0.3	-17.6	8A	88	107	0	0.0000	20	0.00E+00	0.00E+00	0.0000
99-DD-200	0.3	-17.6	8B	88	107	0.1	0.0002	52	9.22E-08	5.53E-06	0.0080
99-DD-200	0.3	-17.6	9A	73	93	0	0.0000	25	0.00E+00	0.00E+00	0.0000
99-DD-200	0.3	-17.6	9B	73	93	0	0.0000	55	0.00E+00	0.00E+00	0.0000
99-DD-200	0.3	-17.6	10A	59	78	0	0.0000	24	0.00E+00	0.00E+00	0.0000
99-DD-200	0.3	-17.6	10B	59	78	0	0.0000	50	0.00E+00	0.00E+00	0.0000
99-DD-200	0.3	-17.6	11A	44	64	0	0.0000	25	0.00E+00	0.00E+00	0.0000
99-DD-200	0.3	-17.6	11B	44	64	0	0.0000	53	0.00E+00	0.00E+00	0.0000
99-DD-200	0.3	-17.6	12A	30	49	0.2	0.0004	19	7.26E-07	4.35E-05	0.0627
99-DD-200	0.3	-17.6	12B	30	49	2.4	0.0054	46	2.56E-06	1.54E-04	0.2212
99-DD-201	5.2	22.89	1A	189	203	0	0.0000	30	0.00E+00	0.00E+00	0.0000
99-DD-201	5.2	22.89	1B	189	203	0.2	0.0004	75	1.15E-07	6.88E-06	0.0099
99-DD-201	5.2	22.89	2A	174	194	0	0.0000	27	0.00E+00	0.00E+00	0.0000
99-DD-201	5.2	22.89	2B	174	194	0.4	0.0009	76	1.95E-07	1.17E-05	0.0168
99-DD-201	5.2	22.89	3A	160	179	1.6	0.0036	24	2.06E-06	1.24E-04	0.1780
99-DD-201	5.2	22.89	3B	160	179	2	0.0045	70	1.05E-06	6.30E-05	0.0907
99-DD-201	5.2	22.89	4A	145	165	1.7	0.0038	35	1.62E-06	9.75E-05	0.1404
99-DD-201	5.2	22.89	4B	145	165	2.7	0.0060	60	1.63E-06	9.76E-05	0.1406
99-DD-201	5.2	22.89	5A	131	150	1.2	0.0027	24	1.55E-06	9.27E-05	0.1335
99-DD-201	5.2	22.89	5B	131	150	2.8	0.0062	53	1.88E-06	1.13E-04	0.1626
99-DD-201	5.2	22.89	6A	116	136	1.2	0.0027	26	1.45E-06	8.72E-05	0.1256
99-DD-201	5.2	22.89	6B	116	136	1.8	0.0040	51	1.25E-06	7.51E-05	0.1081
99-DD-201	5.2	22.89	7A	102	121	> 23 gpm - could not pump at high enough rate to achieve pressure					
99-DD-201	5.2	22.89	8A	87	107	> 23 gpm - could not pump at high enough rate to achieve pressure					
99-DD-201	5.2	22.89	9A	73	92	0	0.0000	22	0.00E+00	0.00E+00	0.0000
99-DD-201	5.2	22.89	9B	73	92	0.8	0.0018	52	5.47E-07	3.28E-05	0.0472
99-DD-201	5.2	22.89	10A	58	78	0.2	0.0004	58	1.24E-07	7.45E-06	0.0107
99-DD-201	5.2	22.89	10B	58	78	0	0.0000	24	0.00E+00	0.00E+00	0.0000
99-DD-201	5.2	22.89	11A	44	63	0	0.0000	23	0.00E+00	0.00E+00	0.0000
99-DD-201	5.2	22.89	11B	44	63	1.8	0.0040	48	1.32E-06	7.91E-05	0.1139
99-DD-201	5.2	22.89	12A	29	49	11.2	0.0250	25	1.40E-05	8.43E-04	1.2138
99-DD-201	5.2	22.89	12B	29	49	21.4	0.0477	50	1.52E-05	9.12E-04	1.3129
99-DD-203	2	7.98	1A	163	183	0.4	0.0009	52	2.91E-07	1.75E-05	0.0251

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)	(psi)	K (ft/sec)	K (ft/min)	K (ft/day)
99-DD-203	2	7.98	1B	163	183	0	0.0000	25	0.00E+00	0.00E+00	0.0000
99-DD-203	2	7.98	2A	149	168	0	0.0000	50	0.00E+00	0.00E+00	0.0000
99-DD-203	2	7.98	2B	149	168	0	0.0000	25	0.00E+00	0.00E+00	0.0000
99-DD-203	2	7.98	3A	134	154	0	0.0000	52	0.00E+00	0.00E+00	0.0000
99-DD-203	2	7.98	3B	134	154	1	0.0022	85	4.63E-07	2.78E-05	0.0400
99-DD-203	2	7.98	3C	134	154	0	0.0000	50	0.00E+00	0.00E+00	0.0000
99-DD-203	2	7.98	4A	119	139	0	0.0000	57	0.00E+00	0.00E+00	0.0000
99-DD-203	2	7.98	4B	119	139	0	0.0000	25	0.00E+00	0.00E+00	0.0000
99-DD-203	2	7.98	5A	104	124	0	0.0000	59	0.00E+00	0.00E+00	0.0000
99-DD-203	2	7.98	5B	104	124	0	0.0000	30	0.00E+00	0.00E+00	0.0000
99-DD-203	2	7.98	6A	90	109	1.8	0.0040	60	1.17E-06	6.99E-05	0.1007
99-DD-203	2	7.98	6B	90	109	0.9	0.0020	28	1.19E-06	7.15E-05	0.1030
99-DD-203	2	7.98	7A	74	94	3	0.0067	59	1.97E-06	1.18E-04	0.1705
99-DD-203	2	7.98	7B	74	94	1.2	0.0027	25	1.76E-06	1.06E-04	0.1522
99-DD-203	2	7.98	8A	60	80	0	0.0000	58	0.00E+00	0.00E+00	0.0000
99-DD-203	2	7.98	9A	45	65	0	0.0000	30	0.00E+00	0.00E+00	0.0000
99-DD-203	2	7.98	9B	45	65	4.6	0.0103	60	2.98E-06	1.79E-04	0.2574
99-DD-203	2	7.98	10A	31	50	0	0.0000	26	0.00E+00	0.00E+00	0.0000
99-DD-203	2	7.98	10B	31	50	0	0.0000	50	0.00E+00	0.00E+00	0.0000
99-DD-204	2.1	23.18	1A	179	198	0	0.0000	64	0.00E+00	0.00E+00	0.0000
99-DD-204	2.1	23.18	2A	164	184	0	0.0000	65	0.00E+00	0.00E+00	0.0000
99-DD-204	2.1	23.18	3A	150	169	0	0.0000	65	0.00E+00	0.00E+00	0.0000
99-DD-204	2.1	23.18	4A	135	155	0	0.0000	65	0.00E+00	0.00E+00	0.0000
99-DD-204	2.1	23.18	5A	121	140	1.2	0.0027	68	6.34E-07	3.81E-05	0.0548
99-DD-204	2.1	23.18	5B	121	140	0.15	0.0003	36	1.36E-07	8.13E-06	0.0117
99-DD-204	2.1	23.18	6A	106	126	0.8	0.0018	69	4.18E-07	2.51E-05	0.0361
99-DD-204	2.1	23.18	6B	106	126	0.15	0.0003	35	1.39E-07	8.32E-06	0.0120
99-DD-204	2.1	23.18	7A	92	111	1.2	0.0027	65	6.60E-07	3.96E-05	0.0570
99-DD-204	2.1	23.18	7B	92	111	0	0.0000	32	0.00E+00	0.00E+00	0.0000
99-DD-204	2.1	23.18	8A	77	97	2.4	0.0054	60	1.42E-06	8.49E-05	0.1223
99-DD-204	2.1	23.18	8B	77	97	1	0.0022	30	1.04E-06	6.25E-05	0.0900
99-DD-204	2.1	23.18	9A	63	82	0	0.0000	60	0.00E+00	0.00E+00	0.0000
99-DD-204	2.1	23.18	10A	48	68	32.8	0.0731	40	2.76E-05	1.66E-03	2.3832
99-DD-204	2.1	23.18	10B	48	68	20.2	0.0450	20	2.86E-05	1.71E-03	2.4685

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure (psi)	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)		K (ft/sec)	K (ft/min)	K (ft/day)
99-DD-204	2.1	23.18	11A	34	53	10	0.0223	50	6.91E-06	4.15E-04	0.5972
99-DD-204	2.1	23.18	11B	34	53	5.8	0.0129	26	6.75E-06	4.05E-04	0.5832
99-DD-204	2.1	23.18	12A	19	39	40.8	0.0910	22	5.51E-05	3.30E-03	4.7569
99-DD-204	2.1	23.18	12B	19	39	30	0.0669	12	5.95E-05	3.57E-03	5.1389
99-DD-205	6.2	1.8	1A	166	193	3.2	0.0071	36	2.81E-06	1.69E-04	0.2432
99-DD-205	6.2	1.8	1B	166	193	6	0.0134	64	2.90E-06	1.74E-04	0.2503
99-DD-205	6.2	1.8	2A	151	171	9	0.0201	36	1.01E-05	6.05E-04	0.8712
99-DD-205	6.2	1.8	2B	151	171	18.2	0.0406	68	1.05E-05	6.31E-04	0.9088
99-DD-205	6.2	1.8	3A	136	156	17.8	0.0397	31	2.33E-05	1.40E-03	2.0169
99-DD-205	6.2	1.8	3B	136	156	21	0.0468	50	1.67E-05	1.00E-03	1.4403
99-DD-205	6.2	1.8	4A	121	141	14.6	0.0326	52	1.11E-05	6.68E-04	0.9620
99-DD-205	6.2	1.8	4B	121	141	7	0.0156	24	1.21E-05	7.26E-04	1.0456
99-DD-205	6.2	1.8	5A	106	126	1.2	0.0027	25	1.99E-06	1.19E-04	0.1717
99-DD-205	6.2	1.8	5B	106	126	1.4	0.0031	55	1.01E-06	6.05E-05	0.0871
99-DD-205	6.2	1.8	6A	89	109	0.3	0.0007	32	3.81E-07	2.29E-05	0.0329
99-DD-205	6.2	1.8	6B	89	109	0.8	0.0018	60	5.27E-07	3.16E-05	0.0455
99-DD-205	6.2	1.8	7A	76	96	0	0.0000	28	0.00E+00	0.00E+00	0.0000
99-DD-205	6.2	1.8	7B	76	96	0	0.0000	58	0.00E+00	0.00E+00	0.0000
99-DD-205	6.2	1.8	8A	61	81	3.7	0.0083	22	7.04E-06	4.22E-04	0.6084
99-DD-205	6.2	1.8	8B	61	81	6	0.0134	51	4.67E-06	2.80E-04	0.4036
99-DD-205	6.2	1.8	9A	46	66	2	0.0045	22	3.81E-06	2.28E-04	0.3288
99-DD-205	6.2	1.8	9B	46	66	8.4	0.0187	50	6.67E-06	4.00E-04	0.5766
99-DD-205	6.2	1.8	10A	31	51	5	0.0112	22	9.51E-06	5.70E-04	0.8212
99-DD-205	6.2	1.8	10B	31	51	7.2	0.0161	38	7.62E-06	4.57E-04	0.6586
99-DD-205	6.2	1.8	11A	16	36	0	0.0000	20	0.00E+00	0.00E+00	0.0000
99-DD-205	6.2	1.8	11B	16	36	0.5	0.0011	40	5.02E-07	3.01E-05	0.0434
99-DD-206	0.3	23.1	1A	166	190	34.5	0.0769	18	4.16E-05	2.50E-03	3.5952
99-DD-206	0.3	23.1	2A	153	173	30.6	0.0682	20	3.92E-05	2.35E-03	3.3844
99-DD-206	0.3	23.1	3A	138	158	31.6	0.0705	80	1.34E-05	8.07E-04	1.1616
99-DD-206	0.3	23.1	3B	138	158	18.6	0.0415	40	1.43E-05	8.56E-04	1.2322
99-DD-206	0.3	23.1	4A	123	143	39	0.0870	25	4.28E-05	2.57E-03	3.6949
99-DD-206	0.3	23.1	5A	108	128	40.8	0.0910	19	5.40E-05	3.24E-03	4.6688
99-DD-206	0.3	23.1	6A	93	113	40.4	0.0901	19	5.35E-05	3.21E-03	4.6231
99-DD-206	0.3	23.1	7A	78	98	0	0.0000	32	0.00E+00	0.00E+00	0.0000

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure (psi)	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)		K (ft/sec)	K (ft/min)	K (ft/day)
99-DD-206	0.3	23.1	7B	78	98	0	0.0000	59	0.00E+00	0.00E+00	0.0000
99-DD-206	0.3	23.1	8A	63	83	0	0.0000	27	0.00E+00	0.00E+00	0.0000
99-DD-206	0.3	23.1	8B	63	83	0	0.0000	60	0.00E+00	0.00E+00	0.0000
99-DD-206	0.3	23.1	9A	48	68	39.8	0.0888	20	5.14E-05	3.08E-03	4.4386
99-DD-206	0.3	23.1	10A	33	53	18.6	0.0415	55	1.10E-05	6.61E-04	0.9523
99-DD-206	0.3	23.1	10B	33	53	3.2	0.0071	23	3.72E-06	2.23E-04	0.3216
00-DD-207	3.5	8.6	1A	118	140	11.8	0.0263	50	8.10E-06	4.86E-04	0.6994
00-DD-207	3.5	8.6	1B	118	140	7.8	0.0174	25	1.03E-05	6.16E-04	0.8874
00-DD-207	3.5	8.6	2A	103	123	24	0.0535	18	4.57E-05	2.74E-03	3.9471
00-DD-207	3.5	8.6	2B	103	123	40.2	0.0896	36	4.05E-05	2.43E-03	3.4995
00-DD-207	3.5	8.6	3A	88	108	8.4	0.0187	22	1.33E-05	7.98E-04	1.1487
00-DD-207	3.5	8.6	3B	88	108	14.2	0.0317	40	1.29E-05	7.73E-04	1.1132
00-DD-207	3.5	8.6	4A	73	93	10.6	0.0236	12	2.86E-05	1.72E-03	2.4742
00-DD-207	3.5	8.6	4B	73	93	14.6	0.0326	22	2.31E-05	1.39E-03	1.9980
00-DD-207	3.5	8.6	5A	58	78	3.2	0.0071	22	5.06E-06	3.03E-04	0.4369
00-DD-207	3.5	8.6	5B	58	78	14	0.0312	54	9.53E-06	5.72E-04	0.8238
00-DD-207	3.5	8.6	6A	43	63	23.6	0.0526	12	6.40E-05	3.84E-03	5.5317
00-DD-207	3.5	8.6	6B	43	63	20.2	0.0450	8	7.63E-05	4.58E-03	6.5966
00-DD-207	3.5	8.6	7A	28	48	10.8	0.0241	25	1.52E-05	9.13E-04	1.3141
00-DD-207	3.5	8.6	7B	28	48	24.25	0.0541	50	1.78E-05	1.07E-03	1.5380
00-DD-207	3.5	8.6	8A	13	33	24	0.0535	6	1.13E-04	6.81E-03	9.7994
00-DD-208	3.5	18.5	1A	134	150	12.7	0.0283	36	1.37E-05	8.22E-04	1.1836
00-DD-208	3.5	18.5	1B	134	150	23.4	0.0522	72	1.37E-05	8.20E-04	1.1810
00-DD-208	3.5	18.5	2A	119	139	14.8	0.0330	26	1.75E-05	1.05E-03	1.5129
00-DD-208	3.5	18.5	2B	119	139	22.2	0.0495	48	1.57E-05	9.39E-04	1.3526
00-DD-208	3.5	18.5	3A	104	124	2.4	0.0054	33	2.32E-06	1.39E-04	0.2008
00-DD-208	3.5	18.5	3B	104	124	4.2	0.0094	65	2.25E-06	1.35E-04	0.1943
00-DD-208	3.5	18.5	4A	89	109	2.6	0.0058	80	1.15E-06	6.90E-05	0.0993
00-DD-208	3.5	18.5	5A	74	94	2	0.0045	70	1.00E-06	6.00E-05	0.0864
00-DD-208	3.5	18.5	6A	59	79	1	0.0022	52	6.54E-07	3.92E-05	0.0565
00-DD-208	3.5	18.5	7A	44	64	0.6	0.0013	36	5.40E-07	3.24E-05	0.0467
00-DD-208	3.5	18.5	8A	29	49	2	0.0045	14	3.73E-06	2.24E-04	0.3226
00-DD-208	3.5	18.5	8B	29	49	3	0.0067	30	3.14E-06	1.89E-04	0.2717
00-DD-209	3.6	19.8	1A	164	180	1.7	0.0038	80	8.92E-07	5.35E-05	0.0771

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure (psi)	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)		K (ft/sec)	K (ft/min)	K (ft/day)
00-DD-209	3.6	19.8	1B	164	180	1	0.0022	40	9.71E-07	5.83E-05	0.0839
00-DD-209	3.6	19.8	2A	149	169	24.8	0.0553	16	4.19E-05	2.51E-03	3.6172
00-DD-209	3.6	19.8	2B	149	169	14.8	0.0330	8	3.82E-05	2.29E-03	3.2980
00-DD-209	3.6	19.8	3A	134	154	24.6	0.0549	42	1.93E-05	1.16E-03	1.6702
00-DD-209	3.6	19.8	3B	134	154	15.8	0.0352	22	2.10E-05	1.26E-03	1.8117
00-DD-209	3.6	19.8	4A	119	139	12.2	0.0272	42	9.55E-06	5.73E-04	0.8254
00-DD-209	3.6	19.8	4B	119	139	6.2	0.0138	20	8.81E-06	5.28E-04	0.7608
00-DD-209	3.6	19.8	5A	104	124	0.4	0.0009	92	1.54E-07	9.27E-06	0.0133
00-DD-209	3.6	19.8	6A	89	109	2.4	0.0054	74	1.13E-06	6.80E-05	0.0979
00-DD-209	3.6	19.8	6B	89	109	1.2	0.0027	36	1.07E-06	6.40E-05	0.0922
00-DD-209	3.6	19.8	7A	74	94	2.2	0.0049	62	1.22E-06	7.31E-05	0.1053
00-DD-209	3.6	19.8	7B	74	94	1.2	0.0027	30	1.24E-06	7.44E-05	0.1071
00-DD-209	3.6	19.8	8A	59	79	1.2	0.0027	50	8.07E-07	4.84E-05	0.0697
00-DD-209	3.6	19.8	8B	59	79	0.8	0.0018	26	9.27E-07	5.56E-05	0.0801
00-DD-209	3.6	19.8	9A	44	64	11.2	0.0250	38	9.54E-06	5.73E-04	0.8245
00-DD-209	3.6	19.8	9B	44	64	6.4	0.0143	20	9.09E-06	5.45E-04	0.7853
00-DD-209	3.6	19.8	10A	29	49	13	0.0290	40	1.06E-05	6.37E-04	0.9169
00-DD-209	3.6	19.8	10B	29	49	5.8	0.0129	20	8.24E-06	4.94E-04	0.7115
00-DD-209	3.6	19.8	11A	14	34	2.6	0.0058	40	2.12E-06	1.27E-04	0.1828
00-DD-209	3.6	19.8	11B	14	34	1.4	0.0031	20	1.98E-06	1.19E-04	0.1713
00-DD-210	3.7	23.5	1A	185	200	25.8	0.0575	28	3.36E-05	2.02E-03	2.9051
00-DD-210	3.7	23.5	1B	185	200	16.2	0.0361	14	3.41E-05	2.05E-03	2.9459
00-DD-210	3.7	23.5	2A	170	190	20.2	0.0450	10	4.23E-05	2.54E-03	3.6536
00-DD-210	3.7	23.5	2B	170	190	27.8	0.0620	20	3.79E-05	2.27E-03	3.2752
00-DD-210	3.7	23.5	3A	155	175	14.2	0.0317	28	1.49E-05	8.96E-04	1.2899
00-DD-210	3.7	23.5	3B	155	175	25	0.0558	56	1.49E-05	8.94E-04	1.2871
00-DD-210	3.7	23.5	4A	140	160	13.8	0.0308	18	2.00E-05	1.20E-03	1.7284
00-DD-210	3.7	23.5	4B	140	160	22.4	0.0500	36	1.94E-05	1.16E-03	1.6728
00-DD-210	3.7	23.5	5A	125	145	8.4	0.0187	30	8.35E-06	5.01E-04	0.7217
00-DD-210	3.7	23.5	5B	125	145	16.8	0.0375	60	9.40E-06	5.64E-04	0.8123
00-DD-210	3.7	23.5	6A	110	130	3.6	0.0080	66	1.85E-06	1.11E-04	0.1595
00-DD-210	3.7	23.5	6B	110	130	12	0.0268	33	1.11E-05	6.65E-04	0.9579
00-DD-210	3.7	23.5	7A	95	115	5.2	0.0116	76	2.35E-06	1.41E-04	0.2033
00-DD-210	3.7	23.5	7B	95	115	2	0.0045	38	1.65E-06	9.92E-05	0.1428

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)	(psi)	K (ft/sec)	K (ft/min)	K (ft/day)
00-DD-210	3.7	23.5	8A	80	100	10.6	0.0236	60	5.93E-06	3.56E-04	0.5120
00-DD-210	3.7	23.5	8B	80	100	5.6	0.0125	30	5.56E-06	3.34E-04	0.4807
00-DD-210	3.7	23.5	9A	65	85	10.4	0.0232	58	5.99E-06	3.59E-04	0.5175
00-DD-210	3.7	23.5	9B	65	85	6.8	0.0152	29	6.94E-06	4.16E-04	0.5995
00-DD-210	3.7	23.5	10A	50	70	0.6	0.0013	50	3.92E-07	2.35E-05	0.0338
00-DD-210	3.7	23.5	10B	50	70	0.2	0.0004	25	2.28E-07	1.37E-05	0.0197
00-DD-210	3.7	23.5	11A	35	55	10.2	0.0227	30	1.02E-05	6.09E-04	0.8777
00-DD-210	3.7	23.5	11B	35	55	3.2	0.0071	15	5.19E-06	3.11E-04	0.4483
00-DD-210	3.7	23.5	12A	20	40	0.4	0.0009	40	3.15E-07	1.89E-05	0.0272
00-DD-210	3.7	23.5	12B	20	40	0	0.0000	20	0.00E+00	0.00E+00	0.0000
00-DD-211	3.7	11.15	1A	125	140	13.7	0.0306	42	1.43E-05	8.57E-04	1.2338
00-DD-211	3.7	11.15	1B	125	140	9	0.0201	20	1.83E-05	1.10E-03	1.5793
00-DD-211	3.7	11.15	2A	110	130	6.8	0.0152	62	3.99E-06	2.39E-04	0.3446
00-DD-211	3.7	11.15	2B	110	130	4	0.0089	30	4.60E-06	2.76E-04	0.3977
00-DD-211	3.7	11.15	3A	95	115	5.8	0.0129	66	3.21E-06	1.92E-04	0.2769
00-DD-211	3.7	11.15	3B	95	115	3.9	0.0087	33	4.12E-06	2.47E-04	0.3556
00-DD-211	3.7	11.15	4A	80	100	3	0.0067	80	1.38E-06	8.27E-05	0.1191
00-DD-211	3.7	11.15	4B	80	100	1.4	0.0031	40	1.24E-06	7.43E-05	0.1070
00-DD-211	3.7	11.15	5A	65	85	13.2	0.0294	40	1.17E-05	7.02E-04	1.0106
00-DD-211	3.7	11.15	5B	65	85	7.6	0.0169	20	1.25E-05	7.52E-04	1.0827
00-DD-211	3.7	11.15	6A	50	70	15	0.0335	36	1.47E-05	8.79E-04	1.2658
00-DD-211	3.7	11.15	6B	50	70	9.2	0.0205	18	1.66E-05	9.97E-04	1.4354
00-DD-212	3.7	16.5	1A	140	155	6	0.0134	60	4.39E-06	2.63E-04	0.3792
00-DD-212	3.7	16.5	1B	140	155	3.4	0.0076	30	4.50E-06	2.70E-04	0.3889
00-DD-212	3.7	16.5	2A	125	145	9.8	0.0219	62	5.55E-06	3.33E-04	0.4798
00-DD-212	3.7	16.5	2B	125	145	4.8	0.0107	30	5.17E-06	3.10E-04	0.4468
00-DD-212	3.7	16.5	3A	110	130	3.8	0.0085	60	2.22E-06	1.33E-04	0.1915
00-DD-212	3.7	16.5	3B	110	130	2.6	0.0058	30	2.80E-06	1.68E-04	0.2416
00-DD-212	3.7	16.5	4A	95	115	5.6	0.0125	62	3.17E-06	1.90E-04	0.2741
00-DD-212	3.7	16.5	4B	95	115	3	0.0067	31	3.14E-06	1.88E-04	0.2712
00-DD-212	3.7	16.5	5A	80	100	1.6	0.0036	60	9.33E-07	5.60E-05	0.0806
00-DD-212	3.7	16.5	5B	80	100	0.8	0.0018	30	8.61E-07	5.16E-05	0.0743
00-DD-212	3.7	16.5	6A	65	85	4.6	0.0103	56	2.86E-06	1.72E-04	0.2471
00-DD-212	3.7	16.5	6B	65	85	1	0.0022	28	1.14E-06	6.84E-05	0.0985

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure (psi)	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)		K (ft/sec)	K (ft/min)	K (ft/day)
00-DD-212	3.7	16.5	7A	50	70	5.6	0.0125	34	5.42E-06	3.25E-04	0.4685
00-DD-212	3.7	16.5	7B	50	70	3.2	0.0071	17	5.43E-06	3.26E-04	0.4688
00-DD-212	3.7	16.5	8A	35	55	5.2	0.0116	40	4.37E-06	2.62E-04	0.3777
00-DD-212	3.7	16.5	8B	35	55	3.6	0.0080	20	5.39E-06	3.23E-04	0.4655
00-DD-213	3.7	3.36	1A	130	145	5.8	0.0129	76	3.60E-06	2.16E-04	0.3109
00-DD-213	3.7	3.36	1B	130	145	0.8	0.0018	38	9.95E-07	5.97E-05	0.0859
00-DD-213	3.7	3.36	2A	115	135	2.4	0.0054	72	1.28E-06	7.66E-05	0.1103
00-DD-213	3.7	3.36	2B	115	135	0.8	0.0018	36	8.53E-07	5.12E-05	0.0737
00-DD-213	3.7	3.36	3A	100	120	4.2	0.0094	90	1.79E-06	1.07E-04	0.1544
00-DD-213	3.7	3.36	3B	100	120	2.2	0.0049	45	1.88E-06	1.13E-04	0.1620
00-DD-213	3.7	3.36	4A	85	105	1	0.0022	72	5.32E-07	3.19E-05	0.0460
00-DD-213	3.7	3.36	4B	85	105	0.4	0.0009	36	4.27E-07	2.56E-05	0.0369
00-DD-213	3.7	3.36	5A	70	90	0.6	0.0013	60	3.83E-07	2.30E-05	0.0331
00-DD-213	3.7	3.36	5B	70	90	0.4	0.0009	30	5.12E-07	3.07E-05	0.0443
00-DD-213	3.7	3.36	6A	55	75	1	0.0022	56	6.85E-07	4.11E-05	0.0591
00-DD-213	3.7	3.36	6B	55	75	0.4	0.0009	68	2.25E-07	1.35E-05	0.0195
00-DD-213	3.7	3.36	7A	40	60	5.8	0.0129	34	6.55E-06	3.93E-04	0.5660
00-DD-213	3.7	3.36	7B	40	60	3.2	0.0071	17	7.26E-06	4.36E-04	0.6273
00-DD-213	3.7	3.36	8A	25	45	3.5	0.0078	52	2.58E-06	1.55E-04	0.2230
00-DD-213	3.7	3.36	8B	25	45	2.6	0.0058	26	3.85E-06	2.31E-04	0.3322
00-DD-213	3.7	3.36	9A	10	30	2.6	0.0058	36	2.77E-06	1.66E-04	0.2396
00-DD-213	3.7	3.36	9B	10	30	1.4	0.0031	18	3.00E-06	1.80E-04	0.2591
00-DD-214	3.8	1.2	1A	155	170	21.4	0.0477	16	6.75E-05	4.05E-03	5.8295
00-DD-214	3.8	1.2	1B	155	170	19.3	0.0430	12	8.31E-05	4.99E-03	7.1828
00-DD-214	3.8	1.2	2A	140	160	23.6	0.0526	20	4.77E-05	2.86E-03	4.1175
00-DD-214	3.8	1.2	2B	140	160	12.4	0.0277	10	5.32E-05	3.19E-03	4.5984
00-DD-214	3.8	1.2	3A	125	145	1	0.0022	42	9.35E-07	5.61E-05	0.0808
00-DD-214	3.8	1.2	3B	125	145	0	0.0000	20	0.00E+00	0.00E+00	0.0000
00-DD-214	3.8	1.2	4A	110	130	1.6	0.0036	60	1.04E-06	6.23E-05	0.0898
00-DD-214	3.8	1.2	4B	110	130	0.6	0.0013	30	7.94E-07	4.77E-05	0.0686
00-DD-214	3.8	1.2	5A	95	115	1.6	0.0036	50	1.25E-06	7.51E-05	0.1081
00-DD-214	3.8	1.2	5B	95	115	1	0.0022	25	1.60E-06	9.61E-05	0.1383
00-DD-214	3.8	1.2	6A	80	100	2	0.0045	40	1.97E-06	1.18E-04	0.1699
00-DD-214	3.8	1.2	6B	80	100	1	0.0022	20	2.03E-06	1.22E-04	0.1750

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)	(psi)	K (ft/sec)	K (ft/min)	K (ft/day)
00-DD-214	3.8	1.2	7A	65	85	2.2	0.0049	62	1.38E-06	8.29E-05	0.1194
00-DD-214	3.8	1.2	7B	65	85	1	0.0022	30	1.32E-06	7.94E-05	0.1143
00-DD-214	3.8	1.2	8A	50	70	25.2	0.0562	16	6.45E-05	3.87E-03	5.5737
00-DD-214	3.8	1.2	8B	50	70	19	0.0424	10	8.15E-05	4.89E-03	7.0416
00-DD-214	3.8	1.2	8C	50	70	11.2	0.0250	47	9.33E-06	5.60E-04	0.8060
00-DD-214	3.8	1.2	8D	50	70	2.6	0.0058	22	4.76E-06	2.86E-04	0.4113
00-DD-214	3.8	1.2	9A	35	55	8	0.0178	32	9.90E-06	5.94E-04	0.8554
00-DD-214	3.8	1.2	9B	35	55	3.4	0.0076	18	7.70E-06	4.62E-04	0.6654
00-DD-214	3.8	1.2	10A	20	40	22.6	0.0504	22	4.13E-05	2.48E-03	3.5664
00-DD-214	3.8	1.2	10B	20	40	10.8	0.0241	8	5.98E-05	3.59E-03	5.1696
00-DD-214	3.8	1.2	11A	10	30	25.3	0.0564	22	4.62E-05	2.77E-03	3.9922
00-DD-214	3.8	1.2	11B	10	30	18.1	0.0404	10	7.76E-05	4.66E-03	6.7089
00-DD-214	3.8	1.2	11C	10	30	18.2	0.0406	10	7.81E-05	4.68E-03	6.7459
00-DD-216	3.7	5.65	1A	130	145	24.4	0.0544	30	3.73E-05	2.24E-03	3.2208
00-DD-216	3.7	5.65	1B	130	145	15	0.0335	15	4.46E-05	2.68E-03	3.8541
00-DD-216	3.7	5.65	2A	115	135	25	0.0558	30	3.10E-05	1.86E-03	2.6813
00-DD-216	3.7	5.65	2B	115	135	24.2	0.0540	30	3.00E-05	1.80E-03	2.5955
00-DD-216	3.7	5.65	2C	115	135	15	0.0335	15			0.0000
00-DD-216	3.7	5.65	3A	100	120	4.8	0.0335	66	8.58E-06	5.15E-04	0.7414
00-DD-216	3.7	5.65	3B	100	120	2	0.0107	33	5.43E-06	3.26E-04	0.4689
00-DD-216	3.7	5.65	4A	85	105	3.6	0.0045	50	1.50E-06	9.02E-05	0.1299
00-DD-216	3.7	5.65	4B	85	105	2	0.0080	25	5.33E-06	3.20E-04	0.4602
00-DD-216	3.7	5.65	5A	70	90	24.2	0.0045	42	1.79E-06	1.07E-04	0.1544
00-DD-216	3.7	5.65	5B	70	90	15.2	0.0540	22	4.05E-05	2.43E-03	3.5027
00-DD-216	3.7	5.65	6A	55	75	0.6	0.0339	50	1.14E-05	6.86E-04	0.9876
00-DD-216	3.7	5.65	6B	55	75	0	0.0013	25	8.88E-07	5.33E-05	0.0767
00-DD-216	3.7	5.65	7A	40	60	2.8	0.0000	32	0.00E+00	0.00E+00	0.0000
00-DD-216	3.7	5.65	7B	40	60	1.6	0.0062	16	6.36E-06	3.81E-04	0.5491
00-DD-217	3.7	38.2	1A	135	150	5	0.0112	60	3.20E-06	1.92E-04	0.2762
00-DD-217	3.7	38.2	1B	135	150	3.2	0.0071	30	3.35E-06	2.01E-04	0.2894
00-DD-217	3.7	38.2	2A	120	140	5	0.0112	58	2.67E-06	1.60E-04	0.2307
00-DD-217	3.7	38.2	2B	120	140	3.2	0.0071	29	2.78E-06	1.67E-04	0.2405
00-DD-217	3.7	38.2	3A	105	125	5.4	0.0120	80	2.21E-06	1.32E-04	0.1907
00-DD-217	3.7	38.2	3B	105	125	0.6	0.0013	40	4.17E-07	2.50E-05	0.0361

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)	(psi)	K (ft/sec)	K (ft/min)	K (ft/day)
00-DD-217	3.7	38.2	4A	90	110	5.8	0.0129	88	2.16E-06	1.29E-04	0.1864
00-DD-217	3.7	38.2	4B	90	110	1	0.0022	44	6.49E-07	3.89E-05	0.0560
00-DD-217	3.7	38.2	5A	75	95	2.2	0.0049	74	9.46E-07	5.67E-05	0.0817
00-DD-217	3.7	38.2	5B	75	95	0.8	0.0018	37	5.89E-07	3.53E-05	0.0509
00-DD-217	3.7	38.2	6A	60	80	7.8	0.0174	54	4.34E-06	2.60E-04	0.3748
00-DD-217	3.7	38.2	6B	60	80	4.2	0.0094	27	3.94E-06	2.36E-04	0.3404
00-DD-217	3.7	38.2	7A	45	65	7.6	0.0169	44	4.95E-06	2.97E-04	0.4273
00-DD-217	3.7	38.2	7B	45	65	4.8	0.0107	24	4.74E-06	2.84E-04	0.4091
00-DD-217	3.7	38.2	8A	30	50	6.6	0.0147	34	5.17E-06	3.10E-04	0.4469
00-DD-217	3.7	38.2	8B	30	50	5	0.0112	27	4.71E-06	2.82E-04	0.4068
00-DD-217	3.7	38.2	9A	15	35	20	0.0446	34	1.70E-05	1.02E-03	1.4716
00-DD-217	3.7	38.2	9B	15	35	9	0.0201	17	1.22E-05	7.33E-04	1.0556
00-DD-218	3.8	32.7	1A	135	150	7.3	0.0163	80	3.72E-06	2.23E-04	0.3213
00-DD-218	3.8	32.7	1B	135	150	4.2	0.0094	40	3.77E-06	2.26E-04	0.3258
00-DD-218	3.8	32.7	2A	120	140	2.4	0.0054	80	9.93E-07	5.96E-05	0.0858
00-DD-218	3.8	32.7	2B	120	140	5	0.0112	40	3.65E-06	2.19E-04	0.3153
00-DD-218	3.8	32.7	3A	105	125	5	0.0112	70	2.32E-06	1.39E-04	0.2005
00-DD-218	3.8	32.7	3B	105	125	0	0.0000	35	0.00E+00	0.00E+00	0.0000
00-DD-218	3.8	32.7	4A	90	110	4	0.0089	80	1.65E-06	9.92E-05	0.1428
00-DD-218	3.8	32.7	4B	90	110	0.6	0.0013	40	4.37E-07	2.62E-05	0.0377
00-DD-218	3.8	32.7	5A	75	95	1.4	0.0031	72	6.33E-07	3.80E-05	0.0547
00-DD-218	3.8	32.7	5B	75	95	0.6	0.0013	36	4.73E-07	2.84E-05	0.0408
00-DD-218	3.8	32.7	6A	60	80	0.2	0.0004	60	1.05E-07	6.33E-06	0.0091
00-DD-218	3.8	32.7	6B	60	80	0	0.0000	30	0.00E+00	0.00E+00	0.0000
00-DD-218	3.8	32.7	7A	45	65	4.5	0.0100	40	3.28E-06	1.97E-04	0.2836
00-DD-218	3.8	32.7	7B	45	65	2.6	0.0058	20	3.06E-06	1.83E-04	0.2640
00-DD-218	3.8	32.7	8A	30	50	4.8	0.0107	32	4.13E-06	2.48E-04	0.3571
00-DD-218	3.8	32.7	8B	30	50	3	0.0067	16	4.02E-06	2.41E-04	0.3473
00-DD-218	3.8	32.7	9A	15	35	7.2	0.0161	30	6.50E-06	3.90E-04	0.5612
00-DD-218	3.8	32.7	9B	15	35	4.6	0.0103	18	5.79E-06	3.47E-04	0.4999
01-DD-222	0.3	14.74	1A	86	103	2.66	0.0059	70	1.39E-06	8.31E-05	0.1198
01-DD-222	0.3	14.74	1B	86	103	0.34	0.0008	34	3.35E-07	2.01E-05	0.0290
01-DD-222	0.3	14.74	2A	73	90	0.84	0.0019	63	5.30E-07	3.18E-05	0.0458
01-DD-222	0.3	14.74	2B	73	90	0.18	0.0004	30	2.17E-07	1.30E-05	0.0187

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)	(psi)	K (ft/sec)	K (ft/min)	K (ft/day)
01-DD-222	0.3	14.74	3A	61	77	7.4	0.0165	53	5.47E-06	3.28E-04	0.4727
01-DD-222	0.3	14.74	3B	61	77	3.14	0.0070	30	3.78E-06	2.27E-04	0.3277
01-DD-222	0.3	14.74	4A	49	65	8.34	0.0186	40	7.91E-06	4.75E-04	0.6833
01-DD-222	0.3	14.74	4B	49	65	6.62	0.0148	30	8.01E-06	4.80E-04	0.6918
01-DD-222	0.3	14.74	4C	49	65	6.56	0.0146	30	7.93E-06	4.76E-04	0.6855
01-DD-222	0.3	14.74	5A	36	53	5.74	0.0128	30	6.94E-06	4.16E-04	0.5997
01-DD-222	0.3	14.74	5B	36	53	6.62	0.0148	35	7.03E-06	4.22E-04	0.6077
01-DD-222	0.3	14.74	6A	24	41	1.13	0.0025	30	1.36E-06	8.17E-05	0.1178
01-DD-222	0.3	14.74	6B	24	41	1.056	0.0024	30	1.27E-06	7.64E-05	0.1101
01-DD-222	0.3	14.74	7A	12	28	0	0.0000	30	0.00E+00	0.00E+00	0.0000
01-DD-222	0.3	14.74	7B	12	28	0.02	0.0000	32	2.28E-08	1.37E-06	0.0020
01-DD-222	0.3	14.74	7C	12	28	0.22	0.0005	30	2.65E-07	1.59E-05	0.0229
01-DD-223	0.3	-2	1A	111	131	6.78	0.0151	90	2.75E-06	1.65E-04	0.2375
01-DD-223	0.3	-2	1B	111	131	3.56	0.0079	45	2.91E-06	1.75E-04	0.2515
01-DD-223	0.3	-2	2A	96	116	1.56	0.0035	75	8.03E-07	4.82E-05	0.0694
01-DD-223	0.3	-2	2B	96	116	0.79	0.0018	35	8.82E-07	5.29E-05	0.0762
01-DD-223	0.3	-2	3A	81	101	0.72	0.0016	65	4.28E-07	2.57E-05	0.0370
01-DD-223	0.3	-2	3B	81	101	0.24	0.0005	35	2.68E-07	1.61E-05	0.0231
01-DD-223	0.3	-2	4A	66	86	0.62	0.0014	55	4.37E-07	2.62E-05	0.0377
01-DD-223	0.3	-2	4B	66	86	0.32	0.0007	30	4.18E-07	2.51E-05	0.0361
01-DD-223	0.3	-2	5A	44	64	10.16	0.0227	35	1.13E-05	6.80E-04	0.9789
01-DD-223	0.3	-2	5B	44	64	7.1	0.0158	30	9.27E-06	5.56E-04	0.8011
01-DD-223	0.3	-2	6A	31	51	6.06	0.0135	30	7.91E-06	4.75E-04	0.6838
01-DD-223	0.3	-2	6B	31	51	5.8	0.0129	30	7.57E-06	4.54E-04	0.6545
01-DD-223	0.3	-2	7A	16	36	5.66	0.0126	30	7.39E-06	4.44E-04	0.6387
01-DD-223	0.3	-2	7B	16	36	5.8	0.0129	30	7.57E-06	4.54E-04	0.6545
01-DD-224	0.3	28.32	1A	109	122	1.57	0.0035	90	8.39E-07	5.03E-05	0.0725
01-DD-224	0.3	28.32	1B	109	122	1.1	0.0025	45	1.03E-06	6.17E-05	0.0888
01-DD-224	0.3	28.32	2A	97	113	1.88	0.0042	80	9.31E-07	5.59E-05	0.0804
01-DD-224	0.3	28.32	2B	97	113	1.32	0.0029	40	1.13E-06	6.77E-05	0.0975
01-DD-224	0.3	28.32	3A	85	101	0.76	0.0017	70	4.21E-07	2.52E-05	0.0363
01-DD-224	0.3	28.32	3B	85	101	0.62	0.0014	35	5.83E-07	3.50E-05	0.0504
01-DD-224	0.3	28.32	4A	73	89	2.1	0.0047	60	1.32E-06	7.90E-05	0.1138
01-DD-224	0.3	28.32	4B	73	89	1.16	0.0026	30	1.21E-06	7.27E-05	0.1047

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)	(psi)	K (ft/sec)	K (ft/min)	K (ft/day)
01-DD-224	0.3	28.32	5A	61	77	1.26	0.0028	50	9.12E-07	5.47E-05	0.0788
01-DD-224	0.3	28.32	5B	61	77	0.72	0.0016	30	7.52E-07	4.51E-05	0.0650
01-DD-224	0.3	28.32	6A	49	65	11.1	0.0248	40	9.58E-06	5.75E-04	0.8281
01-DD-224	0.3	28.32	6B	49	65	8.98	0.0200	30	9.47E-06	5.68E-04	0.8186
01-DD-224	0.3	28.32	7A	36	53	14.54	0.0324	30	1.54E-05	9.27E-04	1.3349
01-DD-224	0.3	28.32	7B	36	53	16.16	0.0360	30	1.72E-05	1.03E-03	1.4866
01-DD-224	0.3	28.32	8A	24	40	19.2	0.0428	30	2.06E-05	1.23E-03	1.7772
01-DD-224	0.3	28.32	8B	24	40	18.84	0.0420	30	2.02E-05	1.21E-03	1.7421
01-DD-224	0.3	28.32	9A	12	28	13.86	0.0309	30	1.60E-05	9.59E-04	1.3811
01-DD-224	0.3	28.32	9B	12	28	12.9	0.0288	30	1.49E-05	8.91E-04	1.2831
01-DD-225	0.3	2.68	1A	102	115	3.78	0.0084	85	2.46E-06	1.47E-04	0.2122
01-DD-225	0.3	2.68	1B	102	115	1.82	0.0041	45	2.20E-06	1.32E-04	0.1903
01-DD-225	0.3	2.68	2A	91	106	6.3	0.0140	75	3.97E-06	2.38E-04	0.3434
01-DD-225	0.3	2.68	2B	91	106	3.02	0.0067	35	4.00E-06	2.40E-04	0.3454
01-DD-225	0.3	2.68	3A	79	95	1.52	0.0034	70	1.03E-06	6.15E-05	0.0886
01-DD-225	0.3	2.68	3B	79	95	0.84	0.0019	35	1.11E-06	6.67E-05	0.0961
01-DD-225	0.3	2.68	4A	68	83	0.44	0.0010	55	3.76E-07	2.26E-05	0.0325
01-DD-225	0.3	2.68	4B	68	83	0.14	0.0003	30	2.15E-07	1.29E-05	0.0186
01-DD-225	0.3	2.68	5A	56	72	0	0.0000	45	0.00E+00	0.00E+00	0.0000
01-DD-225	0.3	2.68	5B	56	72	0	0.0000	30	0.00E+00	0.00E+00	0.0000
01-DD-225	0.3	2.68	6A	45	60	0	0.0000	35	0.00E+00	0.00E+00	0.0000
01-DD-225	0.3	2.68	6B	45	60	-0.1	-0.0002	30	---	---	---
01-DD-225	0.3	2.68	6C	45	60	0	0.0000	35	0.00E+00	0.00E+00	0.0000
01-DD-225	0.3	2.68	6D	45	60	-0.02	0.0000	30	---	---	---
01-DD-225	0.3	2.68	7A	33	49	0.18	0.0004	30	2.76E-07	1.66E-05	0.0239
01-DD-225	0.3	2.68	7B	33	49	0.12	0.0003	30	1.84E-07	1.11E-05	0.0159
01-DD-225	0.3	2.68	8A	22	37	0.02	0.0000	30	3.07E-08	1.84E-06	0.0027
01-DD-225	0.3	2.68	8B	22	37	0	0.0000	30	0.00E+00	0.00E+00	0.0000
01-DD-225	0.3	2.68	9A	10	26	0.28	0.0006	30	4.30E-07	2.58E-05	0.0371
01-DD-225	0.3	2.68	9B	10	26	0.22	0.0005	30	3.38E-07	2.03E-05	0.0292
01-DD-226	0.3	5.11	1A	126	143	21.02	0.0469	60	1.37E-05	8.21E-04	1.1823
01-DD-226	0.3	5.11	1B	126	143	20.8	0.0464	50	1.61E-05	9.68E-04	1.3938
01-DD-226	0.3	5.11	2A	113	130	25	0.0558	60	1.64E-05	9.84E-04	1.4170
01-DD-226	0.3	5.11	2B	113	130	21.86	0.0487	45	1.89E-05	1.13E-03	1.6314

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure (psi)	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)		K (ft/sec)	K (ft/min)	K (ft/day)
01-DD-226	0.3	5.11	3A	100	117	17.8	0.0397	80	8.82E-06	5.29E-04	0.7624
01-DD-226	0.3	5.11	3B	100	117	8.46	0.0189	40	8.15E-06	4.89E-04	0.7038
01-DD-226	0.3	5.11	4A	87	104	15.3	0.0341	70	8.63E-06	5.18E-04	0.7457
01-DD-226	0.3	5.11	4B	87	104	6.82	0.0152	35	7.44E-06	4.47E-04	0.6430
01-DD-226	0.3	5.11	5A	74	91	1.8	0.0040	60	1.18E-06	7.06E-05	0.1016
01-DD-226	0.3	5.11	5B	74	91	1	0.0022	30	1.26E-06	7.55E-05	0.1087
01-DD-226	0.3	5.11	6A	61	78	5.04	0.0112	50	3.92E-06	2.35E-04	0.3390
01-DD-226	0.3	5.11	6B	61	78	2.66	0.0059	30	3.35E-06	2.01E-04	0.2891
01-DD-226	0.3	5.11	7A	48	65	5.7	0.0127	40	5.49E-06	3.29E-04	0.4739
01-DD-226	0.3	5.11	7B	48	65	4.64	0.0103	30	5.84E-06	3.50E-04	0.5042
01-DD-226	0.3	5.11	8A	35	52	0.86	0.0019	30	1.08E-06	6.49E-05	0.0935
01-DD-226	0.3	5.11	8B	35	52	0.78	0.0017	30	9.81E-07	5.89E-05	0.0848
01-DD-226	0.3	5.11	9A	22	39	1.24	0.0028	30	1.56E-06	9.36E-05	0.1348
01-DD-226	0.3	5.11	9B	22	39	1.08	0.0024	30	1.36E-06	8.15E-05	0.1174
01-DD-228	0.3	112	1A	147	165	22.1	0.0493	120	5.42E-06	3.25E-04	0.4683
01-DD-228	0.3	112	1B	147	165	7.4	0.0165	60	2.78E-06	1.67E-04	0.2398
01-DD-228	0.3	112	2A	132	152	6.08	0.0136	105	1.52E-06	9.15E-05	0.1317
01-DD-228	0.3	112	2B	132	152	1.92	0.0043	55	7.10E-07	4.26E-05	0.0613
01-DD-228	0.3	112	3A	117	137	2.46	0.0055	90	6.80E-07	4.08E-05	0.0587
01-DD-228	0.3	112	3B	117	137	1.06	0.0024	45	4.34E-07	2.60E-05	0.0375
01-DD-228	0.3	112	4A	102	122	0.04	0.0001	80	1.19E-08	7.15E-07	0.0010
01-DD-228	0.3	112	4B	102	122	0	0.0000	40	0.00E+00	0.00E+00	0.0000
01-DD-228	0.3	112	5A	87	107	0.84	0.0019	70	2.79E-07	1.67E-05	0.0241
01-DD-228	0.3	112	5B	87	107	0.46	0.0010	35	2.19E-07	1.31E-05	0.0189
01-DD-228	0.3	112	6A	72	92	0.16	0.0004	60	5.64E-08	3.38E-06	0.0049
01-DD-228	0.3	112	6B	72	92	0.1	0.0002	30	4.87E-08	2.92E-06	0.0042
01-DD-228	0.3	112	7A	57	77	0.12	0.0003	45	4.74E-08	2.84E-06	0.0041
01-DD-228	0.3	112	7B	57	77	0.08	0.0002	30	3.74E-08	2.24E-06	0.0032
01-DD-228	0.3	112	8A	42	62	2.08	0.0046	35	8.83E-07	5.30E-05	0.0763
01-DD-228	0.3	112	8B	42	62	1.96	0.0044	30	8.81E-07	5.29E-05	0.0762
01-DD-228	0.3	112	9A	27	47	17.2	0.0384	30	7.72E-06	4.63E-04	0.6671
01-DD-228	0.3	112	9B	27	47	17.52	0.0391	30	7.86E-06	4.72E-04	0.6795
01-DD-230	0.3	8.13	1A	66	78	5.8	0.0129	55	5.71E-06	3.43E-04	0.4933
01-DD-230	0.3	8.13	1B	66	78	3.88	0.0087	30	6.55E-06	3.93E-04	0.5658

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure (psi)	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)		K (ft/sec)	K (ft/min)	K (ft/day)
01-DD-230	0.3	8.13	2A	56	70	4.32	0.0096	45	4.25E-06	2.55E-04	0.3670
01-DD-230	0.3	8.13	2B	56	70	3.5	0.0078	30	4.91E-06	2.95E-04	0.4246
01-DD-230	0.3	8.13	3A	45	59	1.14	0.0025	35	1.40E-06	8.41E-05	0.1211
01-DD-230	0.3	8.13	3B	45	59	0.98	0.0022	30	1.38E-06	8.26E-05	0.1190
03-DD-231	11.2	16.3	1A	129	148	17.2	0.0383	38	1.32E-05	7.91E-04	1.1392
03-DD-231	11.2	16.3	3A	99	119	16.4	0.0365	39	1.23E-05	7.38E-04	1.0621
03-DD-231	11.2	16.3	4B	84	104	16	0.0356	35	1.30E-05	7.82E-04	1.1254
03-DD-231	11.2	16.3	5B	69	89	14.4	0.0321	30	1.31E-05	7.87E-04	1.1335
03-DD-231	11.2	16.3	6A	54	74	3.3	0.0074	45	2.18E-06	1.31E-04	0.1884
03-DD-231	11.2	16.3	6B	54	74	1.7	0.0038	25	1.73E-06	1.04E-04	0.1496
03-DD-231	11.2	16.3	7A	39	59	1	0.0022	30	8.97E-07	5.38E-05	0.0775
03-DD-231	11.2	16.3	7B	39	59	-4.6	-0.0102	0	-1.47E-05	-8.82E-04	1.2707
03-DD-231	11.2	16.3	8A	24	44	1.94	0.0043	20	2.29E-06	1.37E-04	0.1975
03-DD-231	11.2	16.3	8B	24	44	0.7	0.0016	10	1.20E-06	7.21E-05	0.1038
03-DD-232	14.6	7.5	1A	135	156	11	0.0245	70	4.88E-06	2.93E-04	0.4214
03-DD-232	14.6	7.5	1B	135	156	9.38	0.0209	55	5.13E-06	3.08E-04	0.4431
03-DD-232	14.6	7.5	2A	120	140	10.22	0.0228	55	5.98E-06	3.59E-04	0.5171
03-DD-232	14.6	7.5	2B	120	140	8.64	0.0192	45	5.98E-06	3.59E-04	0.5167
03-DD-232	14.6	7.5	3A	105	125	10.24	0.0228	40	7.82E-06	4.69E-04	0.6759
03-DD-232	14.6	7.5	3B	105	125	1.38	0.0031	40	1.05E-06	6.28E-05	0.0905
03-DD-232	14.6	7.5	4A	90	110	10.1	0.0225	40	7.72E-06	4.63E-04	0.6667
03-DD-232	14.6	7.5	4B	90	110	8.8	0.0196	35	7.47E-06	4.48E-04	0.6450
03-DD-232	14.6	7.5	5A	75	95	2.3	0.0051	60	1.24E-06	7.46E-05	0.1074
03-DD-232	14.6	7.5	5B	75	95	1.08	0.0024	30	1.03E-06	6.16E-05	0.0887
03-DD-232	14.6	7.5	6A	60	80	1.68	0.0037	45	1.16E-06	6.95E-05	0.1000
03-DD-232	14.6	7.5	6B	60	80	1.36	0.0030	25	1.48E-06	8.88E-05	0.1278
03-DD-232	14.6	7.5	7A	45	65	8.48	0.0189	35	7.19E-06	4.32E-04	0.6214
03-DD-232	14.6	7.5	7B	45	65	6.5	0.0145	20	8.33E-06	5.00E-04	0.7195
03-DD-232	14.6	7.5	8A	30	50	4.04	0.0090	25	4.41E-06	2.65E-04	0.3810
03-DD-232	14.6	7.5	8B	30	50	2.82	0.0063	15	4.32E-06	2.59E-04	0.3729
03-DD-233	2.5	16.5	1A	142	163	0.14	0.0003	110	4.16E-08	2.50E-06	0.0036
03-DD-233	2.5	16.5	1B	142	163	0.06	0.0001	55	3.33E-08	2.00E-06	0.0029
03-DD-233	2.5	16.5	2A	127	147	0.84	0.0019	100	2.92E-07	1.75E-05	0.0252
03-DD-233	2.5	16.5	2B	127	147	0.36	0.0008	50	2.33E-07	1.40E-05	0.0201

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure (psi)	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)		K (ft/sec)	K (ft/min)	K (ft/day)
03-DD-233	2.5	16.5	3A	112	132	3.5	0.0078	90	1.34E-06	8.04E-05	0.1158
03-DD-233	2.5	16.5	3B	112	132	0.86	0.0019	45	6.08E-07	3.65E-05	0.0525
03-DD-233	2.5	16.5	4A	97	117	5.84	0.0130	80	2.49E-06	1.50E-04	0.2155
03-DD-233	2.5	16.5	4B	97	117	3.8	0.0085	40	2.96E-06	1.78E-04	0.2560
03-DD-233	2.5	16.5	5A	82	102	12.9	0.0287	65	6.66E-06	4.00E-04	0.5757
03-DD-233	2.5	16.5	5B	82	102	8.84	0.0197	35	7.73E-06	4.64E-04	0.6677
03-DD-233	2.5	16.5	6A	67	87	16.92	0.0377	40	1.33E-05	8.00E-04	1.1523
03-DD-233	2.5	16.5	6B	67	87	10.66	0.0238	20	1.44E-05	8.61E-04	1.2400
03-DD-233	2.5	16.5	7A	52	72	5.4	0.0120	40	4.23E-06	2.54E-04	0.3651
03-DD-233	2.5	16.5	7B	52	72	9.64	0.0215	20	1.30E-05	7.79E-04	1.1212
03-DD-233	2.5	16.5	8A	37	57	11.92	0.0266	30	1.18E-05	7.10E-04	1.0228
03-DD-233	2.5	16.5	8B	37	57	-0.34	-0.0008	20	-4.53E-07	-2.72E-05	-0.0391
03-DD-233	2.5	16.5	9A	22	42	9.6	0.0214	20	1.29E-05	7.75E-04	1.1165
03-DD-233	2.5	16.5	9B	22	42	4.64	0.0103	10	9.63E-06	5.78E-04	0.8323
03-DD-234	6.53	9	1A	93	107	0.2	0.0004	75	1.26E-07	7.54E-06	0.0109
03-DD-234	6.53	9	1B	93	107	0.1	0.0002	40	1.10E-07	6.59E-06	0.0095
03-DD-234	6.53	9	2A	78	98	-1.42	-0.0032	60	-8.00E-07	-4.80E-05	-0.0692
03-DD-234	6.53	9	2B	78	98	-3.18	-0.0071	30	-3.26E-06	-1.95E-04	-0.2814
03-DD-234	6.53	9	3A	63	83	0.86	0.0019	50	5.70E-07	3.42E-05	0.0493
03-DD-234	6.53	9	3B	63	83	0.38	0.0008	25	4.50E-07	2.70E-05	0.0389
03-DD-234	6.53	9	4A	48	68	-1.1	-0.0025	40	-8.85E-07	-5.31E-05	-0.0765
03-DD-234	6.53	9	4B	48	68	-5.1	-0.0114	20	-7.18E-06	-4.31E-04	-0.6200
03-DD-234	6.53	9	5A	33	53	0.88	0.0020	25	1.04E-06	6.26E-05	0.0901
03-DD-234	6.53	9	5B	33	53	-3.48	-0.0078	15	-6.02E-06	-3.61E-04	-0.5204
03-DD-235	2.5	5.5	1A	92	110	0.86	0.0019	75	4.75E-07	2.85E-05	0.0410
03-DD-235	2.5	5.5	1B	92	110	0.36	0.0008	35	4.06E-07	2.43E-05	0.0351
03-DD-235	2.5	5.5	2A	77	97	-1.16	-0.0026	60	-6.87E-07	-4.12E-05	-0.0594
03-DD-235	2.5	5.5	2B	77	97	-1.86	-0.0041	30	-2.09E-06	-1.25E-04	-0.1806
03-DD-235	2.5	5.5	3A	62	82	-1.52	-0.0034	50	-1.07E-06	-6.42E-05	-0.0924
03-DD-235	2.5	5.5	3B	62	82	-3.86	-0.0086	25	-5.10E-06	-3.06E-04	-0.4407
03-DD-235	2.5	5.5	4A	47	67	0.44	0.0010	40	3.81E-07	2.28E-05	0.0329
03-DD-235	2.5	5.5	4B	47	67	-1.86	-0.0041	20	-2.98E-06	-1.79E-04	-0.2576
03-DD-235	2.5	5.5	5A	32	52	-2.94	-0.0066	25	-3.88E-06	-2.33E-04	-0.3356
03-DD-235	2.5	5.5	5B	32	52	-1.98	-0.0044	15	-4.03E-06	-2.42E-04	-0.3484

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure (psi)	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)		K (ft/sec)	K (ft/min)	K (ft/day)
03-DD-236	2.5	9	1A	102	117	8.2	0.0183	75	5.06E-06	3.04E-04	0.4373
03-DD-236	2.5	9	1B	102	117	6.44	0.0143	40	7.07E-06	4.24E-04	0.6112
03-DD-236	2.5	9	2A	87	107	4.98	0.0111	70	2.50E-06	1.50E-04	0.2161
03-DD-236	2.5	9	2B	87	107	2.46	0.0055	35	2.31E-06	1.39E-04	0.1999
03-DD-236	2.5	9	3A	72	92	6.1	0.0136	60	3.54E-06	2.12E-04	0.3056
03-DD-236	2.5	9	3B	72	92	4.02	0.0090	30	4.33E-06	2.60E-04	0.3741
03-DD-236	2.5	9	4A	57	77	9.64	0.0215	45	7.28E-06	4.37E-04	0.6290
03-DD-236	2.5	9	4B	57	77	6.62	0.0147	25	8.34E-06	5.00E-04	0.7203
03-DD-236	2.5	9	5A	42	62	7.04	0.0157	35	6.64E-06	3.99E-04	0.5739
03-DD-236	2.5	9	5B	42	62	4.34	0.0097	20	6.55E-06	3.93E-04	0.5659
03-DD-236	2.5	9	6A	27	47	5	0.0111	20	7.55E-06	4.53E-04	0.6527
03-DD-236	2.5	9	6B	27	47	2.22	0.0049	10	5.57E-06	3.34E-04	0.4815
03-DD-237	14.7	11.6	2A	103	123	0.9	0.0020	80	3.61E-07	2.17E-05	0.0312
03-DD-237	14.7	11.6	2B	103	123	0.66	0.0015	40	4.71E-07	2.83E-05	0.0407
03-DD-237	14.7	11.6	3A	88	108	1.18	0.0026	70	5.45E-07	3.27E-05	0.0471
03-DD-237	14.7	11.6	3B	88	108	0.76	0.0017	35	6.16E-07	3.70E-05	0.0532
03-DD-237	14.7	11.6	4A	73	93	1.04	0.0023	60	5.48E-07	3.29E-05	0.0473
03-DD-237	14.7	11.6	4B	73	93	1.14	0.0025	30	1.04E-06	6.21E-05	0.0895
03-DD-237	14.7	11.6	5A	58	78	0.8	0.0018	45	5.34E-07	3.20E-05	0.0461
03-DD-237	14.7	11.6	5B	58	78	0.36	0.0008	25	3.72E-07	2.23E-05	0.0321
03-DD-237	14.7	11.6	6A	43	63	2.56	0.0057	35	2.08E-06	1.25E-04	0.1793
03-DD-237	14.7	11.6	6B	43	63	1.74	0.0039	20	2.08E-06	1.25E-04	0.1801
03-DD-237	14.7	11.6	7A	28	48	1.44	0.0032	20	1.72E-06	1.03E-04	0.1490
03-DD-237	14.7	11.6	7B	28	48	0.82	0.0018	10	1.44E-06	8.65E-05	0.1245
03-DD-238	15.1	2.9	1A	124	140	1.02	0.0023	95	4.74E-07	2.84E-05	0.0409
03-DD-238	15.1	2.9	1B	124	140	0.5	0.0011	50	4.13E-07	2.48E-05	0.0357
03-DD-238	15.1	2.9	2A	109	129	0.98	0.0022	85	3.97E-07	2.38E-05	0.0343
03-DD-238	15.1	2.9	2B	109	129	0.62	0.0014	45	4.42E-07	2.65E-05	0.0382
03-DD-238	15.1	2.9	3A	94	114	0.7	0.0016	75	3.18E-07	1.91E-05	0.0275
03-DD-238	15.1	2.9	3B	94	114	0.24	0.0005	40	1.89E-07	1.13E-05	0.0163
03-DD-238	15.1	2.9	4A	79	99	1.36	0.0030	60	7.54E-07	4.53E-05	0.0652
03-DD-238	15.1	2.9	4B	79	99	0.68	0.0015	30	6.77E-07	4.06E-05	0.0585
03-DD-238	15.1	2.9	5A	64	84	6.66	0.0148	50	4.35E-06	2.61E-04	0.3756
03-DD-238	15.1	2.9	5B	64	84	3.44	0.0077	25	3.94E-06	2.37E-04	0.3408

Borehole	Gage Height	Static Water Level	Test ID	Interval		Discharge (Q)		Gage Pressure (psi)	Hydraulic Conductivity (K)		
				Top	Bottom	Q (gpm)	Q (ft3/sec)		K (ft/sec)	K (ft/min)	K (ft/day)
03-DD-238	15.1	2.9	6A	49	69	3.74	0.0083	40	2.94E-06	1.77E-04	0.2543
03-DD-238	15.1	2.9	6B	49	69	1.38	0.0031	20	1.87E-06	1.12E-04	0.1613
03-DD-238	15.1	2.9	7A	34	54	0.12	0.0003	25	1.38E-07	8.26E-06	0.0119
03-DD-238	15.1	2.9	7B	34	54	0.08	0.0002	15	1.32E-07	7.92E-06	0.0114

TABLE A8 - Pumping Test Hydraulic Conductivity Averages

Measured Borehole	Surface Elevation (ft)	Bottom of Borehole Elevation (ft)	Calculated Hydraulic Conductivity (ft/day)					
			Test Borehole 00-RD-215			Test Borehole 01-RD-219		
			Neuman Method		Cooper-Jacob Method	Neuman Method		Cooper-Jacob Method
			Horizontal	Vertical		Horizontal	Vertical	
96-DD-87	1165.7	964.9	1.08	12.14	4.51	1.2	1.67	1.46
99-DD-200	1164.5	959.2	0.93	0.45	2.65			
99-DD-205	1168.6	975.6	1.21	0.56	1.38	1.71	0.29	1.65
99-DD-206	1165.8	975.8	1.01	0.59	1.38			
00-DD-208	1165.1	1014.9	1.36	0.23	1.89	1.4	0.64	1.7
00-DD-209	1169.6	989.6	0.81	0.46	1.33	1.79	0.39	1.33
00-DD-210	1182.3	982.3	0.51	0.4	1.35			
00-DD-212	1181.5	1026.5	1	1.71	2.77			
00-DD-213	1158.3	1013.3	No Response to Pumping			No Response to Pumping		
00-DD-214	1165.5	995.5	0.88	6.71	3.22			
00-DD-216	1172.6	1027.6				1.7	0.74	1.49
00-DD-217	1165.6	1015.6	No Response to Pumping			No Response to Pumping		
00-DD-218	1165.8	1015.8	No Response to Pumping			0.12	0.21	0.73
01-DD-223	1145.9	1014.5				0.73	0.1	1.55
01-DD-224	1149	1027.5				0.16	0.14	0.23
01-DD-230	1140.7	1063				1.57	0.18	1.71

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DESIGN AUTHENTICATION

FISH PASSAGE RESTORATION FACILITY
COFFERDAM AND EXCAVATION,
HOWARD HANSON DAM, WASHINGTON

Signatures affixed below indicate the drawings and specifications included in this solicitation were prepared, reviewed and certified in accordance with Department of Army Engineer Regulation ER 1110-345-100, DESIGN POLICY FOR MILITARY CONSTRUCTION.

(Stamped Drawings on File)

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Chief, Engineering & Construction Division

This project was designed for the U.S. Army Corps of Engineers, Seattle District. The initials and/or signatures and registration designations of individuals appearing on these project documents are as required by ER 1110-1-8152, ENGINEERING AND DESIGN PROFESSIONAL REGISTRATION.

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GENERAL DECISION WA030001 06/13/2003 WA1

Date: June 13, 2003
General Decision Number WA030001

Superseded General Decision No. WA020001

State: Washington

Construction Type:
DREDGING
HEAVY
HIGHWAY

County(ies):
STATEWIDE

HEAVY AND HIGHWAY AND DREDGING CONSTRUCTION PROJECTS
(Excludes D.O.E. Hanford Site in Benton and Franklin Counties)

Modification Number	Publication Date
0	06/13/2003

COUNTY(ies):
STATEWIDE

CARP0001W 06/01/2002

	Rates	Fringes
COLUMBIA RIVER AREA - ADAMS, BENTON, COLUMBIA, DOUGLAS (EAST OF THE 120TH MERIDIAN), FERRY, FRANKLIN, GRANT, OKANOGAN (EAST OF THE 120TH MERIDIAN) AND WALLA WALLA COUNTIES		
CARPENTERS:		
GROUP 1:	23.58	6.25
GROUP 2:	24.69	6.25
GROUP 3:	23.85	6.25
GROUP 4:	23.58	6.25
GROUP 5:	58.43	6.25
GROUP 6:	27.72	6.25
SPOKANE AREA: ASOTIN, GARFIELD, LINCOLN, PEND OREILLE, SPOKANE, STEVENS AND WHITMAN COUNTIES		
CARPENTERS:		
GROUP 1:	22.91	6.25
GROUP 2:	24.01	6.25
GROUP 3:	23.17	6.25
GROUP 4:	22.91	6.25
GROUP 5:	56.77	6.25
GROUP 6:	27.00	6.25

CARPENTERS CLASSIFICATIONS

GROUP 1: Carpenter; Burner-Welder; Rigger and Signaler;

Insulators (all types), Acoustical, Drywall and Metal Studs, Metal Panels and Partitions; Floor Layer, Sander, Finisher and Astro Turf; Layout Carpenters; Form Builder; Rough Framer; Outside or Inside Finisher, including doors, windows, and jams; Sawfiler; Shingler (wood, composition) Solar, Fiberglass, Aluminum or Metal; Scaffold Erecting and Dismantling; Stationary Saw-Off Bearer; Wire, Wood and Metal Lather Applicator
GROUP 2: Millwright, machine erector
GROUP 3: Piledriver - includes driving, pulling, cutting, placing collars, setting, welding, or creosote treated material, on all piling
GROUP 4: Bridge, dock and wharf carpenters
GROUP 5: Divers
GROUP 6: Divers Tender

DEPTH PAYY FOR DIVERS:

Each foot over 50-100 feet	$1.00
Each foot over 100-175 feet	2.25
Each foot over 175-250 feet	5.50

HAZMAT PROJECTS

Anyone working on a HAZMAT job (task), where HAZMAT certification is required, shall be compensated at a premium, in addition to the classification working in as follows:

LEVEL D + $.25 per hour - This is the lowest level of protection. No respirator is used and skin protection is minimal.

LEVEL C + $.50 per hour - This level uses an air purifying respirator or additional protective clothing.
LEVEL B + $.75 per hour - Uses same respirator protection as Level A. Supplied air line is provided in conjunction with a chemical "splash suit".

LEVEL A +$1.00 per hour - This level utilizes a fully encapsulated suit with a self-contained breathing apparatus or a supplied air line.

CARP0003O 06/01/2002

	Rates	Fringes
SOUTHWEST WASHINGTON: CLARK, COWLITZ, KLICKITAT, LEWIS(Piledriver only), PACIFIC (South of a straight line made by extending the north boundary line of Wahkiakum County west to Willapa Bay to the Pacific Ocean), SKAMANIA AND WAHKIAKUM COUNTIES and INCLUDES THE ENTIRE PENINSULA WEST OF WILLAPA BAY		
SEE ZONE DESCRIPTION FOR CITIES BASE POINTS		
ZONE 1:		
CARPENTERS; ACOUSTICAL	27.37	8.80
DRYWALL	27.37	8.80
FLOOR LAYERS & FLOOR FINISHERS (the laying of all hardwood floors nailed and mastic set, parquet and wood-type tiles, and block floors,		

the sanding and finishing of floors, the preparation of old and new floors when the materials mentioned above are to be installed); INSULATORS (fiberglass and similar irritating materils	27.52	8.80
MILLWRIGHTS	27.87	8.80
PILEDRIVERS	27.87	8.80
DIVERS	65.05	8.80
DIVERS TENDERS	29.91	8.80

DEPTH PAY
50 TO 100 FEET $1.00 PER FOOT OVER 50 FEET
100 TO 150 FEET 1.50 PER FOOT OVER 100 FEET
150 TO 200 FEET 2.00 PER FOOT OVER 150 FEET

Zone Differential (Add up Zone 1 rates):
Zone 2 - $0.85
Zone 3 - 1.25

Zone 4 - 1.70
Zone 5 - 2.00
Zone 6 - 3.00

BASEPOINTS: ASTORIA, LONGVIEW, PORTLAND, THE DALLES, AND VANCOUVER, (NOTE: All dispatches for Washington State Counties: Cowlitz, Wahkiakum and Pacific shall be from Longview Local #1707 and mileage shall be computed from that point.)

ZONE 1: Projects located within 30 miles of the respective city hall of the above mentioned cities
ZONE 2: Projects located more than 30 miles and less than 40 miles of the respective city of the above mentioned cities
ZONE 3: Projects located more than 40 miles and less than 50 miles of the respective city of the above mentioned cities
ZONE 4: Projects located more than 50 miles and less than 60 miles of the respective city of the above mentioned cities.
ZONE 5: Projects located more than 60 miles and less than 70 miles of the respective city of the above mentioned cities
ZONE 6: Projects located more than 70 miles of the respected city of the above mentioned cities

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CARP0770D 06/01/2002

	Rates	Fringes
WESTERN WASHINGTON: CLALLAM, GRAYS HARBOR, ISLAND, JEFFERSON, KING, KITSAP, LEWIS (excludes piledrivers only), MASON, PACIFIC (North of a straight line made by extending the north boundary line of Wahkiakum County west to the Pacific Ocean), PIERCE, SAN JUAN, SKAGIT, SNOHOMISH, THURSTON AND WHATCOM COUNTIES		
CARPENTERS AND DRYWALL APPLICATORS	27.95	8.05

CARPENTERS ON CREOSOTE MATERIAL	28.05	8.05
INSULATION APPLICATORS	25.50	8.05
SAWFILERS, STATIONARY POWER SAW OPERATORS, FLOOR FINISHER, FLOOR LAYER, SHINGLER, FLOOR SANDER OPERATOR AND OPERATORS OF OTHER STATIONARY WOOD WORKING TOOLS	28.08	8.05
MILLWRIGHT AND MACHINE ERECTORS	28.95	8.05
ACOUSTICAL WOKRERS	28.11	8.05
PILEDRIVER, DRIVING, PULLING, CUTTING, PLACING COLLARS, SETTING, WELDING OR CRESOTE TREATED MATERIAL, ALL PILING	28.15	8.05
PILEDRIVER, BRIDGE, DOCK & WHARF CARPENTERS	27.95	8.05
DIVERS	68.97	8.05
DIVERS TENDER	30.68	8.05

(HOURLY ZONE PAY: WESTERN AND CENTRAL WASHINGTON - ALL

CLASSIFICATIONS EXCEPT MILLWRIGHTS AND PILEDRIVERS

Hourly Zone Pay shall be paid on jobs located outside of the free zone computed from the city center of the following listed cities:

Seattle	Olympia	Bellingham
Auburn	Bremerton	Anacortes
Renton	Shelton	Yakima
Aberdeen-Hoquiam	Tacoma	Wenatchee
Ellensburg	Everett	Port Angeles
Centralia	Mount Vernon	Sunnyside
Chelan	Pt. Townsend	

Zone Pay	
0 -25 radius miles	Free
25-35 radius miles	$1.00/hour
35-45 radius miles	$1.15/hour
45-55 radius miles	$1.35/hour
Over 55 radius miles	$1.55/hour

(HOURLY ZONE PAY: WESTERN AND CENTRAL WASHINGTON - MILLWRIGHT AND PILEDRIVER ONLY)

Hourly Zone Pay shall be computed from Seattle Union Hall, Tacoma City center, and Everett City center

Zone Pay	
0 -25 radius miles	Free
25-45 radius miles	$ .70/hour
Over 45 radius miles	$1.50/hour

CENTRAL WASHINGTON: CHELAN, DOUGLAS (WEST OF THE 120TH MERIDIAN), KITTITAS, OKANOGAN (WEST OF THE 120TH MERIDIAN) AND YAKIMA COUNTIES

CARPENTERS AND DRYWALL APPLICATORS	20.72	7.82
CARPENTERS ON CREOSOTED MATERIAL	20.82	7.82

INSULATION APPLICATORS	20.72	7.82
SAWFILERS, STATIONARY POWER S37 OPERATORS, FLOOR FINISHER, FLOOR LAYER, SHINGLERS, FLOOR SANDER OPERATORS	20.85	7.82
MILLWRIGHT AND MACHINE ERECTORS	28.95	7.82
PILEDRIVER, DRIVING, PULLING, CUTTING, PLACING COLLARS, SETTING, WELDING OR CRESOTE TREATED MATERIAL, ALL PILING	28.15	7.82
PILEDRIVER, BRIDGE DOCK AND WHARF CARPENTERS	27.95	7.82
DIVERS	68.97	8.05
DIVERS TENDER	30.68	8.05

ELEC0046A 12/30/2002

	Rates	Fringes
CALLAM, JEFFERSON, KING AND KITSAP COUNTIES		
ELECTRICIANS	34.25	3%+9.55
CABLE SPLICERS	37.68	3%+9.55

ELEC0048C 01/01/2003

	Rates	Fringes
CLARK, KLICKITAT AND SKAMANIA COUNTIES		
ELECTRICIANS	31.00	3%+11.83
CABLE SPLICERS	31.25	3%+11.83

ELEC0073A 01/01/2003

	Rates	Fringes
ADAMS, FERRY, LINCOLN, PEND OREILLE, SPOKANE, STEVENS, WHITMAN COUNTIES		
ELECTRICIANS	24.07	3%+10.63
CABLE SPLICERS	24.47	3%+10.63

ELEC0076B 07/01/2002

	Rates	Fringes
GRAYS HARBOR, LEWIS, MASON, PACIFIC, PIERCE, AND THURSTON COUNTIES		
ELECTRICIANS	29.78	3%+11.01
CABLE SPLICERS	32.76	3%+11.01

ELEC0077C 02/01/2003

	Rates	Fringes
LINE CONSTRUCTION:		
CABLE SPLICERS	37.95	3.875%+7.45
LINEMEN, POLE SPRAYERS, HEAVY LINE EQUIPMENT MAN	33.88	3.875%+7.45
LINE EQUIPMENT MEN	29.14	3.875%+5.70

POWDERMEN, JACKHAMMERMEN	25.41	3.875%+5.70
GROUNDMEN	23.72	3.875%+5.70
TREE TRIMMER	23.81	3.875%+5.70

ELEC0112E 06/01/2002

	Rates	Fringes
ASOTIN, BENTON, COLUMBIA, FRANKLIN, GARFIELD, KITTITAS, WALLA WALLA, YAKIMA COUNTIES		
ELECTRICIANS	28.75	3%+9.63
CABLE SPLICERS	30.19	3%+9.63

ELEC0191C 08/31/2002

	Rates	Fringes
ISLAND, SAN JUAN, SNOHOMISH, SKAGIT AND WHATCOM COUNTIES		
ELECTRICIANS	30.66	3%+9.33
CABLE SPLICERS	33.72	3%+9.33

ELEC0191D 12/01/2002

	Rates	Fringes
CHELAN, DOUGLAS, GRANT AND OKANOGAN COUNTIES		
ELECTRICIANS	26.66	3%+9.28
CABLE SPLICERS	29.33	3%+9.28

ELEC0970A 01/01/2003

	Rates	Fringes
COWLITZ AND WAHKIAKUM COUNTIES		
ELECTRICIANS	28.55	3%+9.25
CABLE SPLICERS	31.41	3%+9.25

ENGI0302E 06/01/2002

	Rates	Fringes
CHELAN (WEST OF THE 120TH MERIDIAN), CLALLAM, DOUGLAS (WEST OF THE 120TH MERIDIAN), GRAYS HARBOR, ISLAND, JEFFERSON, KING, KITSAP, KITTITAS, MASON, OKANOGAN (WEST OF THE 120TH MERIDIAN), SAN JUAN, SKAGIT, SNOHOMISH, WHATCOM AND YAKIMA (WEST OF THE 120TH MERIDIAN) COUNTIES		
PROJECTS		
CATEGORY A PROJECTS (excludes Category B projects, as show below)		
POWER EQUIPMENT OPERATORS:		
Zone 1 (0-25 radius miles):		
GROUP 1AAA	31.14	8.40
GROUP 1AA	30.64	8.40
GROUP 1A	30.14	8.40
GROUP 1	29.64	8.40
GROUP 2	29.20	8.40

GROUP 3	28.84	8.40
GROUP 4	26.74	8.40

Zone 2 (26-45 radius miles) - Add $ .70 to Zone 1 rates
Zone 3 (Over 45 radius miles) - Add $1.00 to Zone 1 rates

BASEPOINTS: Bellingham, Mount Vernon, Kent, Port Angeles, Port Townsend, Aberdeen, Shelton, Bremerton, Wenatchee, Yakima, Seattle, Everett

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1AAA - Cranes-over 300 tons or 300 ft. of boom (including job with attachments)

GROUP 1AA - Cranes - 200 tons to 300 tons or 250 ft. of boom (including jib and attachments); Tower crane over 175 ft. in height, base to boom

GROUP 1A - Cranes - 100 tons thru 199 tons or 150' of boom (including jib with attachments); Crane-overhead, bridge type, 100 tons and over; Tower crane up to 175 ft. in height base to boom; Loader-overhead, 8 yards and over; Shovel, excavator, backhoes-6 yards and over with attachments

GROUP 1 - Cableway; Cranes-45 tons thru 99 tons, under 150 ft. of boom (including jib with attachments); Crane-overhead, bridge type, 45 tons thru 99 tons; Shovel, excavator, backhoes over 3 yards and under 6 yards; Hard tail end dump articulating off-road equipment 45 yards and over; Loader-overhead, 6 yards to, but not including 8 yards; Mucking machine, mole, tunnel, drill and/or shield; Quad 9, HD 41, d-10; Remote control operator on rubber tired earth moving equipment; Rollagon; Scrapers-self-propelled-45 yards and over; Slipform pavers; Transporters, all track or truck type

GROUP 2 - Barrier machine (zipper); Barch Plant opeator-concrete; Bump cutter; Cranes-20 tons thru 44 tons with attachments; Cranes-overheads, bridge type-20 tons through 44 tons; Chipper; Concrete pump-truck mount with boom attachment; Crusher; Deck Engineer/Deck Winches (power); Drilling machine; Excavator, shovel backhoe-3 yards and under; Finishing machine Bidwell, Gamaco and similar equipment; Guardrail punch; Horizontal/directional drill operator; Loaders, overhead under 6 yds.; Loaders-plant feed; Locomotives-all; Mechanics-all; Mixers-asphalt plant; Motor patrol graders-finishing; Pildriver (other than crane mount); Roto-mill, roto-grinder; Screedman, Spreader, Topside Operator-Blaw Knox, Cedar Rapids, Jaeger, Caterpillar, Barbar Green; Scraper-self-propelled, hard tail end dump, articulating off-road equipment-under 45 yards; Subgrader trimmer; Tractors, backhoes-over 75 hp; Transfer material service machine-shuttle buggy, blow knox, roadtec; Truck crane oiler/driver-100 tons and over; Truck mount portable conveyor;Yo Yo Pay Dozer

GROUP 3 - Conveyors; Cranes-thru 19 tons with attachments;

Cranes-A-frame over 10 tons; Drill oilers-auger type, truck or crane mount; Dozers D9 and under; Forklifts-3000 lbs and over with attachments; horizontal/directional drill locator; Outside hoists-(elevators and manlifts), air tuggers, strao tower bucket elevators; Hydralifts/boom truck-over 10 tons; Loader-elevating type belt; Motor Patrol Grader-non-finishing; Plant Oiler-asphalt, crusher; Pumps-concrete; Roller, plant mix or multi-lift materials; Saws-concrete; Scrapers-concrete and carryall; Service engineers-equipment; Trenching machines; Truck crane oiler/driver-under 100 tons Tractors, backhoes-under 75 hp

GROUP 4 - Assistant Engineer; Bobcat; Brooms; Compressor; Concrete Finish Machine-laser screed; Cranes-A-frame-10 tons and under; Elevator and manlift-permanent and shaft type; Forklifts-under 3000 lbs. with attachments; Gradechecker, stakehop; Hydralifts, boom trucks-10 tons and under; Oil distributors, blower distribution and mulch seeding operator; Pavement breaker; Post Hole Digger-mechanical; Power

Plant; Pumps-water; Rigger and Bellman; Roller-other than plant mix; Wheel Tractors, farmall type; Shot crete/gunite equipment operator

CATEGORY B PROJECTS - 95% of the basic hourly rate for each group plus full fringe benefits applicable to Category A projects shall apply to the following projects. Reduced rates may be paid on the following:

1. Projects involving work on structures such as buildings and structures whose total value is less than $1.5 million excluding mechanical, electrical, and utility portions of the contract.
2. Projects of less than $1 million where no building is involved. Surfacing and paving included, but utilities excluded.
3. Marine projects (docks, wharfs, etc.) less than $150,000.

WORK PERFORMED ON HYDRAULIC DREDGES:

Total Project Cost $300,000 and over

GROUP 1	28.38	8.40
GROUP 2	28.48	8.40
GROUP 3	28.82	8.40
GROUP 4	28.87	8.40
GROUP 5	30.26	8.40
GROUP 6	28.38	8.40

GROUP 1: Assistant Mate (Deckhand)
GROUP 2: Oiler
GROUP 3: Assistant Engineer (Electric, Diesel, Steam or Booster Pump); Mates and Boatmen
GROUP 4: Craneman, Engineer Welder
GROUP 5: Leverman, Hydraulic
GROUP 6: Maintenance

Total Project cost under $300,000

GROUP 1	26.96	8.40
GROUP 2	27.06	8.40
GROUP 3	27.38	8.40
GROUP 4	27.43	8.40

GROUP 5	28.75	8.40
GROUP 6	26.96	8.40

GROUP 1: Assistant Mate (Deckhand)
GROUP 2: Oiler
GROUP 3: Assistant Engineer (Electric, Diesel, Steam, or Booster Pump); Mates and Boatmen
GROUP 4: Craneman, Engineer Welder
GROUP 5: Leverman, Hydraulic
GROUP 6: Maintenance

HEAVY WAGE RATES (CATEGORY A) APPLIES TO CLAM SHELL DREDGE, HOE AND DIPPER, SHOVELS AND SHOVEL ATTACHMENTS, CRANES AND BULLDOZERS.

HANDLING OF HAZAARDOUS WASTE MATERIALS: Personnel in all craft classifications subject to working inside a federally designated hazardous perimeter shall be eligible for compensation in

accordance with the following group schedule relative to the level of hazardous waste as outlined in the specific hazardous waste project site safety plan.

H-1 Base wage rate when on a hazardous waste site when not outfitted with protective clothing
H-2 Class "C" Suit - Base wage rate plus $.25 per hour.
H-3 Class "B" Suit - Base wage rate plus $.50 per hour.
H-4 Class "A" Suit - Base wage rate plus $.75 per hour.

ENGI0370C 06/01/2002

	Rates	Fringes
ADAMS, ASOTIN, BENTON, CHELAN (EAST OF THE 120TH MERIDIAN), COLUMBIA, DOUGLAS (EAST OF THE 120TH MERIDIAN), FERRY, FRANKLIN, GARFIELD, GRANT, LINCOLN, OKANOGAN (EAST OF THE 120TH MERIDIAN), PEND OREILLE, SPOKANE, STEVENS, WALLA WALLA, WHITMAN AND YAKIMA (EAST OF THE 120TH MERIDIAN) COUNTIES		
ZONE 1:		
POWER EQUIPMENT OPERATORS:		
GROUP 1A	20.94	6.52
GROUP 1	21.49	6.52
GROUP 2	21.81	6.52
GROUP 3	22.42	6.52
GROUP 4	22.58	6.52
GROUP 5	22.74	6.52
GROUP 6	23.02	6.52
GROUP 7	23.29	6.52
GROUP 8	24.39	6.52

ZONE DIFFERENTIAL (Add to Zone 1 rate): Zone 2 - $2.00

Zone 1: Within 45 mile radius of Spokane, Moses Lake, Pasco, Washington; Lewiston, Idaho
Zone 2: Outside 45 mile radius of Spokane, Moses Lake, Pasco, Washington; Lewiston, Idaho

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1A: Boat Operator; Crush Feeder; Oiler; Steam Cleaner

GROUP 1: Bit Grinders; Bolt Threading Machine; Compressors (under 2000 CFM, gas, diesel, or electric power); Deck Hand; Drillers Helper (Assist driller in making drill rod connections, service drill engine and air compressor, repair drill rig and drill tools, drive drill support truck to and on the job site, remove drill cuttings from around bore hole and inspect drill rig while in operation); Fireman & Heater Tender; Grade Checker; Hydro-seeder, Mulcher, Nozzleman; Oiler Driver, & Cable Tender, Mucking Machine; Pumpman; Rollers, all types on subgrade, including seal and chip coatings (farm type, Case, John Deere & similar, or Compacting Vibrator), except when pulled by Dozer with operable blade; Welding Machine

GROUP 2: A-frame Truck (single drum); Assistant Refrigeration Plant (under 1000 ton); Assistant Plant Operator, Fireman or Pugmixer (asphalt); Bagley or Stationary Scraper; Belt Finishing Machine; Blower Operator (cement); Cement Hog; Compressor (2000 CFM or over, 2 or more, gas diesel or electric power); Concrete Saw (multiple cut); Distributor Leverman; Ditch Witch or similar; Elevator Hoisting Materials; Dope Pots (power agitated); Fork Lift or Lumber Stacker, hydra-lift & similar; Gin Trucks (pipeline); Hoist, single drum; Loaders (bucket elevators and conveyors); Longitudinal Float; Mixer (portable-concrete); Pavement Breaker, Hydra-Hammer & similar; Power Broom; Railroad Ballast Regulation Operator (self-propelled); Railroad Power Tamper Operator (self-propelled); Railroad Tamper Jack Operator (self-propelled; Spray Curing Machine (concrete); Spreader Box (self-propelled); Straddle Buggy (Ross & similar on construction job only); Tractor (Farm type R/T with attachment, except Backhoe); Tugger Operator

GROUP 3: A-frame Truck (2 or more drums); Assistant Refrigeration Plant & Chiller Operator (over 1000 ton); Backfillers (Cleveland & similar); Batch Plant & Wet Mix Operator, single unit (concrete); Belt-Crete Conveyors with power pack or similar; Belt Loader (Kocal or similar); Bending Machine; Bob Cat; Boring Machine (earth); Boring Machine (rock under 8" bit) (Quarry Master, Joy or similar); Bump Cutter (Wayne, Saginau or similar); Canal Lining Machine (concrete); Chipper (without crane); Cleaning & Doping Machine (pipeline); Deck Engineer; Elevating Belt-type Loader (Euclid, Barber Green & similar); Elevating Grader-type Loader (Dumor, Adams or similar); Generator Plant Engineers (diesel or electric); Gunnite Combination Mixer & Compressor; Locomotive Engineer; Mixermobile; Mucking Machine; Posthole Auger or Punch; Pump (grout or jet); Soil Stabilizer (P & H or similar); Spreader Machine; Tractor (to D-6 or equivalent) and Traxcavator; Traverse Finish Machine; Turnhead Operator

GROUP 4: Concrete Pumps (squeeze-crete, flow-crete, pump-crete, Whitman & similar); Curb Extruder (asphalt or concrete); Drills (churn, core, calyx or diamond)(operate

drilling machine, drive or transport drill rig to and on job site and weld well casing); Equipment Serviceman; Greaser & Oiler; Hoist (2 or more drums or Tower Hoist); Loaders (overhead & front-end, under 4 yds. R/T); Refrigeration Plant Engineer (under 1000 ton); Rubber-tired Skidders (R/T with or without attachments); Surface Heater & Plant Machine; Trenching Machines (under 7 ft. depth capacity); Turnhead (with re-screening); Vacuum Drill (reverse circulation drill under 8" bit)

GROUP 5: Backhoe (under 45,000 gw); Backhoe & Hoe Ram (under 3/4 yd.); Carrydeck & Boom Truck (under 25 tons); Cranes (25 tons & under), all attachments including clamshell, dragline; Derricks & Stifflegs (under 65 tons); Drilling Equipment(8" bit & over) (Robbins, reverse circulation & similar)(operates drilling machine, drive or transport drill rig to and on job site and weld well casing); Hoe Ram; Piledriving Engineers; Paving (dual drum); Railroad Track Liner Operaotr (self-propelled);

Refrigeration Plant Engineer (1000 tons & over); Signalman (Whirleys, Highline Hammerheads or similar)

GROUP 6: Asphalt Plant Operator; Automatic Subgrader (Ditches & Trimmers)(Autograde, ABC, R.A. Hansen & similar on grade wire); Backhoe (45,000 gw and over to 110,000 gw); Backhoes & Hoe Ram (3/4 yd. to 3 yd.); Batch Plant (over 4 units); Batch & Wet Mix Operator (multiple units, 2 & incl. 4); Blade Operator (motor patrol & attachments, Athey & Huber); Boom Cats (side); Cable Controller (dispatcher); Clamshell Operator (under 3 yds.); Compactor (self-propelled with blade); Concrete Pump Boom Truck; Concrete Slip Form Paver; Cranes (over 25 tons, to and including 45 tons), all attachments including clamshell, dragline; Crusher, Grizzle & Screening Plant Operator; Dozer, 834 R/T & similar; Draglines (under 3 yds.); Drill Doctor; H.D. Mechanic; H.D. Welder; Loader Operator (front-end & overhead, 4 yds. incl. 8 yds.); Multiple Dozer Units with single blade; Paving Machine (asphalt and concrete); Quad-Track or similar equipment; Rollerman (finishing asphalt pavement); Roto Mill (pavement grinder); Scrapers, all, rubber-tired; Screed Operator; Shovel(under 3 yds.); Tractors (D-6 & equilvalent & over); Trenching Machines (7 ft. depth & over); Tug Boat Operator Vactor guzzler, super sucker

GROUP 7: Backhoe (over 110,000 gw); Backhoes & Hoe Ram (3 yds & over); Blade (finish & bluetop) Automatic, CMI, ABC, Finish Athey & Huber & similar when used as automatic; Cableway Operators; Concrete Cleaning/Decontamination machine operator; Cranes (over 45 tons to but not including 85 tons), all attachments including clamshell and dragine; Derricks & Stiffleys (65 tons & over); Elevating Belt (Holland type); Heavy equipment robotics operator; Loader (360 degrees revolving Koehring Scooper or similar); Loaders (overhead & front-end, over 8 yds. to 10 yds.); Rubber-tired Scrapers (multiple engine with three or more scrapers); Shovels (3 yds. & over); Whirleys & Hammerheads, ALL

GROUP 8: Cranes (85 tons and over, and all climbing, overhead,rail and tower), all attachments including clamshell, dragline; Loaders (overhead and front-end, 10 yards and over);

Helicopter Pilot

BOOM PAY: (All Cranes, Including Tower)
180' to 250' $ .30 over scale
Over 250' $ .60 over scale

NOTE: In computing the length of the boom on Tower Cranes, they shall be measured from the base of the Tower to the point of the boom.

HAZMAT: Anyone working on HAZMAT jobs, working with supplied air shall receive $1.00 an hour above classification.

ENGI0370G 06/01/2002

	Rates	Fringes
ADAMS, ASOTIN, BENTON, CHELAN (EAST OF THE 120TH MERIDIAN), COLUMBIA, DOUGLAS (EAST OF THE 120TH MERIDIAN), FERRY, FRANKLIN, GARFIELD, GRANT, LINCOLN, OKANOGAN (EAST OF THE 120TH MERIDIAN), PEND OREILLE, SPOKANE, STEVENS, WALLA WALLA, WHITMAN AND YAKIMA (EAST OF THE 120TH MERIDIAN) COUNTIES		
WORK PERFORMED ON HYDRAULIC DREDGES		
GROUP 1:	24.73	6.27
GROUP 2:	25.10	6.27
GROUP 3:	25.13	6.27
GROUP 4:	25.52	6.27
GROUP 5:	24.73	6.27

GROUP 1: Assistant Mate (Deckhand) and Oiler
GROUP 2: Assistant Engineer (Electric, Diesel, Steam, or Booster Pump); Mates and Boatmen
GROUP 3: Engineer Welder
GROUP 4: Leverman, Hydraulic
GROUP 5: Maintenance

HEAVY WAGE RATES APPLIES TO CLAM SHELL DREDGE, HOE AND DIPPER, SHOVELS AND SHOVEL ATTACHMENTS, CRANES AND BULLDOZERS.

ENGI0612A 06/01/2002

	Rates	Fringes
LEWIS, PIERCE, PACIFIC (THAT PORTION WHICH LIES NORTH OF A PARALLEL LINE EXTENDED WEST FROM THE NORTHERN BOUNDARY OF WAHKAIKUM COUNTY TO THE SEA IN THE STATE OF WASHINGTON) AND THURSTON COUNTIES		
PROJECTS:		
CATEGORY A PROJECTS (excludes Category B projects, as shown below)		
POWER EQUIPMENT OPERATORS:		
ZONE 1 (0-25 radius miles):		
GROUP 1AAA	31.14	8.40
GROUP 1AA	30.64	8.40
GROUP 1A	30.14	8.40

GROUP 1	29.64	8.40
GROUP 2	29.20	8.40
GROUP 3	28.94	8.40
GROUP 4	26.74	8.40

ZONE 2 (26-45 radius miles) - Add $.70 to Zone 1 rates
ZONE 3 (Over 45 radius miles) - Add $1.00 to Zone 1 rates

BASEPOINTS: Tacoma, Olympia, and Centralia

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1AAA - Cranes-300 tons, or 300 ft of boom (including jib with attachments)

GROUP 1AA - Cranes 200 tons to 300 tons, or 250 ft of boom (including jib with attachments); Tower crane over 175 ft in

height, base to boom

GROUP 1A - Crane 100 tons thru 199 tons, or 150 of boom (including jib with attachments); Crane-overhead, bridge type, 100 tons and over; Shovel, excavator, backhoes-6 yds and over with attachments

GROUP 1 - Cableways; Cranes-45 tons thru 99 tons, under 150 ft of boom (including jib with attachments); Crane-overhead, bridge type - 45 tons thru 99 tons; Excavator, shovel, backhoes over 3 yards and under 6 yards; hard tail end dump articulating off-road equipment 45 yards and over; loader-overhead 6 yards to, but not including 8 yards; Mucking machine, mole, tunnel, drill and/or shield; Quad 9, HD 41, D-10; Remote control operator on rubber tired earth moving equipment; Rollagon; Scrapers-self-propelled-45 yds and over; Slipform pavers; Transporters-all track or truck type

GROUP 2 - Barrier machine (zipper); Batch Plant Operator-concrete; Bump cutter; Cranes-20 tons through 44 tons with attachments; Crane-overhead, bridge type-20 tons thru 44 tons; Chipper, Concrete Pump-truck mounted with boom attachment; Crushers; Deck Engineer/Deck Winches (power); Drilling machine; Excavator, shovel, backhoe-3yards and under; Finishing machine, Bidwell, Gamaco and similar equipment; Guardrail punch; Horizontal/directional drill operator; Loaders, overhead under 6 yds.; Loaders, plant feed; Locomotive-all; Mechanics-all; Mixers, asphalt plant; Motor patrol graders-finishing; Piledriver (other than crane mount); Roto-mill, roto grinder; screedman, spreader, topside operator-Blaw Knox, Cedar Rapids, Jaeger, Caterpillar, Barbar Green; Scraper-self propelled, hard tail end dump, articulating off-road equipment under 45 yds.; Subgrader trimmer; Tractors, backhoes over 75 hp.; Transfer material service machine-shuttle buggy, Blaw Knox-Roadtec; Truck Crane Oiler/driver-100 tons and over, Truck Mount Portable Conveyor; Yo Yo Pay dozer.

GROUP 3 - Conveyors; Cranes-thru 19 tons with attachments; Cranes-A-frame over 10 tons; Drill Oilers-Auger type, truck or

crane mount; Dozers-D-9 and under; Forklifts-3000 lbs. and over with attachments; Horizontal/directional drill locator; Outside hoists-(elevators and manlifts), air tuggers, strato tower bucket elevators; Hydralifts/Boom Trucks-over 10 tons; Loaders-elevating type, belt; Motor patrol grader-nonfinishing; Plant Oiler-Asphalt, Crusher; Pumps, Concrete; Roller, plant mix or multi-lift materials; Saws-concrete; Scrapers-Concrete and Carry all; Trenching machines; Truck Crane Oiler/Driver-under 100 tons; Tractor, backhoe-under 75 hp

GROUP 4 - Assistant Engineer; Bobcat; Brooms; Compressor; Concrete Finish Machine-laser screed; Crane-A-Frame, 10 tons and under; Elevator and manlift-permanent and shaft type; Forklifts-under 3000 lbs. with attachments; Gradechecker, stakehop; Hydralifts, boom trucks, 10 tons and under; Oil distributors, blower distribution and mulch seeding operator; Pavement breaker; Posthole Digger-mechanical; Power plant;

Pumps-Water; Roller-other than Plant Mix; Wheel Tractors, Farmall type; Shotcrete/Gunite Equipment Operator

CATEGORY B PROJECTS - 95% of the basic hourly rate for each group plus full fringe benefits applicable to Category A projects shall apply to the following projects: Reduced rates may be paid on the following:

1. Projects involving work on structures such as buildings and structures whose total value is less than $1.5 million excluding mechanical, electrical, and utility portions of the contract.
2. Projects of less than $1 million where no building is involved. Surfacing and paving included, but utilities excluded.
3. Marine projects (docts, wharfs, etc.) less than $150,000

WORK PERFORMED ON HYDRAULIC DREDGES:

Total Project cost $300,000 and over

GROUP 1	28.38	8.40
GROUP 2	28.48	8.40
GROUP 3	28.82	8.40
GROUP 4	28.87	8.40
GROUP 5	30.26	8.40
GROUP 6	28.38	8.40

GROUP 1: Assistant Mate (Deckhand)
GROUP 2: Oiler
GROUP 3: Assistant Engineer (Electric, Diesel, Steam or Booster Pump); Mates and Boatmen
GROUP 4: Craneman, Engineer Welder
GROUP 5: Leverman, Hydraulic
GROUP 6: Maintenance

Total Project Cost under $300,000

GROUP 1	26.96	8.40
GROUP 2	27.06	8.40
GROUP 3	27.38	8.40
GROUP 4	27.43	8.40
GROUP 5	28.75	8.40
GROUP 6	26.96	8.40

GROUP 1: Assistant Mate (Deckhand)
GROUP 2: Oiler
GROUP 3: Assistant Engineer (Electric, Diesel, Steam or Booster Pump); Mates and Boatmen
GROUP 4: Craneman, Engineer Welder
GROUP 5: Leverman, Hydraulic
GROUP 6: Maintenance

HEAVY WAGE RATES APPLIES TO CLAM SHEEL DREDGE, HOE AND DIPPER, SHOVELS AND SHOVEL ATTACHMENTS, CRANES AND BULLDOZERS

HANDLING OF HAZARDOUS WASTE MATERIALS

H-1 - When not outfitted with protective clothing of level D equipment - Base wage rate
H-2 - Class "C" Suit - Base wage rate + $.25 per hour

H-3 - Class "B" Suit - Base wage rate + $.50 per hour
H-4 - Class "A" Suit - Base wage rate +$.75 per hour

ENGI0701D 01/01/2003

	Rates	Fringes
CLARK, COWLITZ, KLICKKITAT, PACIFIC (SOUTH), SKAMANIA, AND WAHKIAKUM COUNTIES		
POWER EQUIPMENT OPERATORS (See Footnote A)		
ZONE 1:		
GROUP 1	29.30	8.95
GROUP 1A	30.77	8.95
GROUP 1B	32.23	8.95
GROUP 2	28.07	8.95
GROUP 3	27.31	8.95
GROUP 4	26.79	8.95
GROUP 5	26.19	8.95
GROUP 6	23.84	8.95

Zone Differential (add to Zone 1 rates):
Zone 2 - $1.50
Zone 3 - 3.00

For the following metropolitan counties: MULTNOMAH; CLACKAMAS; MARION; WASHINGTON; YAMHILL; AND COLUMBIA; CLARK; AND COWLITZ COUNTY, WASHINGTON WITH MODIFICATIONS AS INDICATED:

All jobs or projects located in Multnomah, Clackamas and Marion Counties, West of the western boundary of Mt. Hood National Forest and West of Mile Post 30 on Interstate 84 and West of Mile Post 30 on State Highway 26 and West of Mile Post 30 on Highway 22 and all jobs or projects located in Yamhill County, Washington County and Columbia County and all jobs or porjects located in Clark & Cowlitz County, Washington except that portion of Cowlitz County in the Mt. St. Helens "Blast Zone" shall receive Zone I pay for all classifications.

All jobs or projects located in the area outside the identified

boundary above, but less than 50 miles from the Portland City Hall shall receive Zone II pay for all classifications.

All jobs or projects located more than 50 miles from the Portland City Hall, but outside the identified border above, shall receive Zone III pay for all classifications.

For the following cities: ALBANY; BEND; COOS BAY; EUGENE; GRANTS PASS; KLAMATH FALLS; MEDFORD; ROSEBURG

All jobs or projects located within 30 miles of the respective city hall of the above mentioned cities shall receive Zone I pay for all classifications.

All jobs or projects located more than 30 miles and less than 50 miles from the respective city hall of the above mentioned cities shall receive Zone II pay for all classifications.

All jobs or projects located more than 50 miles from the respective city hall of the above mentioned cities shall receive Zone III pay for all classifications.

POWER EQUIPMENT OPERATORS CLASSIFICATIONS

GROUP 1: CONCRETE: Batch Plant and/or Wet Mix Operator, three units or more; CRANE: Helicopter Operator, when used in erecting work; Whirley Operator, 90 ton and over; LATTICE BOOM CRANE: Operator 200 tons through 299 tons, and/or over 200 feet boom; HYDRAULIC CRANE: Hydraulic Crane Operator 90 tons through 199 tons with luffing or tower attachments; FLOATING EQUIPMENT: Floating Crane, 150 ton but less than 250 ton

GROUP 1A: HYDRAULIC CRANE: Hydraulic Operator, 200 tons and over (with luffing or tower attachment); LATTICE BOOM CRANE: Operator, 200 tons through 299 tons, with over 200 feet boom; FLOATING EQUIPMENT: Floating Crane 250 ton and over

GROUP 1B: LATTICE BOOM CRANE: Operator, 300 tons through 399 tons with over 200 feet boom; Operator 400 tons and over; FLOATING EQUIPMENT: Floating Crane 350 ton and over

GROUP 2: ASPHALT: Asphalt Plant Operator (any type); Roto Mill, pavement profiler, operator, 6 foot lateral cut and over; BLADE: Auto Grader or "Trimmer" (Grade Checker required); Blade Operator, Robotic; BULLDOZERS: Bulldozer operator over 120,000 lbs and above; Bulldozer operator, twin engine; Bulldozer Operator,tandem, quadnine, D10, D11, and similar type; Bulldozere Robotic Equipment (any type; CONCRETE: Batch Plant and/or Wet Mix Operator, one and two drum; Automatic Concrete Slip Form Paver Operator; Concrete Canal Line Operator; Concrete Profiler, Diamond Head; CRANE: Cableway Operator, 25 tons and over; HYDRAULIC CRANE: Hydraulic crane operator 90 tons through 199 tons (with luffing or tower attachment); TOWER/WHIRLEY OPERATOR: Tower Crane Operator; Whirley Operator, under 90 tons; LATTICE BOOM CRANE: 90 through 199 tons and/or 150 to 200 feet boom; CRUSHER: Crusher

Plant Operator; FLOATING EQUIPMENT: Floating Clamshell, etc.operator, 3 cu. yds. and over; Floating Crane (derrick barge) Operator, 30 tons but less than 150 tons; LOADERS: Loader operator, 120,000 lbs. and above; REMOTE CONTROL: Remote controlled earth-moving equipment; RUBBER-TIRED SCRAPERS: Rubber-tired scraper operator, with tandem scrapers, multi-engine; SHOVEL, DRAGLINE, CLAMSHELL, SKOOPER OPERATOR: Shovel, Dragline, Clamshell, operator 5 cu. yds and over; TRENCHING MACHINE: Wheel Excavator, under 750 cu. yds. per hour (Grade Oiler required); Canal Trimmer (Grade Oiler required); Wheel Excavator, over 750 cu. yds. per hour; Band Wagon (in conjunction with wheel excavator); UNDERWATER EQUIPMENT: Underwater Equipment Operator, remote or otherwise; HYDRAULIC HOES-EXCAVATOR: Excavator over 130,000 lbs.

GROUP 3: BULLDOZERS: Bulldozer operator, over 70,000 lbs. up to

and including 120,000 lbs.; HYDRAULIC CRANE: Hydraulic crane operator, 50 tons through 89 tons (with luffing or tower attachment); LATTICE BOOM CRANES: Lattice Boom Crane-50 through 89 tons (and less than 150 feet boom); FORKLIFT: Rock Hound Operator; HYDRAULIC HOES-EXCAVATOR: excavator over 80,000 lbs. through 130,000 lbs.; LOADERS: Loader operator 60,000 and less than 120,000; RUBBER-TIRED SCRAPERS: Scraper Operator, with tandem scrapers; Self-loading, paddle wheel, auger type, finish and/or 2 or more units; SHOVEL, DRAGLINE, CLAMSHELL,SKOOPER OPERATOR: Shovel, Dragline, Clamshell operators 3 cu. yds. but less than 5 cu yds.

GROUP 4: ASPHALT: Screed Operator; Asphalt Paver operator (screeman required); BLADE: Blade operator; Blade operator, finish; Blade operator, externally controlled by electronic, mechanical hydraulic means; Blade operator, multi-engine; BULLDOZERS: Bulldozer Operator over 20,000 lbs and more than 100 horse up to 70,000 lbs; Drill Cat Operator; Side-boom Operator; Cable-Plow Operator (any type); CLEARING: Log Skidders; Chippers; Incinerator; Stump Splitter (loader mounted or similar type); Stump Grinder (loader mounted or similar type; Tub Grinder; Land Clearing Machine (Track mounted forestry mowing & grinding machine); Hydro Axe (loader mounted or similar type); COMPACTORS SELF-PROPELLED: Compactor Operator, with blade; Compactor Operator, multi-engine; Compactor Operator, robotic; CONCRETE: Mixer Mobile Operator; Screed Operator; Concrete Cooling Machine Operator; Concrete Paving Road Mixer; Concrete Breaker; Reinforced Tank Banding Machine (K-17 or similar types); Laser Screed; CRANE: Chicago boom and similar types; Lift Slab Machine Operator; Boom type lifting device, 5 ton capacity or less; Hoist Operator, two (2) drum; Hoist Operator, three (3) or more drums; Derrick Operator, under 100 ton; Hoist Operator, stiff leg, guy derrick or similar type, 50 ton and over; Cableway Operator up to twenty (25) ton; Bridge Crane Operator, Locomotive, Gantry, Overhead; Cherry Picker or similar type crane; Carry Deck Operator; Hydraulic Crane Operator, under 50 tons; LATTICE BOOM CRANE OPERATOR: Lattice Boom Crane Operator, under 50 tons; CRUSHER: Generator Operator; Diesel-Electric Engineer; Grizzley Operator; Drill Doctor; Boring Machine Operator; Driller-Percussion, Diamond, Core, Cable, Rotary and

similar type; Cat Drill (John Henry); Directional Drill Operator over 20,000 lbs pullback; FLOATING EQUIPMENT: Diesel-electric Engineer; Jack Operator, elevating barges, Barge Operator, self-unloading; Piledriver Operator (not crane type) (Deckhand required); Floating Clamshelll, etc. Operator, under 3 cu. yds. (Fireman or Diesel-Electric Engineer required); Floating Crane (derrick barge) Operator, less than 30 tons; GENERATORS: Generator Operator; Diesel-electric Engineer; GUARDRAIL EQUIPMENT: Guardrail Punch Operator (all types); Guardrail Auger Operator (all types); Combination Guardrail machines, i.e., punch auger, etc.; HEATING PLANT: Surface Heater and Planer Operator; HYDRAULIC HOES EXCAVATOR: Robotic Hydraulic backhoe operator, track and wheel type up to and including 20,0000 lbs. with any or all attachments; Excavator Operator over 20,000 lbs through 80,000 lbs.; LOADERS: Belt Loaders, Kolman and Ko Cal types; Loaders Operator, front end and overhead, 25,000 lbs and less

than 60,000 lbs; Elevating Grader Operator by Tractor operator, Sierra, Euclid or similar types; PILEDRIVERS: Hammer Operator; Piledriver Operator (not crane type); PIPELINE, SEWER WATER: Pipe Cleaning Machine Operator; Pipe Doping Machine Operator; Pipe Bending Machine Operator; Pipe Wrapping Machine Operator; Boring Machine Operator; Back Filling Machine Operator; REMOTE CONTROL: Concrete Cleaning Decontamination Machine Operator; Ultra High Pressure Water Jet Cutting Tool System Operator/Mechanic; Vacuum Blasting Machine Operator/mechanic; REPAIRMEN, HEAVY DUTY: Diesel Electric Engineer (Plant or Floating; Bolt Threading Machine operator; Drill Doctor (Bit Grinder); H.D. Mechanic; Machine Tool Operator; RUBBER-TIRED SCRAPERS: Rubber-tired Scraper Operator,single engine, single scraper; Self-loading, paddle wheel, auger type under 15 cu. yds.; Rubber-tired Scraper Operator, twin engine; Rubber-tired Scraper Operator, with push-ull attachments; Self Loading, paddle wheel, auger type 15 cu. yds. and over, single engine; Water pulls, water wagons; SHOVEL, DRAGLINE, CLAMSHELL, SKOOPER OPERATOR: Diesel Electric Engineer; Stationay Drag Scraper Operator; Shovel, Dragline, Clamshell, Operator under 3 cy yds.; Grade-all Operator; SURFACE (BASE) MATERIAL: Blade mounted spreaders, Ulrich and similar types; TRACTOR-RUBBERED TIRED: Tractor operator, rubber-tired, over 50 hp flywheel; Tractor operator, with boom attachment; Rubber-tired dozers and pushers (Michigan, Cat, Hough type); Skip Loader, Drag Box; TRENCHING MACHINE: Trenching Machine operator, digging capacity over 3 ft depth; Back filling machine operator; TUNNEL: Mucking machine operator

GROUP 5: ASPHALT: Extrusion Machine Operator; Roller Operator (any asphalt mix); Asphalt Burner and Reconditioner Operator (any type); Roto-Mill, pavement profiler, ground man; BULLDOZERS: Bulldozer operator, 20,000 lbs. or less or 100 horse or less; COMPRESSORS: Compressor Operator (any power), over 1,250 cu. ft. total capacity; COMPACTORS: Compactor Operator, including vibratory; Wagner Pactor Operator or similar type (without blade); CONCRETE: Combination mixer and Compressor Operator, gunite work; Concrete Batch Plant Quality Control Operator; Beltcrete Operator; Pumpcrete Operator (any type); Pavement Grinder and/or Grooving Machine Operator (riding type); Cement Pump Operator, Fuller-Kenyon and similar; Concrete Pump Operator;

Grouting Machine Operator; Concrete mixer operator, single drum, under (5) bag capacity; Cast in place pipe laying machine; maginnis Internal Full slab vibrator operator; Concrete finishing mahine operator, Clary, Johnson, Bidwell, Burgess Bridge deck or similar type; Curb Machine Operator, mechanical Berm, Curb and/or Curb and Gutter; Concrete Joint Machine Operator; Concrete Planer Operator; Tower Mobile Operator; Power Jumbo Operator setting slip forms in tunnels; Slip Form Pumps, power driven hydraulic lifting device for concrete forms; Concrete Paving Machine Operator; Concrete Finishing Machine Operator; Concrete Spreader Operator; CRANE: Helicopter Hoist Operator; Hoist Operator, single drum; Elevator Operator; A-frame Truck Operator, Double drum; Boom Truck Operator; HYDRAULIC CRANE OPERATOR: Hydraulic Boom Truck, Pittman; DRILLING: Churm Drill and Earth Boring Machine Operator; Vacuum Truck; Directional Drill Operator over 20,000 lbs pullback; FLOATING EQUIPMENT:

Fireman; FORKLIFT: Fork Lift, over 10 ton and/or robotic; HYDRAULIC HOES EXCAVATORS: Hydraulic Backhoe Operator, wheel type (Ford, John Deere, Case type); Hydraulic Backhoe Operator track type up to and including 20,000 lbs.; LOADERS: Loaders, rubber-tired type, less than 25,000 lbs; Elevating Grader Operator, Tractor Towed requiring Operator or Grader; Elevating loader operator, Athey and similar types; OILERS: Service oiler (Greaser); PIPELINE-SEWER WATER: Hydra hammer or simialr types; Pavement Breaker Operator; PUMPS: Pump Operator, more than 5 (any size); Pot Rammer Operator; RAILROAD EQUIPMENT: Locomotive Operator, under 40 tons; Ballast Regulator Operator; Ballast Tamper Multi-Purpose Operator; Track Liner Operator; Tie Spacer Operator; Shuttle Car Operator; Locomotive Operator, 40 tons and over; MATERIAL HAULRS: Cat wagon DJB's Volvo similar types; Conveyored material hauler; SURFACING (BASE) MATERIAL: Rock Spreaders, self-propelled; Pulva-mixer or similar types; Chiip Spreading machine operator; Lime spreading operator, construction job siter; SWEEPERS: Sweeper operator (Wayne type) self-propelled construction job site; TRACTOR-RUBBER TIRED: Tractor operator, rubber-tired, 50 hp flywheel and under; Trenching machine operator, maximum digging capacity 3 ft depth; TUNNEL: Dinkey

GROUP 6: ASPHALT: Plant Oiler; Plant Fireman; Pugmill Operator (any type); Truck mounted asphalt spreader, with screed; COMPRESSORS: Compressor Operator (any power), under 1,250 cu. ft. total capacity; CONCRETE: Plant Oiler, Assistant Conveyor Operator; Conveyor Operator; Mixer Box Operator (C.T.B., dry batch, etc.); Cement Hog Operator; Concrete Saw Operator; Concrete Curing Machine Operator (riding type); Wire Mat or Brooming Machine Operator; CRANE: Oiler; Fireman, all equipment; Truck Crane Oiler Driver; A-frame Truck Operator, single drum; Tugger or Coffin Type Hoist Operator; CRUSHER: Crusher Oiler; Crusher Feederman; CRUSHER: Crusher oiler; Crusher feederman; DRILLING: Drill Tender; Auger Oiler; FLOATING EQUIPMENT: Deckhand; Boatman; FORKLIFT: Self-propelled Scaffolding Operator, construction job site (exclduing working platform); Fork Lift or Lumber Stacker Operator, construction job site; Ross Carrier Operator, construction job site; Lull Hi-Lift Operator or Similar Type; GUARDRAIL EQUIPMENT: Oiler; Auger Oiler; Oiler, combination guardrail machines; Guardrail Punch Oiler; HEATING PLANT: Temporary Heating Plant Operator; LOADERS:

Bobcat, skid steer (less than 1 cu yd.); Bucket Elevator Loader Operator, BarberGreene and similar types; OILERS: Oiler; Guardrail Punch Oiler; Truck Crane Oiler-Driver; Auger Oiler; Grade Oiler, required to check grade; Grade Checker; Rigger; PIPELINE-SEWER WATER: Tar Pot Fireman; Tar Pot Fireman (power agitated); PUMPS: Pump Operator (any power); Hydrostatic Pump Operator; RAILROAD EQUIPMENT: Brakeman; Oiler; Switchman; Motorman; Ballast Jack Tamper Operator; SHOVEL, DRAGLINE, CLAMSHELL, SKOOPER, ETC. OPERATOR: Oiler, Grade Oiler (required to check grade); Grade Checker; Fireman; SWEEPER: Broom operator, self propelled, construction job site; SURFACING (BASE) MATERIAL: Roller Operator, grading of base rock (not asphalt); Tamping Machine operartor, mechanical, self-propelled; Hydrographic Seeder Machine Operator; TRENCHING MACHINE: Oiler; Grade Oiler; TUNNEL: Conveyor operator; Air filtration equipment operator

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ENGI0701E 06/01/2002

	Rates	Fringes
CLARK, COWLITZ, KLICKITAT, PACIFIC (SOUTH), SKAMANIA, AND WAHKIAKUM COUNTIES		
DREDGING:		
ZONE A		
LEVERMAN, HYDRAULIC	32.43	8.50
LEVERMAN, DIPPER, FLOATING CLAMSHELL	30.25	8.50
ASSISTANT ENGINEER	29.25	8.50
TENDERMAN	28.44	8.50
ASSISTANT MATE	26.58	8.50
ZONE B		
LEVERMAN, HYDRAULIC	34.43	8.50
LEVERMAN, DIPPER, FLOATING CLAMSHELL	32.25	8.50
ASSISTANT ENGINEER	31.25	8.50
TENDERMAN	30.44	8.50
ASSISTANT MATE	28.58	8.50
ZONE C		
LEVERMAN, HYDRAULIC	35.43	8.50
LEVERMAN, DIPPER, FLOATING CLAMSHELL	33.25	8.50
ASSISTANT ENGINEER	32.25	8.50
TENDERMAN	31.44	8.50
ASSISTANT MATE	29.58	8.50

ZONE DESCRIPTION FOR DREDGING:
ZONE A - All jobs or projects located within 30 road miles of Portland City Hall.
ZONE B - Over 30-50 road miles from Portland City Hall.
ZONE C - Over 50 road miles from Portland City Hall.

*All jobs or projects shall be computed from the city hall by the shortest route to the geographical center of the project.

IRON0014F 02/01/2003

	Rates	Fringes
ADAMS, ASOTIN, BENTON, COLUMBIA, DOUGLAS, FERRY, FRANKLIN, GARFIELD, GRANT, LINCOLN, OKANOGAN, PEND ORIELLE, SPOKANE, STEVENS, WALLA WALLA AND WHITMAN COUNTIES		
IRONWORKERS	25.52	11.80

IRON0029I 07/01/2002

	Rates	Fringes
CLARK, COWLITZ, KLICKITAT, PACIFIC, SKAMANIA, AND WAHKAIKUM COUNTIES		
IRONWORKERS	26.97	11.80

IRON0086B 07/01/2002

	Rates	Fringes
YAKIMA, KITTITAS AND CHELAN COUNTIES		
IRONWORKERS	26.72	11.80

IRON0086E 07/01/2002

	Rates	Fringes
CLALLAM, GRAYS HARBOR, ISLAND, JEFFERSON, KING, KITSAP, LEWIS, MASON, PIERCE, SKAGIT, SNOHOMISH, THURSTON, AND WHATCOM COUNTIES		
IRONWORKERS	27.22	11.80

LABO0001D 06/01/2002

	Rates	Fringes
CHELAN, DOUGLAS (WEST OF THE 120TH MERIDIAN), KITTITAS AND YAKIMA COUNTIES		
LABORERS:		
ZONE 1:		
GROUP 1	14.79	6.20
GROUP 2	17.11	6.20
GROUP 3	18.83	6.20
GROUP 4	19.31	6.20
GROUP 5	19.67	6.20

ZONE DIFFERENTIAL (ADD TO ZONE 1 RATES):
ZONE 2 - $ .70
ZONE 3 - $1.00

BASE POINTS: CHELAN, SUNNYSIDE, WENATCHEE, AND YAKIMA

ZONE 1 - Projects within 25 radius miles of the respective city hall
ZONE 2 - More than 25 but less than 45 radius miles from the

respective city hall
ZONE 3 - More than 45 radius miles from the respective city hall

CALLAM, GRAYS HARBOR, ISLAND, JEFFERSON, KING, KITSAP, LEWIS, MASON, PACIFIC (NORTH OF STRAIGHT LINE MADE BY EXTENDING THE NORTH BOUNDARY WAHKIAKUM COUNTY WEST TO THE PACIFIC OCEAN), PIERCE, SAN JUAN, SKAGIT, SNOHOMISH, THURSTON AND WHATCOM COUNTIES

LABORERS:
ZONE 1:

GROUP 1	17.71	6.20
GROUP 2	20.03	6.20
GROUP 3	24.71	6.20
GROUP 4	25.19	6.20
GROUP 5	25.55	6.20

ZONE DIFFERENTIAL (ADD TO ZONE 1 RATES):
ZONE 2 - $ .70
ZONE 3 - $1.00

BASE POINTS: BELLINGHAM, MT. VERNON, EVERETT, SEATTLE, KENT, TACOMA, OLYMPIA, CENTRALIA, ABERDEEN, SHELTON, PT. TOWNSEND, PT. ANGELES, AND BREMERTON

ZONE 1 - Projects within 25 radius miles of the respective city hall
ZONE 2 - More than 25 but less than 45 radius miles from the respective city hall
ZONE 3 - More than 45 radius miles from the respective city hall

LABORERS CLASSIFICATIONS

GROUP 1: Landscaping and Planting; Watchman; Window Washer/Cleaner (detail clean-up, such as but not limited to cleaning floors, ceilings, walls, windows, etc., prior to final acceptance by the owner)

GROUP 2: Batch Weighman; Crusher Feeder; Fence Laborer; Flagman; Pilot Car

GROUP 3: General Laborer; Air, Gas, or Electric Vibrating Screed; Asbestos Abatement Laborer; Ballast Regulator Machine; Brush Cutter; Brush Hog Feeder; Burner; Carpenter Tender; Cement Finisher Tender; Change House or Dry Shack; Chipping Gun (under 30 lbs.); Choker Setter; Chuck Tender; Clean-up Laborer; Concrete Form Stripper; Curing Laborer; Demolition (wrecking and moving including charred material); Ditch Digger; Dump Person; Fine Graders; Firewatch; Form Setter; Gabian Basket Builders; Grout Machine Tender; Grinders; Guardrail Erector; Hazardous Waste Worker (Level C); Maintenance Person; Material Yard Person; Pot Tender; Rip Rap Person; Riggers; Scale Person; Sloper Sprayer; Signal Person; Stock Piler; Stake Hopper; Toolroom Man (at job site); Topper-Tailer; Track Laborer; Truck Spotter; Vinyl Seamer

GROUP 4: Cement Dumper-Paving; Chipping Gun (over 30 lbs.); Clary Power Spreader; Concrete Dumper/Chute Operator; Concrete Saw Operator; Drill Operator (hydraulic, diamond, aiartrac); Faller and Bucker Chain Saw; Grade Checker and Transit Person; Groutmen (pressure) including post tension beams; Hazardous Waste Worker (Level B); High Scaler; Jackhammer; Laserbeam Operator; Manhole Builder-Mudman; Mortarman and Hodcarrier; Nozzleman (concrete pump, green cutter when using combination of high pressure air and water on concrete and rock, sandblast, gunite, shotcrete, water blaster, vacuum blaster); Pavement Breaker; Pipe Layer and Caulker; Pipe Pot Tender; Pipe Reliner (not insert type); Pipe Wrapper; Power Jacks; Railroad Spike Puller-Power; Raker-Asphalt; Rivet Buster; Rodder; Sloper (over 20'); Spreader

(concrete); Tamper and Similar electric, air and glas operated tool; Timber Person-sewer (lagger shorer and cribber); Track Liner Power; Tugger Operator; Vibrator; Well Point Laborer

GROUP 5: Caisson Worker; Miner; Powderman; Re-Timberman; Hazardous Waste Worker (Level A).

LABO0238E 06/01/2002

	Rates	Fringes
ADAMS, ASOTIN, BENTON, COLUMBIA, DOUGLAS (EAST OF THE 120TH MERIDIAN), FERRY, FRANKLIN, GARFIELD, GRANT, LINCOLN, OKANOGAN, PEND OREILLE, STEVENS, SPOKANE, WALLA WALLA AND WHITMAN COUNTIES		
LABORERS:		
ZONE 1:		
GROUP 1	17.66	5.50
GROUP 2	19.76	5.50
GROUP 3	20.03	5.50
GROUP 4	20.30	5.50
GROUP 5	20.58	5.50
GROUP 6	21.95	5.50

Zone Differential (Add to Zone 1 rate): $2.00

BASE POINTS: Spokane, Moses Lake, Pasco, Lewiston

Zone 1: 0-45 radius miles from the main post office.
Zone 2: 45 radius miles and over from the main post office.

LABORERS CLASSIFICATIONS

GROUP 1: Flagman; Landscape Laborer; Scaleman; Traffic Control Maintenance Laborer (to include erection and maintenance of barricades, signs and relief of flagperson); Window Washer/Cleaner (detail cleanup, such as, but not limited to cleaning floors, ceilings, walls, windows, etc. prior to final acceptance by the owner)

GROUP 2: Asbestos Abatement Worker; Brush Hog Feeder; Carpenter Tender; Cement Handler; Clean-up Laborer; Concrete Crewman (to

include stripping of forms, hand operating jacks on slip form construction, application of concrete curing compounds, pumpcrete machine, signaling, handling the nozzle of squeezcrete or similar machine,6 inches and smaller); Confined Space Attendant; Concrete Signalman; Crusher Feeder; Demolition (to include clean-up, burning, loading, wrecking and salvage of all material); Dumpman; Fence Erector; Firewatch; Form Cleaning Machine Feeder, Stacker; General Laborer; Grout Machine Header Tender; Guard Rail (to include guard rails, guide and reference posts, sign posts, and right-of-way markers); Hazardous Waste Worker, Level D (no respirator is used and skin protection is minimal); Miner, Class "A" (to include all bull gang, concrete crewman, dumpman and pumpcrete crewman, including distributing pipe, assembly &

dismantle, and nipper); Nipper; Riprap Man; Sandblast Tailhoseman; Scaffold Erector (wood or steel); Stake Jumper; Structural Mover (to include separating foundation, preparation, cribbing, shoring, jacking and unloading of structures); Tailhoseman (water nozzle); Timber Bucker and Faller (by hand); Track Laborer (RR); Truck Loader; Well-Point Man; All Other Work Classifications Not Specially Listed Shall Be Classified As General Laborer

GROUP 3: Aspahlt Raker; Asphalt Roller, walking; Cement Finisher Tender; Concrete Saw, walking; Demolition Torch; Dope Pot Firemen, non-mechanical; Driller Tender (when required to move and position machine); Form Setter, Paving; Grade Checker using level; Hazardous Waste Worker, Level C (uses a chemical "splash suit" and air purifying respirator); Jackhammer Operator; Miner, Class "B" (to include brakeman, finisher, vibrator, form setter); Nozzleman (to include squeeze and flo-crete nozzle); Nozzleman, water, air or steam; Pavement Breaker (under 90 lbs.); Pipelayer, corrugated metal culvert; Pipelayer, multi-plate; Pot Tender; Power Buggy Operator; Power Tool Operator, gas, electric, pneumatic; Railroad Equipment, power driven, except dual mobile power spiker or puller; Railroad Power Spiker or Puller, dual mobile; Rodder and Spreader; Tamper (to include operation of Barco, Essex and similar tampers); Trencher, Shawnee; Tugger Operator; Wagon Drills; Water Pipe Liner; Wheelbarrow (power driven)

GROUP 4: Air and Hydraulic Track Drill; Brush Machine (to include horizontal construction joint cleanup brush machine, power propelled); Caisson Worker, free air; Chain Saw Operator and Faller; Concrete Stack (to include laborers when laborers working on free standing concrete stacks for smoke or fume control above 40 feet high); Gunite (to include operation of machine and nozzle); Hazardous Waste Worker, Level B (uses same respirator protection as Level A. A supplied air line is provided in conjunction with a chemical "splash suit"); High Scaler; Laser Beam Operator (to include grade checker and elevation control); Miner, Class C (to include miner, nozzleman for concrete, laser beam operator and rigger on tunnels); Monitor Operator (air track or similar mounting); Mortar Mixer; Nozzleman (to include jet blasting nozzleman, over 1,200 lbs., jet blast machine power propelled, sandblast nozzle); Pavement Breaker (90 lbs. and over); Pipelayer (to include working topman, caulker,

collarman, jointer, mortarman, rigger, jacker, shorer, valve or meter installer); Pipewrapper; Plasterer Tender; Vibrators (all)

GROUP 5 - Drills with Dual Masts; Hazardous Waste Worker, Level A (utilizes a fully encapsulated suit with a self-contained breathing apparatus or a supplied air line); Miner Class "D", (to include raise and shaft miner, laser beam operator on riases and shafts)

GROUP 6 - Powderman

LABO0238G 06/01/2002

	Rates	Fringes
COUNTIES EAST OF THE 120TH MERIDIAN: ADAMS, ASOTIN, BENTON, COLUMBIA, DOUGLAS, FERRY, FRANKLIN, GARFIELD, GRANT, LINCOLN, OKANOGAN, PEND OREILLE, STEVENS, SPOKANE, WALLA WALLA, WHITMAN		
HOD CARRIERS	21.55	5.50

LABO0335A 06/01/2002

	Rates	Fringes
CLARK, COWLITZ, KLICKITAT, PACIFIC (SOUTH OF A STRAIGHT LINE MADE BY EXTENDING THE NORTH BOUNDARY LINE OF WAHKIAKUM COUNTY WEST TO THE PACIFIC OCEAN), SKAMANIA AND WAHKIAKUM COUNTIES		
ZONE 1:		
LABORERS:		
GROUP 1	23.43	6.15
GROUP 2	23.94	6.15
GROUP 3	24.33	6.15
GROUP 4	24.66	6.15
GROUP 5	21.26	6.15
GROUP 6	19.16	6.15
GROUP 7	16.40	6.15

Zone Differential (Add to Zone 1 rates):
Zone 2 $ 0.65
Zone 3 - 1.15
Zone 4 - 1.70
Zone 5 - 2.75

BASE POINTS: GOLDENDALE, LONGVIEW, AND VANCOUVER

ZONE 1: Projects within 30 miles of the respective city all.
ZONE 2: More than 30 miles but less than 40 miles from the respective city hall.
ZONE 3: More than 40 miles but less than 50 miles from the respective city hall.
ZONE 4: More than 50 miles but less than 80 miles from the respective city hall.
ZONE 5: More than 80 miles from the respective city hall.

LABORERS CLASSIFICATIONS

GROUP 1: Asphalt Plant Laborers; Asphalt Spreaders; Batch Weighman; Broomers; Brush Burners and Cutters; Car and Truck Loaders; Carpenter Tender; Change-House Man or Dry Shack Man; Choker Setter; Clean-up Laborers; Curing, Concrete; Demolition, Wrecking and Moving Laborers; Dumpers, road oiling crew; Dumpmen (for grading crew); Elevator Feeders; Guard Rail, Median Rail Reference Post, Guide Post, Right of Way Marker; Fine Graders; Fire Watch; Form Strippers (not swinging stages); General Laborers; Hazardous Waste Worker; Leverman or Aggregate Spreader (Flaherty and similar types); Loading Spotters; Material Yard Man (including electrical); Pittsburgh Chipper Operator or Similar Types; Railroad Track Laborers; Ribbon Setters (including steel forms); Rip Rap Man (hand placed); Road Pump Tender; Sewer Labor;

Signalman; Skipman; Slopers; Spraymen; Stake Chaser; Stockpiler; Tie Back Shoring; Timber Faller and Bucker (hand labor); Toolroom Man (at job site); Tunnel Bullgang (above ground); Weight-Man-Crusher (aggregate when used)

GROUP 2: Applicator (including pot power tender for same), applying protective material by hand or nozzle on utility lines or storage tanks on project; Brush Cutters (power saw); Burners; Choker Splicer; Clary Power Spreader and similar types; Clean-up Nozzleman-Green Cutter (concrete, rock, etc.); Concrete Power Buggyman; Concrete Laborer; Crusher Feeder; Demolition and Wrecking Charred Materials; Gunite Nozzleman Tender; Gunite or Sand Blasting Pot Tender; Handlers or Mixers of all Materials of an irritating nature (including cement and lime); Tool Operators (includes but not limited to: Dry Pack Machine; Jackhammer; Chipping Guns; Paving Breakers); Pipe Doping and Wrapping; Post Hole Digger, air, gas or electric; Vibrating Screed; Tampers; Sand Blasting (Wet); Stake-Setter; Tunnel-Muckers, Brakemen, Concrete Crew, Bullgang (underground)

GROUP 3: Asbestos Removal; Bit Grinder; Drill Doctor; Drill Operators, air tracks, cat drills, wagon drills, rubber-mounted drills, and other similar types including at crusher plants; Gunite Nozzleman; High Scalers, Strippers and Drillers (covers work in swinging stages, chairs or belts, under extreme conditions unusual to normal drilling, blasting, barring-down, or sloping and stripping); Manhole Builder; Powdermen; Concrete Saw Operator; Pwdermen; Power Saw Operators (Bucking and Falling); Pumpcrete Nozzlemen; Sand Blasting (Dry); Sewer Timberman; Track Liners, Anchor Machines, Ballast Regulators, Multiple Tampers, Power Jacks, Tugger Operator; Tunnel-Chuck Tenders, Nippers and Timbermen; Vibrator; Water Blaster

GROUP 4: Asphalt Raker; Concrete Saw Operator (walls); Concrete Nozzelman; Grade Checker; Pipelayer; Laser Beam (pipelaying)-applicable when employee assigned to move, set up, align; Laser Beam; Tunnel Miners; Motorman-Dinky Locomotive-Tunnel; Powderman-Tunnel; Shield Operator-Tunnel

GROUP 5: Traffic Flaggers

GROUP 6: Fence Builders

GROUP 7: Landscaping or Planting Laborers

LABO0335L 06/01/2002

	Rates	Fringes
CLARK, COWLITZ, KLICKITAT, PACIFIC (SOUTH OF A STRAIGHT LINE MADE BY EXTENDING THE NORTH BOUNDARY LINE OF WAHKIAKUM COUNTY WEST TO THE PACIFIC OCEAN), SKAMANIA AND WAHKIAKUM COUNTIES		
HOD CARRIERS	25.04	6.15

PAIN0005B 06/01/2002

	Rates	Fringes
STATEWIDE EXCEPT CLARK, COWLITZ, KLICKITAT, PACIFIC (SOUTH), SKAMANIA, AND WAHKIAKUM COUNTIES		
STRIPERS	21.25	6.40

PAIN0005D 07/01/2002

	Rates	Fringes
CLALLAM, GRAYS HARBOR, ISLAND, JEFFERSON, KING, KITSAP, LEWIS, MASON, PIERCE, SAN JUAN, SKAGIT, SNOHOMISH, THURSTON AND WHATCOM COUNTIES		
PAINTERS	23.27	5.36

PAIN0005G 07/01/2002

	Rates	Fringes
ADAMS, ASOTIN; BENTON AND FRANKLIN (EXCEPT HANFORD SITE); CHELAN, COLUMBIA, DOUGLAS, FERRY, GARFIELD, GRANT, KITTITAS, LINCOLN, OKANOGAN, PEND OREILLE, SPOKANE, STEVENS, WALLA WALLA, WHITMAN AND YAKIMA COUNTIES		
PAINTERS*:		
Brush, Roller, Striping, Steam-cleaning and Spray	18.97	5.32
Application of Cold Tar Products, Epoxies, Polyurethanes, Acids, Radiation Resistant Material, Water and Sandblasting, Bridges, Towers, Tanks, Stacks, Steeples	19.97	5.32
TV Radio, Electrical Transmission Towers	20.72	5.32
Lead Abatement, Asbestos Abatement	19.97	5.32

*$.70 shall be paid over and above the basic wage rates listed for work on swing stages and high work of over 30 feet.

PAIN0055C 07/01/2002

	Rates	Fringes

CLARK, COWLITZ, KLICKITAT, PACIFIC, SKAMANIA, AND WAHKIAKUM COUNTIES

PAINTERS:		
Brush & Roller	17.35	5.08
Spray and Sandblasting	17.95	5.08
High work - All work 60 ft. or higher	18.10	5.08

PAIN0055L 06/01/2002

	Rates	Fringes
CLARK, COWLITZ, KLICKITAT, SKAMANIA and WAHKIAKUM COUNTIES		
PAINTERS:		
HIGHWAY AND PARKING LOT STRIPER	23.36	5.75

PLAS0072E 06/01/2002

	Rates	Fringes
ADAMS, ASOTIN, BENTON, CHELAN, COLUMBIA, DOUGLAS, FERRY, FRANKLIN, GARFIELD, GRANT, KITTITAS, LINCOLN, OKANOGAN, PEND OREILLE, SPOKANE, STEVENS, WALLA WALLA, WHITMAN, AND YAKIMA COUNTIES		
ZONE 1:		
CEMENT MASONS	22.33	5.98

Zone Differential (Add to Zone 1 rate): Zone 2 - $2.00

BASE POINTS: Spokane, Pasco, Moses Lake, Lewiston

Zone 1: 0 - 45 radius miles from the main post office
Zone 2: Over 45 radius miles from the main post office

PLAS0528A 12/01/2002

	Rates	Fringes
CLALLAM, GRAYS HARBOR, ISLAND, JEFFERSON, KING, KITSAP, LEWIS, MASON, PACIFIC (NORTH), PIERCE, SAN JUAN, SKAGIT, SNOHOMISH, THURSTON, AND WHATCOM COUNTIES		
CEMENT MASON	28.05	9.84
COMPOSITION, COLOR MASTIC, TROWEL MACHINE, GRINDER, POWER TOOLS, GUNNITE NOZZLE	28.30	9.84

PLAS0555B 06/01/2002

	Rates	Fringes
CLARK, COWLITZ, KLICKITAT, PACIFIC (SOUTH), SKAMANIA, AND WAHKIAKUM COUNTIES		
ZONE 1:		

CEMENT MASONS	24.24	9.70
COMPOSITION WORKERS AND POWER MACHINERY OPERATORS	24.68	9.70
CEMENT MASONS ON SUSPENDED, SWINGING AND/OR HANGING SCAFFOLD	24.68	9.70
CEMENT MASONS DOING BOTH COMPOSITION/POWER MACHINERY AND SUSPENDED/HANGING SCAFFOLD	25.13	9.70

Zone Differential (Add To Zone 1 Rates):
Zone 2 - $0.65

Zone 3 - 1.15
Zone 4 - 1.70
Zone 5 - 2.75

BASE POINTS: BEND, CORVALLIS, EUGENE, LONGVIEW, MEDFORD, PORTLAND, SALEM, THE DALLES, VANCOUVER

ZONE 1: Projects within 30 miles of the respective city hall
ZONE 2: More than 30 miles but less than 40 miles from the respective city hall.
ZONE 3: More than 40 miles but less than 50 miles from the respective city hall.
ZONE 4: More than 50 miles but less than 80 miles from the respective city hall.
ZONE 5: More than 80 miles from the respective city hall

PLUM0032B 01/01/2003

	Rates	Fringes
CLALLAM, KING AND JEFFERSON COUNTIES		
PLUMBERS AND PIPEFITTERS	34.18	12.68

PLUM0032D 06/01/2002

	Rates	Fringes
CHELAN, KITTITAS (NORTHERN TIP), DOUGLAS (NORTH), AND OKANOGAN (NORTH) COUNTIES		
PLUMBERS AND PIPEFITTERS	26.13	10.23

PLUM0044C 06/01/2002

	Rates	Fringes
ADAMS (NORTHERN PART), ASOTIN (CLARKSTON ONLY), FERRY (EASTERN PART), LINCOLN (EASTERN PART), PEND ORIELLE, STEVENS, SPOKANE, AND WHITMAN COUNTIES		
PLUMBERS AND PIPEFITTERS	26.16	9.89

PLUM0082A 08/01/2002

	Rates	Fringes

CLARK (NORTHERN TIP INCLUDING WOODLAND), COWLITZ, GRAYS HARBOR,
LEWIS, MASON (EXCLUDING NE SECTION), PACIFIC, PIERCE
SKAMANIA, THURSTON AND WAHKIAKUM COUNTIES

PLUMBERS AND PIPEFITTERS	29.60	11.62

PLUM0265C 08/01/2002

	Rates	Fringes
ISLAND, SKAGIT, SNOHOMISH,SAN JUAN AND WHATCOM COUNTIES		
PLUMBERS AND PIPEFITTERS	29.00	11.62

PLUM0290K 10/01/2002

	Rates	Fringes
CLARK (ALL EXCLUDING NORTHERN TIP INCLUDING CITY OF WOODLAND)		
PLUMBERS AND PIPEFITTERS	31.73	12.93

PLUM0598E 06/01/2002

	Rates	Fringes
ADAMS (SOUTHERN PART), ASOTIN (EXCLUDING THE CITY OF CLARKSTON), BENTON, COLUMBIA, DOUGLAS (EASTERN HALF), FERRY (WESTERN PART), FRANKLIN, GARFIELD, GRANT, KITTITAS (ALL BUT NORTHERN TIP), KLICKITAT, LINCOLN (WESTERN PART), OKANOGAN (EASTERN), WALLA WALLA AND YAKIMA COUNTIES		
PLUMBERS	29.85	12.59

PLUM0631A 08/01/2002

	Rates	Fringes
MASON (NE SECTION), AND KITSAP COUNTIES		
PLUMBERS/PIPEFITTERS:		
All new construction, additions, and remodeling of commercial building projects such as: cocktail lounges and taverns, professional buildings, medical clinics, retail stores, hotels and motels, restaurants and fast food types, gasoline service stations, and car washes where the plumbing and mechanical cost of the project is less than $100,000	19.20	4.58
All other work where the plumbing and mechanical cost of the project is $100,000 and over	27.84	11.62

TEAM0037C 06/01/2002

	Rates	Fringes
CLARK, COWLITZ, KLICKITAT, PACIFIC (South of a straight line made by extending the north boundary line of Wahkiakum County west to the Pacific Ocean), SKAMANIA, AND WAHKIAKUM COUNTIES		
TRUCK DRIVERS		
ZONE 1:		
GROUP 1	23.65	8.45
GROUP 2	23.77	8.45
GROUP 3	23.90	8.45
GROUP 4	24.16	8.45
GROUP 5	24.38	8.45
GROUP 6	24.54	8.45
GROUP 7	24.74	8.45

Zone Differential (Add to Zone 1 Rates):
Zone 2 - $0.65
Zone 3 - 1.15
Zone 4 - 1.70
Zone 5 - 2.75

BASE POINTS: ASTORIA, THE DALLES, LONGVIEW AND VANCOUVER

ZONE 1: Projects within 30 miles of the respective city hall.
ZONE 2: More than 30 miles but less than 40 miles from the respective city hall.
ZONE 3: More than 40 miles but less than 50 miles from the respective city hall.
ZONE 4: More than 50 miles but less than 80 miles from the respective city hall.
ZONE 5: More than 80 miles from the respective city hall.

TRUCK DRIVERS CLASSIFICATIONS

GROUP 1: A Frame or Hydra lifrt truck w/load bearing surface; Articulated dump truck; Battery Rebuilders; Bus or Manhaul Driver; Concrete Buggies (power operated); Concrete pump truck; Dump Trucks, side, end and bottom dumps, including Semi Trucks and Trains or combinations there of: up to and including 10 cu. yds.; Lift Jitneys, Fork Lifts (all sizes in loading, unloading and transporting material on job site); Loader and/or Leverman on Concrete Dry Batch Plant (manually operated); Pilot Car; Pickup truck; Solo Flat Bed and misc. Body Trucks, 0-10 tons; Truck Tender; Truck Mechanic Tender; Water Wagons (rated capacity) up to 3,000 gallons; Transit Mix and Wet or Dry Mix - 5 cu. yds. and under; Lubrication Man, Fuel Truck Driver, Tireman, Wash Rack, Steam Cleaner or combinations; Team Driver; Slurry Truck Driver or Leverman; Tireman

GROUP 2: Boom truck/hydra lift or retracting crane; Challenger; Dumpsters or similar equipment all sizes; Dump Trucks/articulated dumps 6 cu to 10 cu.; Flaherty Spreader Driver or Leverman; Lowbed Equipment, Flat Bed Semi-trailer or doubles transporting equipment or wet or dry materials; Lumber Carrier, Driver-Straddle Carrier (used in loading, unloading and

transporting of materials on job site); Oil Distributor Driver or Leverman; Transit mix and wet or dry mix trcuks: over 5 cu. yds. and including 7 cu. yds.; Vacuum trucks; Water truck/Wagons (rated capacity) over 3,000 to 5,000 gallons

GROUP 3: Ammonia nitrate distributor driver; Dump trucks, side, end and bottom dumps, including Semi Trucks and Trains or combinations thereof: over 10 cu. yds. and including 30 cu. yds. includes Articulated dump trucks; Selfpropelled street sweeper; Transit mix and wet or dry mix truck: over 7 cu yds. and including 11 cu yds.; Truck Mechanic-Welder-Body Repairman; Utility and cleanup truck; Water Wagons (rated capacity) over 5,000 to 10,000 gallons

GROUP 4: Asphalt burner; Dump Trucks, side, end and bottom cumps, including Semi-Trucks and Trains or combinations thereof: over 30 cu. yds. and including 50 cu. yds. includes articulated dump trucks; Fire guard; Transit Mix and Wet or Dry Mix Trucks, over 11 cu. yds. and including 15 cu. yds.; Water Wagon (rated capacity) over 10,000 gallons to 15,000 gallons

GROUP 5: Dump Trucks, side, end and bottom dumps, including Semi Trucks and Trains or combinations thereof: over 50 cu. yds. and including 60 cu. yds. includes articulated dump trucks

GROUP 6: Bulk cement spreader w/o auger; Dry prebatch concrete mix trucks; Dump trucks, side, end and bottom dumps, including Semi Trucks and Trains of combinations thereof: over 60 cu. yds. and including 80 cu. yds., and includes articulated dump trucks; Skid truck

GROUP 7: Dump Trucks, side, end and bottom dumps, including Semi Trucks and Trains or combinations thereof: over 80 cu. yds. and including 100 cu. yds., includes articulated dump trucks; Industrial lift truck (mechanical tailgate)

TEAM0174A 06/01/2002

	Rates	Fringes
CLALLAM, GRAYS HARBOR, ISLAND, JEFFERSON, KING, KITSAP, LEWIS, MASON, PACIFIC (North of a straight line made by extending the north boundary line of Wahkiakum County west to the Pacific Ocean), PIERCE, SAN JUAN, SKAGIT, SNOHOMISH, THURSTON AND WHATCOM COUNTIES		
TRUCK DRIVERS;		
ZONE A:		
GROUP 1:	25.79	9.68
GROUP 2:	25.21	9.68
GROUP 3:	22.81	9.68
GROUP 4:	18.56	9.68
GROUP 5:	25.55	9.68
ZONE B (25-45 miles from center of listed cities*): Add $.70 per hour to Zone A rates.		
ZONE C (over 45 miles from centr of listed cities*): Add $1.00 per hour to Zone A rates.		

*Zone pay will be calculated from the city center of the following listed cities:

BELLINGHAM	CENTRALIA	RAYMOND	OLYMPIA
EVERETT	SHELTON	ANACORTES	BELLEVUE
SEATTLE	PORT ANGELES	MT. VERNON	KENT
TACOMA	PORT TOWNSEND	ABERDEEN	BREMERTON

TRUCK DRIVERS CLASSIFICATIONS

GROUP 1 -"A-frame or Hydralift" trucks and Boom trucks or similar equipment when "A" frame or "Hydralift" and Boom truck or

similar equipment is used; Buggymobile; Bulk Cement Tanker; Dumpsters and similar equipment, Tournorockers, Tournowagon, Tournotrailer, Cat DW series, Terra Cobra, Le Tourneau, Westinghouse, Athye Wagon, Euclid Two and Four-Wheeled power tractor with trailer and similar top-loaded equipment transporting material: Dump Trucks, side, end and bottom dump, including semi-trucks and trains or combinations thereof with 16 yards to 30 yards capacity: Over 30 yards $.15 per hour additional for each 10 yard increment; Explosive Truck (field mix) and similar equipment; Hyster Operators (handling bulk loose aggregates); Lowbed and Heavy Duty Trailer; Road Oil Distributor Driver; Spreader, Flaherty Transit mix used exclusively in heavy construction; Water Wagon and Tank Truck-3,000 gallons and over capacity

GROUP 2 - Bulllifts, or similar equipment used in loading or unloading trucks, transporting materials on job site; Dumpsters, and similar equipment, Tournorockers, Tournowagon, Turnotrailer, Cat. D.W. Series, Terra Cobra, Le Tourneau, Westinghouse, Athye wagon, Euclid two and four-wheeled power tractor with trailer and similar top-loaded equipment transporting material: Dump trucks, side, end and bottom dump, including semi-trucks and trains or combinations thereof with less than 16 yards capacity; Flatbed (Dual Rear Axle); Grease Truck, Fuel Truck, Greaser, Battery Service Man and/or Tire Service Man; Leverman and loader at bunkers and batch plants; Oil tank transport; Scissor truck; Slurry Truck; Sno-Go and similar equipment; Swampers; Straddler Carrier (Ross, Hyster) and similar equipment; Team Driver; Tractor (small, rubber-tired)(when used within Teamster jurisdiction); Vacuum truck; Water Wagon and Tank trucks-less than 3,000 gallons capacity; Winch Truck; Wrecker, Tow truck and similar equipment

GROUP 3 - Flatbed (single rear axle); Pickup Sweeper; Pickup Truck. (Adjust Group 3 upward by $2.00 per hour for onsite work only)

GROUP 4 - Escort or Pilot Car

GROUP 5 - Mechanic

HAZMAT PROJECTS

Anyone working on a HAZMAT job, where HAZMAT certification is

required, shall be compensated as a premium, in addition to the classification working in as follows:
LEVEL C: +$.25 per hour - This level uses an air purifying respirator or additional protective clothing.
LEVEL B: +$.50 per hour - Uses same respirator protection as Level A. Supplied air line is provided in conjunction with a chemical "splash suit."
LEVEL A: +$.75 per hour - This level utilizes a fully-encapsulated suit with a self-contained breathing apparatus or a supplied air line.

TEAM0760C 06/01/2002

	Rates	Fringes
ADAMS, ASOTIN, BENTON, CHELAN, COLUMBIA, DOUGLAS, FERRY, FRANKLIN, GARFIELD, GRANT KITTITAS, LINCOLN, OKANOGAN, PEND OREILLE, SPOKANE, STEVENS, WALLA WALLA, AND WHITMAN COUNTIES		
TRUCK DRIVERS (ANYONE WORKING ON HAZMAT JOBS SEE FOOTNOTE A BELOW)		
ZONE 1: (INCLUDES ALL OF YAKIMA COUNTY)		
GROUP 1	17.73	8.50
GROUP 2	20.00	8.50
GROUP 3	20.50	8.50
GROUP 4	20.83	8.50
GROUP 5	20.94	8.50
GROUP 6	21.11	8.50
GROUP 7	21.64	8.50
GROUP 8	21.97	8.50

Zone Differential (Add to Zone 1 rate: Zone 2 - $2.00)

BASE POINTS: Spokane, Moses Lake, Pasco, Lewiston

Zone 1: 0-45 radius miles from the main post office.
Zone 2: 45 radius miles and over from the main post office

TRUCK DRIVERS CLASSIFICATIONS

GROUP 1: Escort Driver or Pilot Car; Employee Haul; Power Boat Hauling Employees or Material

GROUP 2: Fish Truck; Flat Bed Truck; Fork Lift (3000 lbs. and under); Leverperson (loading trucks at bunkers); Trailer Mounted Hydro Seeder and Mulcher; Seeder & Mulcher; Stationary Fuel Operator; Tractor (small, rubber-tired, pulling trailer or similar equipment)

GROUP 3: Auto Crane (2000 lbs. capacity); Buggy Mobile & Similar; Bulk Cement Tanks & Spreader; Dumptor (6 yds. & under); Flat Bed Truck with Hydraullic System; Fork Lift (3001-16,000 lbs.); Fuel Truck Driver, Steamcleaner & Washer; Power Operated Sweeper; Rubber-tired Tunnel Jumbo; Scissors Truck; Slurry Truck

Driver; Straddle Carrier (Ross, Hyster, & similar); Tireperson; Transit Mixers & Truck Hauling Concrete (3 yd. to & including 6 yds.); Trucks, side, end, bottom & articulated end dump (3 yards to and including 6 yds.); Warehouseperson (to include shipping & receiving); Wrecker & Tow Truck

GROUP 4: A-Frame; Burner, Cutter, & Welder; Service Greaser; Trucks, side, end, bottom & articulated end dump (over 6 yards to and including 12 yds.); Truck Mounted Hydro Seeder; Warehouseperson; Water Tank truck (0-8,000 gallons)
GROUP 5: Dumptor (over 6 yds.); Lowboy (50 tons & under); Self-loading Roll Off; Semi-Truck & Trailer; Tractor with Steer Trailer; Transit Mixers and Trucks Hauling Concrete (over 6 yds.

to and including 10 yds.); Trucks, side, end, bottom and end dump (over 12 yds. to & including 20 yds.); Truck-Mounted Crane (with load bearing surface either mounted or pulled, up to 14 ton); Vacuum Truck (super sucker, guzzler, etc.)
GROUP 6: Flaherty Spreader Box Driver; Flowboys; Fork Lift (over 16,000 lbs.); Dumps (Semi-end); Mechanic (Field); Semi-end Dumps; Transfer Truck & Trailer; Transit Mixers & Trucks Hauling Concrete (over 10 yds. to & including 20 yds.); Trucks, side, end, bottom and articulated end dump (over 20 yds. to & including 40 yds.); Truck and Pup; Tournarocker, DW's & similar with 2 or more 4 wheel-power tractor with trailer, gallonage or yardage scale, whichever is greater Water Tank Truck (8,001-14,000 gallons)

GROUP 7: Oil Distributor Driver; Stringer Truck (cable oeprated trailer); Transit Mixers & Trucks Hauling Concrete (over 20 yds.); Truck, side, end, bottom end dump (over 40 yds. to & including 100 yds.); Truck Mounted Crane (with load bearing surface either mounted or pulled (16 through 25 tons);

GROUP 8: Prime Movers and Stinger Truck; Trucks, side, end, bottom and articulated end dump (over 100 yds.); Helicopter Pilot Hauling Employees or Materials

Footnote A - Anyone working on a HAZMAT job, where HAZMAT certification is required, shall be compensated as a premium, in additon to the classification working in as follows:

LEVEL C-D: - $.50 PER HOUR (This is the lowest level of protection. This level may use an air purifying respirator or additional protective clothing.
LEVEL A-B: - $1.00 PER HOUR (Uses supplied air is conjunction with a chemical spash suit or fully encapsulated suit with a self-contained breathing apparatus.

NOTE: Trucks Pulling Equipment Railers: shall receive $.15/hour over applicable truck rate

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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR 5.5(a)(1)(ii)).

In the listing above, the "SU" designation means that rates listed under that identifier do not reflect collectively bargained wage and fringe benefit rates. Other designations indicate unions whose rates have been determined to be prevailing.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment

data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U. S. Department of Labor

200 Constitution Avenue, N. W.
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

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PROJECT TABLE OF CONTENTS

SECTION 01001

SUPPLEMENTARY REQUIREMENTS

PART 1 GENERAL

1.1 DEFINITIONS

"SUPPLEMENTARY REQUIREMENTS " shall be read to pertain to any of the sections of the DIVISION 1 as required by the content of the section or paragraph containing the reference.

Specification "SECTION 01300 - SUBMITTALS" shall be read as a specification "SECTION 01330 - SUBMITTAL PROCEDURES".

Specification "SECTION 01400 - CONTRACTOR QUALITY CONTROL" shall be read as specification "SECTION 01451 - CONTRACTOR QUALITY CONTROL".

1.2 CONSTRUCTION SCHEDULING

The instructions for preparation and submittal of the Contractor-prepared Network Analysis System are found in SECTION 01320, PROJECT SCHEDULE.

1.3 CORRESPONDENCE

1.3.1 All correspondence shall be addressed to the Administrative Contracting Officer, shall be serially numbered commencing with Number 1, with no numbers missing or duplicated and shall be furnished with an original and one copy. Enclosures attached or transmitted with the correspondence shall also be furnished with an original and one copy. Each serial letter shall make reference to the contract name, contract number and shall have only one subject.

1.3.2 All correspondence from the Contracting Officer will be also serially numbered with no numbers missing or duplicated. Letters to the Contractor will be forwarded in duplicate.

1.3.3 In the event there is more than one project within a contract, correspondence shall contain separate and distinct submittals to identify each project by name.

1.3.4 For submission of Contractor payment requests, See Section 01025, MEASUREMENT AND PAYMENT.

1.4 CONTRACTOR'S FILES

Contractor shall maintain "Approved (Action Code "A") and "Approved Except as Noted (Action Code "B") shop drawing files in fabrication shops and at project sites for government use.

1.5 IDENTIFICATION OF EMPLOYEES (1984 APR OCE):

The Contractor shall be responsible for furnishing an identification badge/card to each employee prior to the employees work on?site, and for requiring each employee engaged on the work to display identification (insert specific type identification required and procedure for obtaining such ID). All prescribed identification shall immediately be delivered to

the Contracting Officer, for cancellation upon the release of the employee. (Include the following sentence if fingerprints are required). The Contractor shall obtain and submit fingerprints of all persons employed or to be employed on the project.

1.6 SPECIAL SAFETY REQUIREMENTS:

All construction activities shall be conducted in strict compliance with the Corps of Engineers Safety and Health Requirements Manual EM 385-1-1, and Occupational Safety and Health Administration regulations, as applicable. The manual is available on line at: http://www.usace.army.mil/inet/usace-docs/eng-manuals/em385-1-1/toc.htm

1.14.1 In addition to Safety and Health Requirements Manual EM 385?1?1, and all applicable OSHA standards, the Contractor shall comply with the requirements listed below. Paragraph numbers refer to EM 385?1?1 or are added thereto.

(a) Paragraph 01.A.12: Add new paragraph: Safety Personnel. The Contractor shall designate a person on his staff to manage the Contractor's safety and accident prevention program. This person will provide a point of contact for the Contracting Officer on matters of job safety, and shall be responsible for ensuring the health and safety of on site personnel.

(b) Paragraph 01.D.02, revise as follows:

(1) Replace paragraph 01.D.02c with the following:
"c. Property damage in excess of $2,000.00

(2) Add new paragraph d as follows:
"An injury resulting in a lost workday, not including the day of injury."

1.7 COMPLIANCE WITH DAVIS-BACON ACT

1.7.1 Contractor POC

Within 14 days after award of the contract, the Contractor shall designate a point of contact (POC) within their organization who will be responsible for the Davis-Bacon Act Labor Program for the Contractor and all subcontractors under this contract as required by the Contract Clauses and FAR 52.222.

1.7.2 Responsibilities

The designated Contractor POC shall be responsible for Davis-Bacon Act Labor Program activities including, but not limited to:

Documentation and record keeping
Submittal and accuracy of certified payrolls
Submittal of required labor forms including requests for additional classifications and rates, Statements and Acknowledgement, etc.
Posting of the wage determination, approved additional classifications and rates, labor and EEO posters
Coordination with the Contracting Officer's Labor Program POC

Prior to submittal to the Government, payrolls shall be reviewed for

compliance to all applicable labor standards, to include, but not be limited to the following items: correct wage rates, correct overtime classification and pay, misclassification of workers for work actually performed, apprentice to journeyman ratios, and registration of apprentice. Corrective actions shall be taken as necessary to ensure Contractor compliance with applicable contract and FAR clauses.

1.7.3 Certification

The Contractor POC shall provide a signed certification stating the following: "I certify that the submitted items being forwarded have been reviewed in detail and are correct and in strict conformance with the Labor Standards of the contract except as otherwise stated."

PART 2 NOT USED

PART 3 NOT USED

-- End of Section --

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SECTION 01005

SITE SPECIFIC SUPPLEMENTARY REQUIREMENTS

PART 1 GENERAL

1.1 COORDINATION AND WORK HOURS

1.1.1 Coordination with using agencies, to include Howard Hanson Dam Operations and Tacoma Public Utilities (TPU), shall be made through the Contracting Officer to assist the Contractor in completing the work with a minimum of interference and inconvenience.

1.1.2 Work hours in the construction area will not be restricted, but will be according to the Contractor's accepted proposal as required in Section 00110 PROPOSAL SUBMISSION AND EVALUATION of this document. Work hours other than as specified in the original Contractor's proposal shall be coordinated with and approved by the Contracting Officer.

1.2 GENERAL ACCESS REQUIREMENTS

This section describes controls and restrictions regarding site access and Green River watershed activities. The watershed provides drinking water for over 300,000 people and must necessarily be protected during construction. Only authorized personnel (Government personnel or Contractor personnel participating in Government business) may enter the restricted watershed.

1.2.1 Access to Howard Hanson Dam structures will be controlled at an entrance guard station operated by TPU. TPU will issue permits for the Contractor's vehicles on the first occasion they come to the guard station. Access can be expedited by notifying the Tacoma control station, at (206) 502-8346, and the Corps of Engineers Project Office at (206) 886-2911, in advance. Incoming traffic will be restricted from entering the controlled area until proper identification is provided. Access on a regular basis and during other than established working hours will require prior coordination and approval by the Contracting Officer.

1.2.2 Access to the Green River Watershed will be permitted only to those persons actually engaged in operations authorized by the Contractor by permit from (TPU). Access to the watershed is permitted only at such times as personnel are on direct work assignment. Wandering from the work area or engaging in any activity other than that authorized is not permitted. If there is probable cause to believe that there has been a violation of the regulations, then any such vehicle or vehicles as may appear to be involved in such violations maybe stopped and inspected by TPU or the Contracting Officer's Representatives. The refusal by the operator of any such designated vehicle to permit such inspection may be deemed sufficient reason to deny that operator further access to the watershed.

1.2.3 The Contractor shall submit a complete listing of Contractor personnel, including job title and identification credential number, who will be working on the project. This listing shall be updated as needed to ensure that the Government has been notified of any changes of Contractor Personnel in advance of new personnel engaging in work on the project. The Government will allow access to the controlled areas of only the Contractor Personnel authorized in advance and included on the employee listing. The

list will be submitted the week prior to personnel arrival on-site. The list shall be revised on each occasion of change of employees and the revised list provided to the Contracting Officer during weekly meetings.

1.2.3.1 Identification Credentials

Contractor personnel shall either be issued a photo identification card (ID) by the Contractor or agree to provide their individual vehicle driver's license as appropriate identification credential. In either case, the identification number shall be included on the listing required above. If the Contractor determines to issue ID cards to its employees, the following information shall be included:

Contractor Identification and Card Number Indicating Employees:

- Full Name
- Current Address
- Birth Date
- Recent Photograph
- Height
- Weight
- Hair Color
- Eye Color

Contractor personnel shall be instructed to present identification credential upon request by proper authority as established by the Contracting Officer.

1.2.3.2 Employee Termination

If a Contractor employee resigns or is terminated the Contracting Officer, or designated representative shall be so notified at the earliest opportunity, but in no case later than the start of the succeeding workday.

1.2.4 Contractor employee parking shall be in the designated areas at the TPU Watershed Office. The Contractor is responsible for providing shuttle transportation from the designated parking areas to the work at the dam (approx. 4 miles). Contractor trade vehicles (e.g., pipefitting, electrical truck, etc.) shall be permitted on the worksite as needed to perform construction activities. Contractor's vehicles will not be allowed to park at the base of the intake tower or under the access bridge. All vehicles entering the site shall be permitted and insured to the Contracting Officer's requirements and shall be properly maintained to be free of drips and leaks of oil and other fluids.

1.2.5 The Contractor shall instruct all persons who enter the watershed on its behalf the nature of the watershed and to the serious consequences arising from failure to comply with access guidelines. The Contractor shall provide a copy of these guidelines to all employees and agents who enter the watershed. A copy of these guidelines shall also be posted in a conspicuous place at each worksite. All gates at the worksite are provided to control access and shall be kept locked at all times, except as otherwise specifically approved by the Contracting Officer.

1.3 ACCESS ROADS

The Contractor is required to pay to TPU the rate of $21.40/trip for hauling to Disposal Site #1 and $3.40/trip for hauling to Disposal Site #2 for all construction vehicles over 14,000 lbs. The fees are to reimburse TPU for required road repair. The Contractor shall keep records of road use in the watershed and to provide 3 copies of road use trip and mileage records to the Contracting Officer. The Contractor is required to coordinate with TPU's Watershed Manager, Brian King, (360) 886-2018 for

forms and frequency of payment. Costs for the road repair in this paragraph shall be included in Bid Item No.1.

1.3.1 Access Road "A"

The Government and its contractors have the right to use the one-lane access road (Access Road "A" - see Reference Drawings) to the dam site. However, usage of the road by the Government or its contractors is neither superior nor inferior to the rights of any other party. All parties authorized to use the road (including the Forest Service, the Department of Health and Human Services, and the City of Tacoma) do so on an equal basis. The speed limit is 35 mph on lengths of paved road, and 25 mph on gravel lengths. Original constructed widths vary from 18' to 22', as shown on the reference drawings. Approximately one mile from the guard station toward the damsite is a one-lane bridge (originally a railroad bridge); all vehicles are required to come to a complete stop before proceeding onto this bridge.

1.3.2 Access Road "C"

See reference drawings for grade, usable width, etc. Access across the face of the dam and through the Construction site shall be maintained by the Contractor for other authorized parties as described herein.

1.3.3 Spillway and Outlet Works Bridges

These bridges were designed according to the 1957 AASHO Standard Specifications for Highway bridges for H 20-S16-44 loading, which is currently designated by AASHTO as HS 20-44 loading. See reference drawings for usable width. Contractor may use spillway and outlet works bridges for access to his work areas, but in no case shall the Contractor exceed design loadings, as furnished herein, for either of these structures.

1.3.4 Gate Tower Foundation (Trash Removal Deck)

The trash removal deck (the top of the base portion of the intake tower) was designed to carry a 25-ton truck crane handling 15-ton loads at a 17-foot radius. See reference drawings for usable area.. Contractor may use the trash removal deck for access to his work areas, but in no case shall the total weight of Contractor's equipment exceed 40 (short) tons.

1.3.5 Control Gates

In addition to the gate at the entrance guard station, control gates stand at either end of the dam embankment.

1.4 CONTRACTOR'S VEHICLES

Contractor's vehicles shall carry proof of insurance at all times and shall be equipped with CB radios (to be tuned to Channel 10). Contractor's lowboys with equipment extending on the sides of the trailer shall be preceded by pilot cars while traveling along the access road to the dam site.

1.5 ACCESS KEYS

1.5.1 Keys are required for access beyond the gate at the guard station and will be provided by the Contracting Officer.

1.5.2 The Contractor shall be responsible for Government-owned keys issued for this contract.

1.5.3 Upon completion of the work at the damsite, or upon request of the Contracting Officer, the key or keys relevant to the completed areas shall be returned.

1.5.4 Should the Contractor lose a key:

a. the Contracting Officer shall be notified, in writing, within three (3) working days after the loss is discovered and

b. should the key not be found before final acceptance, the final contract payment shall be reduced by $100 for each key not returned.

1.6 CONTRACTOR SECURITY

The Corps of Engineers will not be responsible for providing security for Contractor-owned/controlled equipment, supplies, or materials. The Contractor shall provide those necessary security measures.

1.7 SANITARY FACILITIES AND LITTER CONTAINERS

1.7.1 Human excrement or urine shall not be voided or deposited on the watershed, nor shall any garbage, food waste, or other form of decaying, foul, noxious or putrescible matter, either liquid or solid, be thrown, spread or otherwise deposited on, or beneath the surface of the ground.

1.7.2 The Contractor shall provide approved sanitary facilities and litter containers at all work sites. Sanitary facilities and litter containers shall be placed on flat surfaces at convenient locations and adequately protected against upset. Location of sanitary facilities and litter containers shall be subject to approval of the Contracting Officer. Sanitary facilities and litter containers shall be maintained in a satisfactory condition and the contents disposed of in a manner approved by the Contracting Officer.

1.8 CAMPS, HOUSING FACILITIES, AND ANIMALS

No camps or housing facilities may be constructed or maintained within the watershed area. Camping is not allowed. No domestic animals, such as dogs, cats, ferrets, or other are allowed in the watershed or on the worksite.

1.9 EROSION CONTROL

All construction activities shall be conducted in a manner to prevent erosion or siltation. Where culverts, ditches or drainage are necessary for protection of surface water quality, such facilities shall be constructed by the Contractor per the plans and specifications.

1.10 PESTICIDES AND PLANT NUTRIENTS

Pesticides or plant nutrients shall not be applied to the watershed without prior approval of the Contracting Officer. Approval shall be required for each specific activity.

1.11 REGULATORY REQUIREMENTS

1.11.1 All activities in the Green River Watershed shall be conducted in

compliance with all other applicable federal, state, and local laws, rules and regulations for the protection of domestic water supplies.

1.11.2 The project site lies within a forested area. The Contractor shall comply with all forest fire laws, rules and regulations of the State of Washington and such additional Department of Natural Resources and City of Tacoma Public Utilities guidelines as are deemed necessary. A copy of all pertinent fire regulations shall be posted at all work sites. All Contractor tools and equipment shall be kept in serviceable condition, and shall at all times be readily available for fighting fires. Failure to comply with the fire control regulations will be a material breach of contract.

1.12 CONSTRUCTION SEQUENCING AND SCHEDULING

The Contractor shall be required to complete certain critical items of work by a specified date or within a specified period of time after notice to proceed in order to minimize the potential effects on the environment, and to minimize the potential that construction activities could interfere with the functional use of the existing outlet structures to meet project flood control and flow augmentation requirements. See also Attachment "HOWARD HANSON DAM AND RESERVOIR HYDRAULICS AND HYDROLOGY BASELINE REPORT -- WORK IN THE RESERVOIR DURING FLOOD CONTROL SEASON" for key information on construction sequencing and scheduling in the Flood Control Reservoir.

1.13 UTILITY OUTAGES

Contractor shall coordinate utility outages with the Contracting Officer at least 7 days in advance. Outages shall be kept to a minimum and any one outage shall not last more than 2 hours.

1.14 CONSTRUCTION PHASING FOR MAINTAINING NORMAL OUTLET WORKS OPERATIONAL CAPABILITY

The Contractor shall schedule and execute all construction activities such that clear access through the personnel doors of the existing outlet works intake tower is maintained for Howard Hanson Dam project personnel. In addition, clear access for project personnel and equipment shall be provided to and on the existing trash clearing deck upon any advance notice of 24 hours. Outages of any existing utility (including mechanical and electrical utilities of the existing intake tower) shall be coordinated at least 48 hours in advance and in writing, and shall be approved by the Contracting Officer before any such outage shall occur.

1.15 PROTECTION OF GOVERNMENT PROPERTY

In addition to requirements of the CONTRACT CLAUSES, Contractor shall protect all Government property within the buildings in which he is working, except for such property as is required to be demolished. Property which is to be demolished shall be protected until its scheduled demolition time. Protection shall include, but not be limited to, protection from construction generated dust, debris, water, and vibration.

PART 2 NOT USED

PART 3 NOT USED

97011/cs

HOWARD HANSON DAM AND RESERVOIR HYDRAULICS AND HYDROLOGY BASELINE REPORT

WORK IN THE RESERVOIR DURING FLOOD CONTROL SEASON

1. Summary of Howard Hanson Dam Reservoir Operations

A Flood control is the primary mission of Howard Hanson Dam. The secondary mission of HHD is storage of water during spring runoff for use in low flow augmentation of the Green River. These two missions occur in complimentary seasons. Flood control season occurs annually from late fall to early spring. Storage and release of low flow augmentation waters occurs annually from early spring to late fall.

B. The reservoir provides about 106,000 acre-feet of flood control storage at a maximum pool elevation of 1,206 feet.

C. The maximum pool elevation attained in the reservoir to date was 1,183 feet in February 1996.

D. Flood control operations typically occur between mid-October through early to mid-March, annually.

E. Under most circumstances the reservoir elevation during flood control season is maintained at approximately elev. 1,073 to elev. 1,075 feet awaiting floodwaters.

F Significantly higher pool elevations occur on a regular basis when water is stored in the reservoir for flood control (a more detailed summary of flood control operations is provided below).

G. The pool is raised gradually in spring to elev. ,147 feet for low flow augmentation

H. The augmentation pool is slowly drafted from elev. 1,147 through late summer until the flood control low pool elevation of 1,073 is attained in November.

2. Discussion of Normal Howard Hanson Dam Flood Control Operations

A. In mid-October annually, flood control season begins at the dam and continues to mid-March. The general objective of flood control operations is to maintain a low reservoir elevation during most periods of the flood season to maximize the space available in the reservoir to provide storage for high inflows to the reservoir. Water is stored in the reservoir during periods of high runoff (i.e., during periods of significant rainfall) to prevent downstream flooding. Reservoir levels often change rapidly during flood storage operations, especially within the lower elevations of the reservoir (e.g., between elevation 1,073 and 1,110 feet). For example, pool increases of several feet per hour and 10 to 20 feet per day are not uncommon during a flood storage operation. Given the often unpredictable and rapid onset of winter storm systems, flood storage operations at the project often occur with relatively little advance notice. It is not unusual to have only one day or less of advance notice of an approaching storm system that requires a flood control operation at the project. It is also common for conditions to change

during a flood event that require short-term changes to flood control operations. This is because storm-related inflows to the reservoir are often higher or lower than forecasted. Individual flood storage operations during the flood control season are often of relatively short duration on the order of several days. The reservoir is typically lowered within several days of a flood event to bring the pool back down to around elevation 1,073 feet to maximize the amount of storage available in the reservoir for subsequent flood events. Drawing the reservoir below elevation 1,073 feet is avoided to prevent flushing reservoir sediment deposits and associated turbidity downstream.

B. In early to mid-March annually, conservation storage begins. Inflows are stored in the reservoir for downstream use later in the year. The pool elevation generally rises at a gradual rate until a seasonal maximum pool elevation of about 1,147 feet is reached sometime in May or June depending on the conditions of the given year. Relatively rapid increases in pool elevation sometimes occur during this period due to high inflows from snowmelt or rainfall. Once the seasonal maximum pool elevation is reached, the reservoir is typically held at the seasonal maximum elevation for a period of several weeks. A slow drawdown of the pool for fisheries low flow augmentation purposes commences generally in late June or early July. The pool is drawn down at a relatively gradual rate (typically less than one foot per day) until the minimum flood control pool of about elevation 1,073 feet is reached sometime in November or early December. Flood control season begins again typically in mid-October. For the construction associated with this contract it is anticipated that the conservation seasonal maximum pool elevation will be 1,147 feet. However, commencing in early 2006, the conservation seasonal maximum pool elevation will be increased to 1,167 feet.

3. Historical HHD Pool Elevation Information

A. The following figure summarizes the operating range of the Howard Hanson reservoir on an annual basis since 1995. This figure shows the minimum and maximum daily reservoir elevations since 1995. For instance, the lower line represents the lowest reservoir elevation for each day of the year since 1995 and the upper line represents the highest reservoir elevation for each day of the year since 1995. As the figure suggests, reservoir elevations outside of the flood control season (mid-March through mid-October) have stayed below a maximum elevation of about 1,147 feet and generally fluctuate within a fairly predictable range (reservoir rule curve). Conversely, reservoir elevations during the flood control season, and particularly during the period November through February, are subject to greater variability due to flood control operations. For example, the minimum reservoir elevations during this period (November through February) are generally on the order of elevation 1,070 to 1,073 feet and reflect the "reservoir rule curve" during the flood control season. However, reservoir elevations can be well above elevation 1,073 feet during the flood control season as the figure indicates. For example, the reservoir has been above elevation 1,140 feet on three occasions during the flood control season since 1995 and has reached a maximum elevation of 1,183 feet (February 1996).

B. A series of graphs is presented in this section for the purpose of summarizing maximum historical pool elevations in Howard Hanson reservoir. The first figure shows the maximum reservoir elevation during the October through March period for all years since 1963. Many of the reservoir elevations shown on this figure, including the highest pools (i.e., elevation 1,135 feet and greater), are the result of flood control operations. However, many of the reservoir

elevations of roughly 1,120 feet and lower resulted from routine reservoir operations unrelated to flood control operations. The maximum pool elevations from each year (October through March period) are plotted based on exceedance frequency, which represents the approximate probability that the given elevation will be equaled or exceeded in a given year. For example, the historical data suggest that there is about an 80 percent chance in any given year that the maximum pool elevation from October through March will equal or exceed 1,115 feet. Conversely, there is only about a 30 percent chance in any given year that the maximum pool elevation from October through March will equal or exceed 1,135 feet and only a 10 percent chance that the maximum pool elevation will equal or exceed 1,160 feet during a given year.

C. Subsequent graphs in this section show the maximum historical pool elevation in Howard Hanson reservoir on a monthly basis for the months of October through March (approximate flood control season). The maximum pool elevations for each year are plotted based on exceedance frequency. These graphs can be used to estimate the probability that a given reservoir elevation might be exceeded in a particular month. For example, the graph of the October data suggests that there is only about a 3 percent chance that a pool elevation of 1,135 feet would be exceeded in October. The plot of the November data suggest a higher probability for higher pool elevations in November relative to October. For example, there is about 10 percent chance that a pool elevation of 1,135 feet would be exceeded in November. Similar plots show the probability distribution of maximum pool elevations on a monthly basis for December through March. It should be noted that these plots are based in part on historical operation of the project and are included to provide an indication of the probability distribution of maximum pool elevations on a monthly basis throughout the flood control season. As the plots suggest, the probability for elevated pools due to flood control operations is highest in November and December, slightly less probable in January and February, and even less probable in October and March (most of the highest pools that have historically occurred in October and March have not been related to flood control operations).

4. Reservoir Regulation during the Cofferdam Construction Period

A. Regulation of the Howard Hanson reservoir during cofferdam construction activities will be performed in a manner similar to typical flood control reservoir regulation to accomplish the mission of flood control. The objective of reservoir regulation will be to maintain a low pool during periods when there is not an imminent flood threat. During these periods, the pool will be maintained between elevation 1,073 and 1,080 to the extent possible. Maintaining the pool within this elevation range is difficult due to the limited amount of storage in the reservoir within this elevation band. As a result, relatively small increases in reservoir inflow can lead to fairly rapid pool rises (i.e., several feet in less than a day). The objective of reservoir regulation during these periods is typically to adjust reservoir outflows to match reservoir inflows to maintain a steady pool elevation. However, rapid and often unpredictable changes in inflow can make this task difficult.

B. The project is generally not staffed 24 hours per day/ 7 days per week outside of specific flood control operations. Changes in reservoir inflows outside of normal business hours can result in short-term changes in reservoir elevation. Although it won't be feasible to staff the Howard Hanson project office and the Reservoir Control Center (RCC) full time under most periods during the construction season, RCC staff will monitor the project to the extent possible outside of normal

business hours to help meet the needs of construction activities. Staff at the RCC will be in close communication with the Contracting Officer in the event that the reservoir elevation is expected to exceed a pre-determined threshold. In addition, the Contractor will be provided with daily forecasts specific to Howard Hanson Dam.

C. It is expected that the Contractor will confine many of the activities related to cofferdam construction, especially construction of the lower elevation sections, to the flood control season to take advantage of the low reservoir elevation. Contractor activities are subject to flooding during this period. As discussed in the previous section, the reservoir is typically regulated during the flood season to maintain a low reservoir elevation to maximize the available storage space in the reservoir for flood control purposes. As noted in the previous section, reservoir levels often rise significantly above elevation 1,073 feet during flood control operations generally triggered by high rainfall and related high runoff in the Green River basin. Reservoir levels often change rapidly during flood storage operations. It is not uncommon to have pool increases of several feet per hour and 10 to 20 feet per day during flood control operations. Elevated reservoir pools due to flood control operations often last on the order of several days to a week to allow sufficient time to store water during the flood event and then release stored water from the reservoir once the downstream flooding threat has subsided.

D. The following table was prepared to provide information as to how often given threshold elevations in the reservoir may be exceeded during construction activities during the flood control season based on historical records. The possibility of the reservoir exceeding a given elevation was determined based on historical flood control operations and based on threshold average daily inflows to the reservoir during non-flood control operations that would likely cause the reservoir to unavoidably exceed the given elevation. Threshold inflows were estimated by considering reservoir operational goals and constraints. For example, the rate at which discharge from the reservoir can be increased or decreased depends on many factors including minimum time requirements for gate changes and limitations on how quickly downstream discharge can be adjusted. Public safety is a factor when increasing reservoir discharge. After establishing the relationship between threshold inflow and reservoir elevation, the historical record of average daily inflows to the reservoir was used to establish an estimated frequency at which various reservoir elevations would be exceeded during construction activities during the flood control season. The possibility of exceeding a given reservoir elevation also exists during flood control operations when reservoir discharge is intentionally limited to control downstream flooding. Determination of the expected number of days that given reservoir elevations may be exceeded during the flood control season was based on the expected frequency and duration of flood control operations and the expected frequency and duration of reservoir inflows during non-flood control operations that would cause given reservoir elevations to be unavoidably exceeded. This information is summarized in the following table for the mid-October through mid-March flood control season.

Estimated Average Number Of Days During Flood Control Season (Oct. 15 – Mar. 15) That Selected Reservoir Elevations May Be Exceeded In Howard Hanson Reservoir

Reservoir Elevation (feet)	Average Number of Days Given Reservoir Elevation May be Exceeded Between Oct. 15 and Mar. 15	Range of Number of Days that Given Reservoir Elevation May be Exceeded Between Oct. 15 and Mar. 15 [1]	Approximate Average Number of Consecutive Days that Given Reservoir Elevation May be Exceeded per Occurrence [2]
1,075	58 Days	44 to 80 Days	2 to 7 days
1,080	18 Days	1 to 49 Days	2 to 6 days
1,085	13 Days	zero to 41 Days	2 to 5 days
1,090	10 Days	zero to 38 Days	3 to 4 days
1,095	8 Days	zero to 33 Days	3 to 4 days

1 - Range of number of days was determined based on a review of historical flood control operations and reservoir inflows from 1975 to 2003.
2 - Ranges represent typical durations that given reservoir elevations would likely be exceeded. Durations could be longer during some flood control operations.

E. The above table summarizes the estimated number of days during the mid-October through mid-March flood control season that given elevations in the reservoir may unavoidably be exceeded. For example, based on anticipated reservoir operations during the flood control season for both flood control and non-flood control purposes, it is estimated that a reservoir elevation of 1,075 feet would be exceeded on average about 58 days during the flood control season (Oct. 15 through Mar. 15). This suggests that a reservoir elevation of 1,075 feet will be exceeded on average about 40 percent of the time during the flood control season and indicates the difficulty in keeping the reservoir below this elevation during the flood control season. The above table also provides a range of the number of days that a given elevation could be exceeded during the flood control season to indicate the considerable variability from year to year regarding the number of times that a given reservoir elevation is unavoidably exceeded. For example, based on an evaluation of historical flood control operations and reservoir inflows, a reservoir elevation of 1,075 feet could be exceeded up to about 80 days (during the mid-October through mid-March flood control season) in some very wet (high inflow) years and possibly during as few as only about 44 days in some extremely dry years. The historical data also suggest that on average the reservoir elevation would remain above elevation 1,075 feet for between two and seven consecutive days per occurrence. There is considerable variability in this value as well such that there will likely be situations when the reservoir exceeds elevation 1,075 feet only briefly (i.e., one day or less) and there may be situations when the reservoir elevation exceeds elevation 1,075 feet for an extended period of possibly up to two or three weeks. As suggested by the table, the probability of unavoidably exceeding a particular reservoir elevation decreases for increasingly higher elevations. For example, on average a reservoir elevation of 1,085 feet may be exceeded only about 13 days during the mid-October through mid-March flood control season with a general range of zero to possibly up to about 41 days (note that elevation 1,085 feet could be exceeded more than 41 days in a flood control season but such an occurrence has a relatively low probability, estimated at less than 5 percent for a single flood control season). A reservoir elevation of 1,095 feet may be exceeded on average only about 8 days during the mid-October through mid-March flood control season with a general range of zero to as high as about 33 days over this period. Estimated number of days of exceedance for elevations greater than 1,095 feet

are not provided in the table, however, the probability of unavoidably exceeding a reservoir elevation of 1,100 feet or greater decreases accordingly for increasingly higher reservoir elevations.

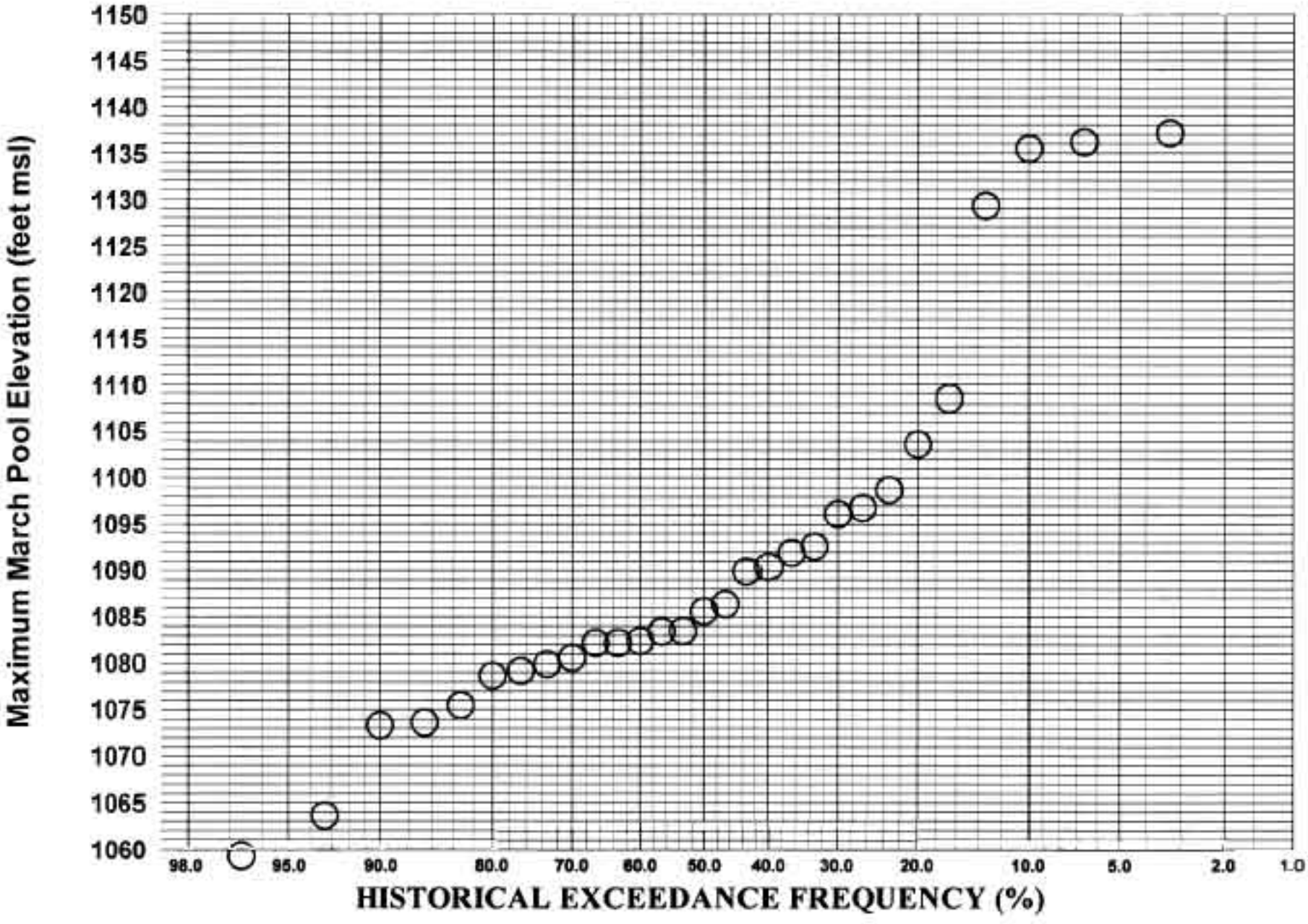
5. Probability of Flooding During Construction

The chance that a certain reservoir level could be exceeded in any season can be described by probability statistics based on recorded reservoir levels. The table below characterizes the probability of the pool exceeding certain elevations during the flood control season (mid-October through mid-March) in terms of percent chance (exceedance frequency) and average return period. As mentioned previously, the possibility of the reservoir reaching elevations above 1,147 feet outside of the flood control season (i.e., mid-March through mid-October) period is very low (less than about a 2 percent chance in any given year). However, flood control operations during the typical flood season, late October through March, can cause the reservoir to exceed elevation 1,073 feet for a week or more. Flood occurrences are random and can happen at anytime throughout the winter. There is an approximately 10 percent chance that the reservoir could exceed elevation 1165 feet during the flood season, which is the existing ground elevation approaching the spillway crest. Note that the emergency spillway and gates have never been used at Howard Hanson Dam. The probability of opening the spillway gates for flood control purposes is less than 0.2 percent annually.

Hanson Reservoir Frequencies due to Flood Control Operations

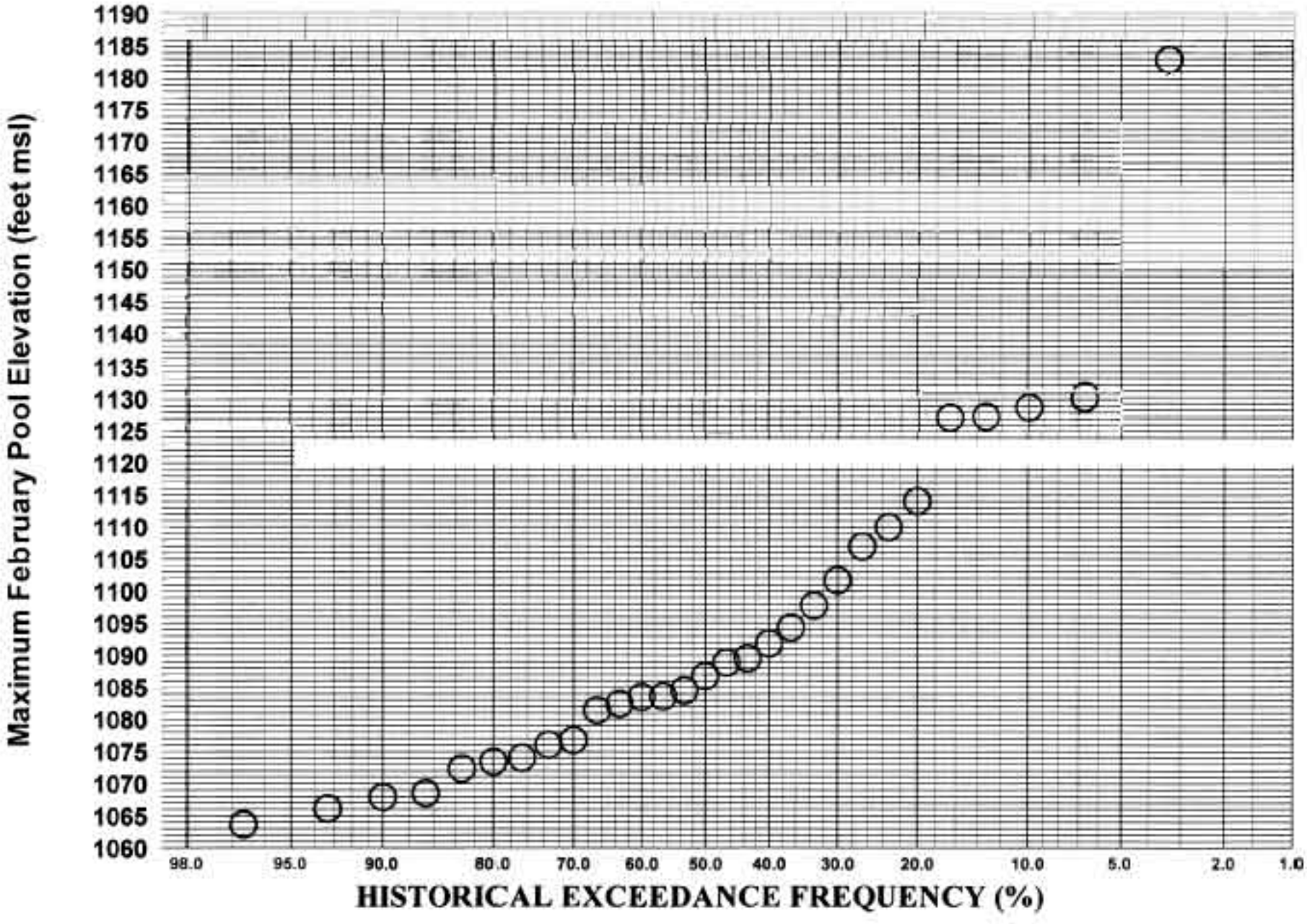
Reservoir Elevation	Exceedance Frequency	Average Return Period
1073 feet	100%	Annual
1100 feet	70%	1.4 years
1120 feet	45%	2 years
1140 feet	18%	6 years
1150 feet	15%	7- years
1160 feet	13%	8 years
1170 feet	8%	13 years
1180 feet	2.5%	40 years
1190 feet	1.2%	80 years
1200 feet	0.4%	250 years

Howard Hanson Reservoir
Historical Maximum March Reservoir Elevations



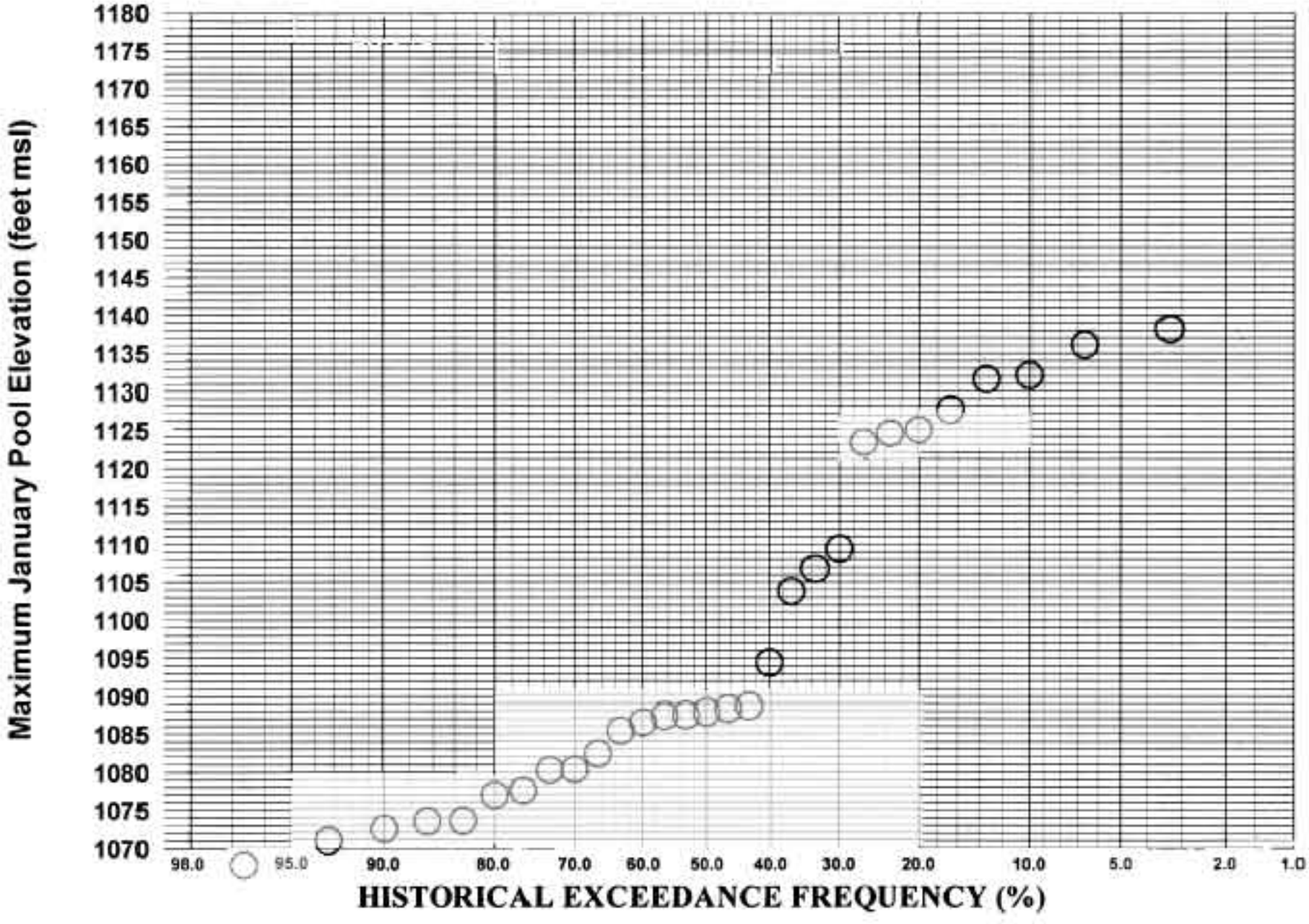
HAH_Mar.GRF

Howard Hanson Reservoir
Historical Maximum February Reservoir Elevations



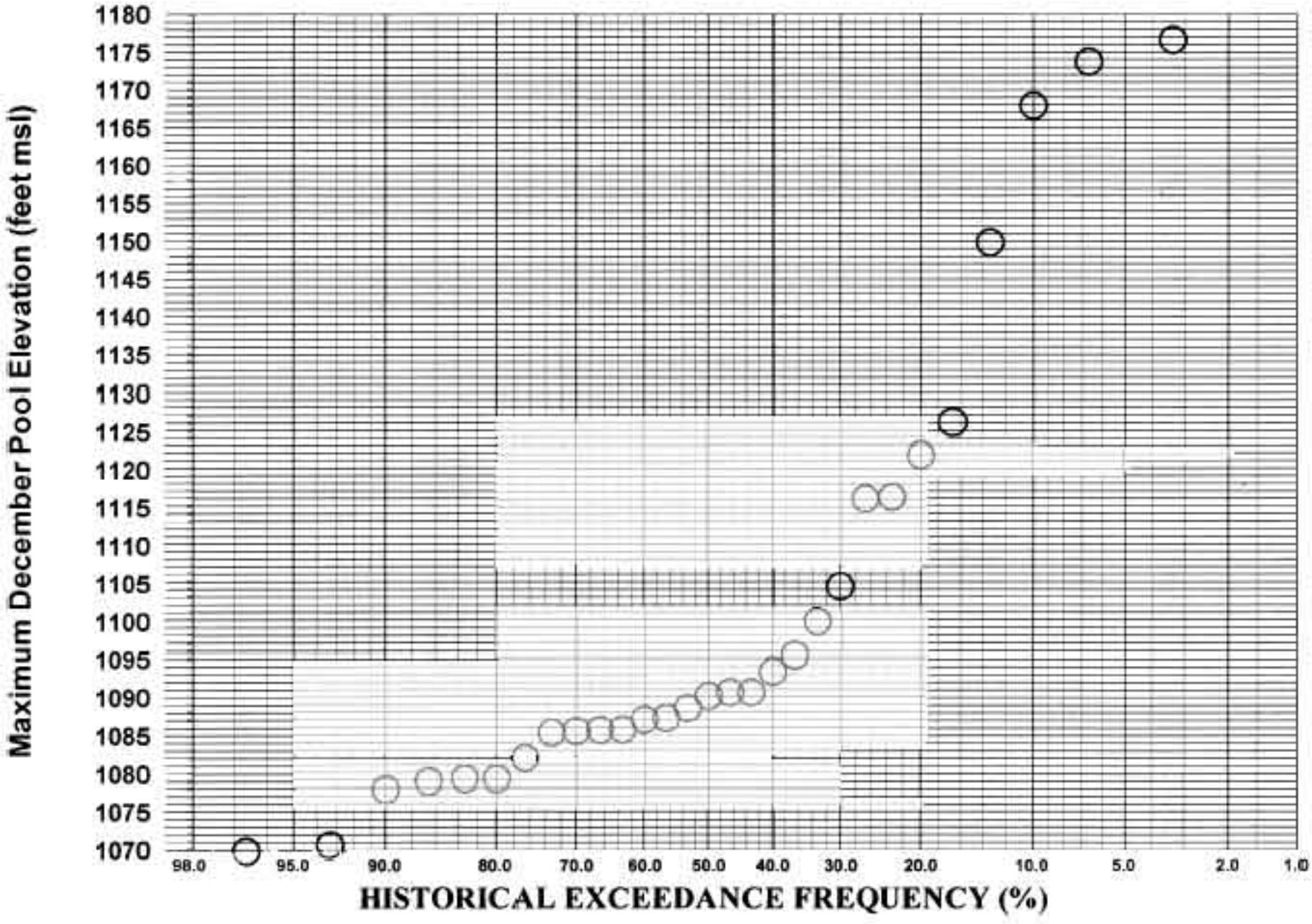
HAH_Feb.GRF

Howard Hanson Reservoir
Historical Maximum January Reservoir Elevations



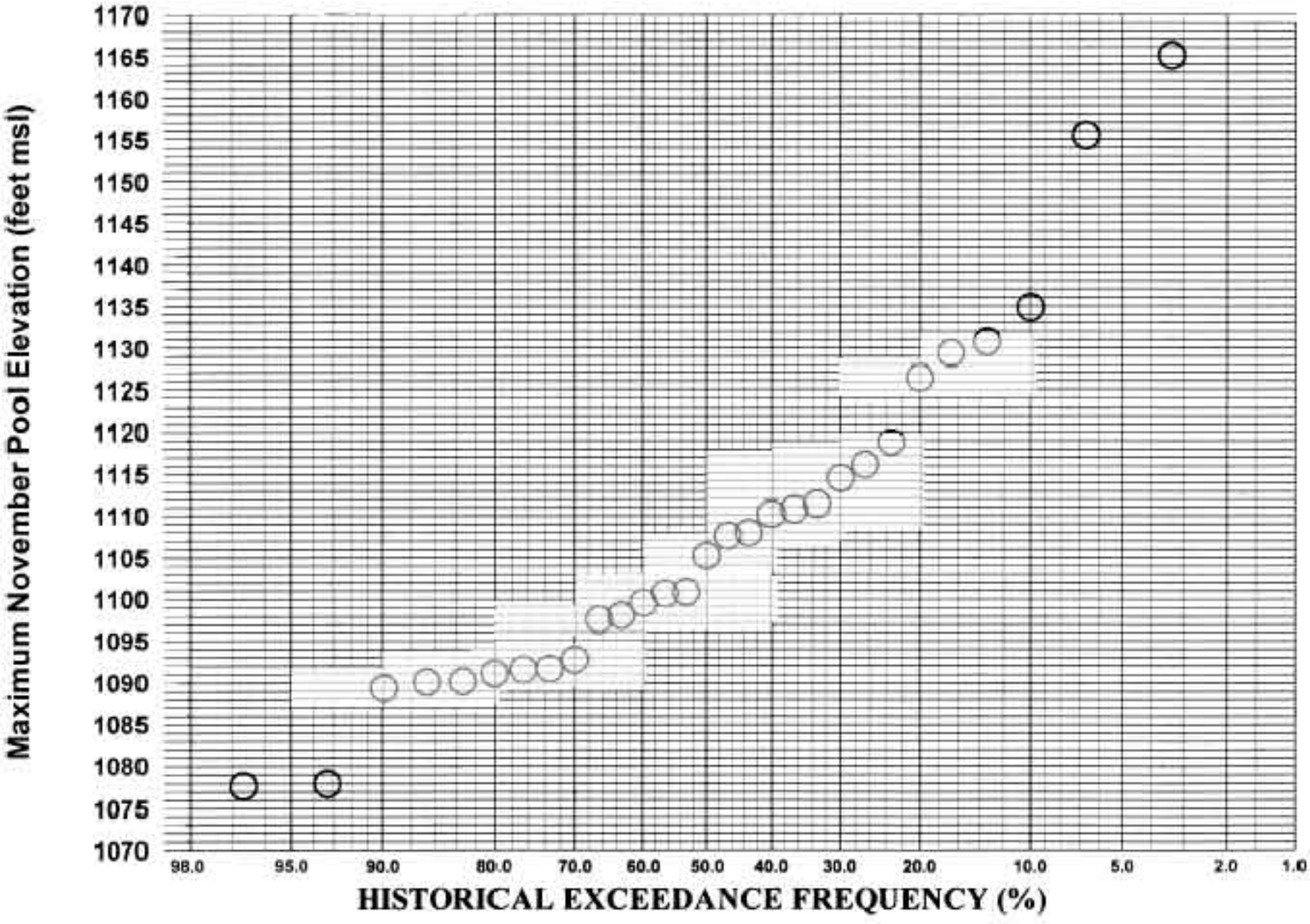
HAH_Jan.GRF

Howard Hanson Reservoir
Historical Maximum December Reservoir Elevations



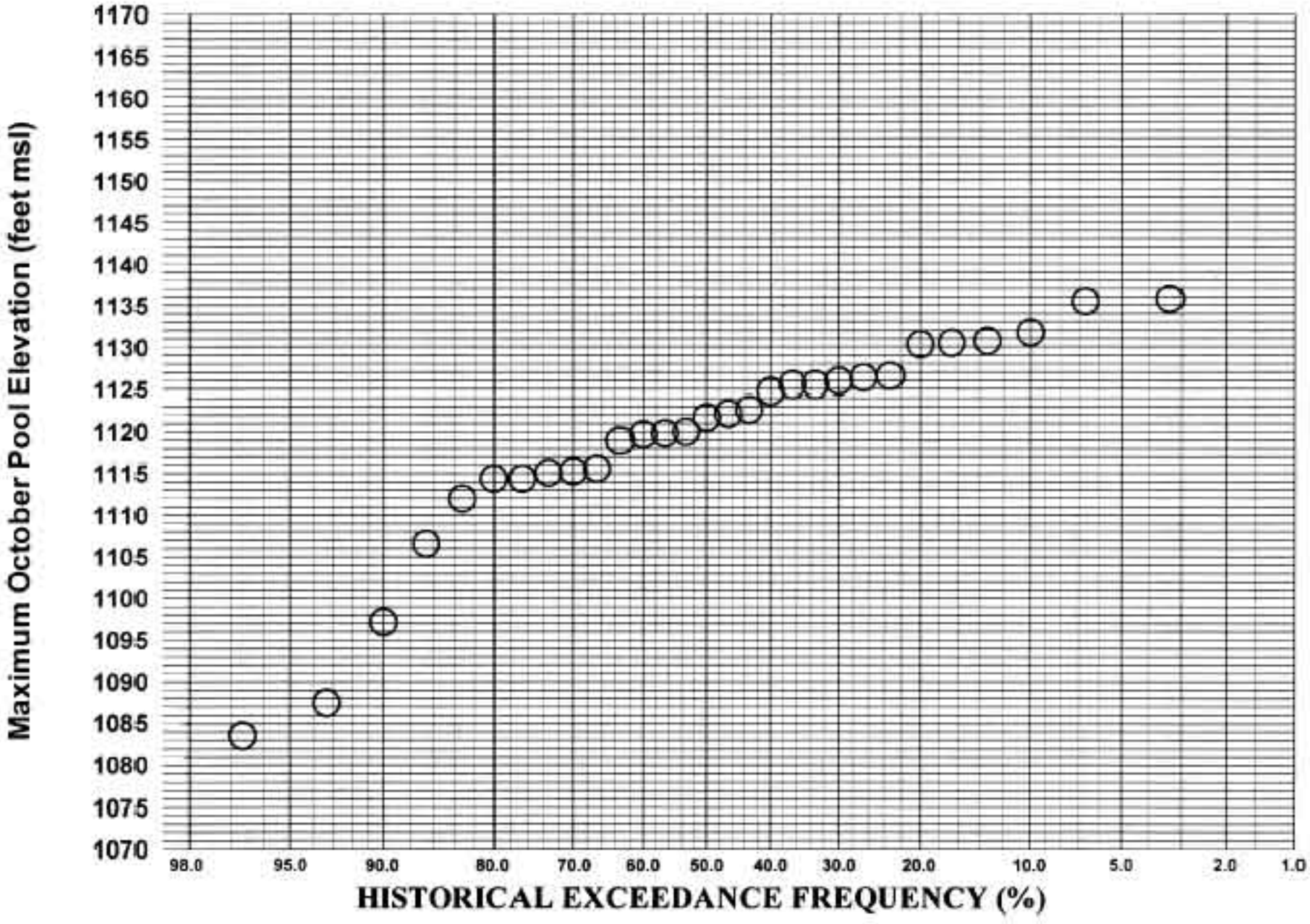
HAH_Dec.GRF

Howard Hanson Reservoir
Historical Maximum November Reservoir Elevations

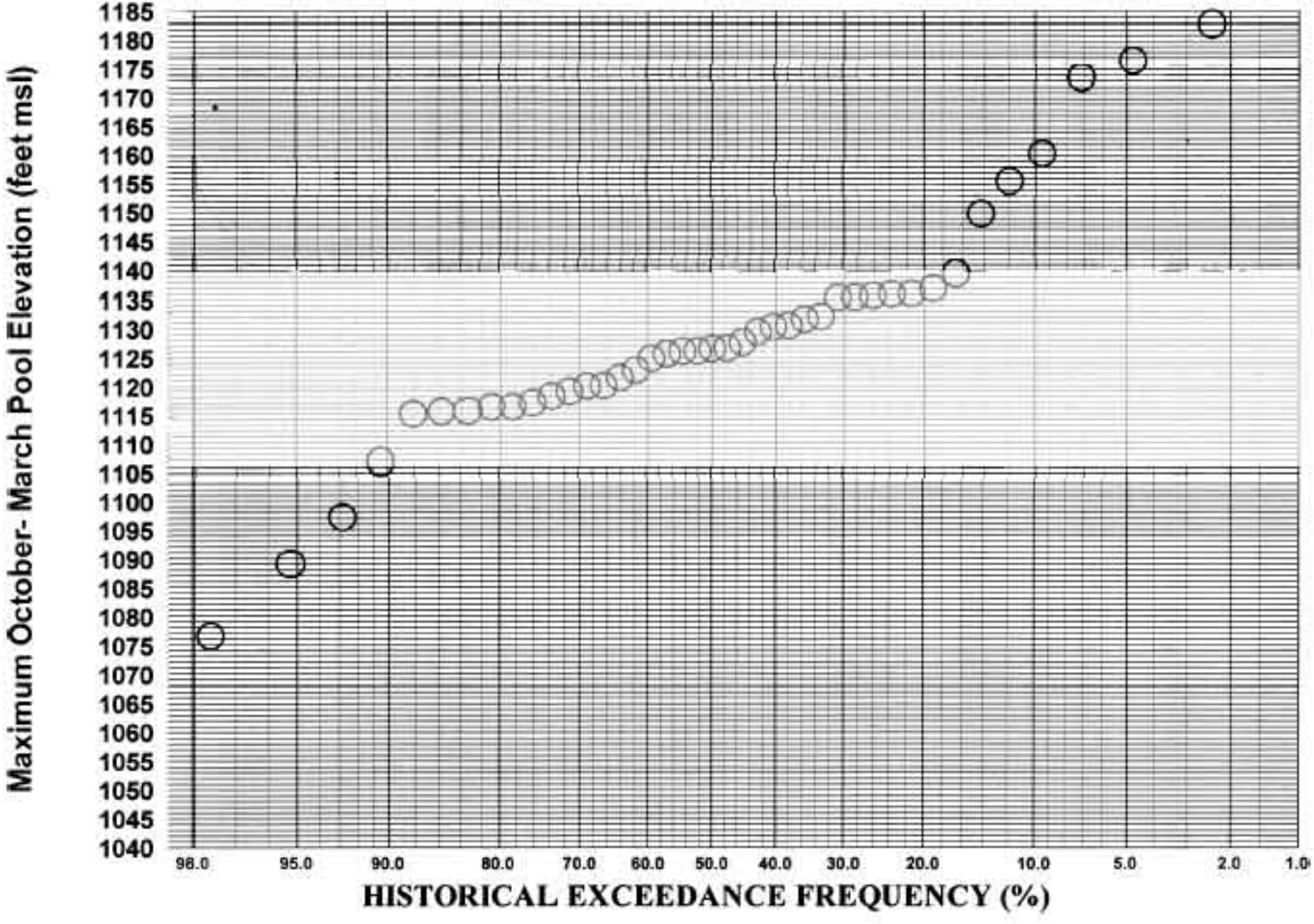


Lib_30f.GRF

Howard Hanson Reservoir
Historical Maximum October Reservoir Elevations



Howard Hanson Reservoir
Historical Maximum October-March Reservoir Elevations
(Water Years 1963-2003)



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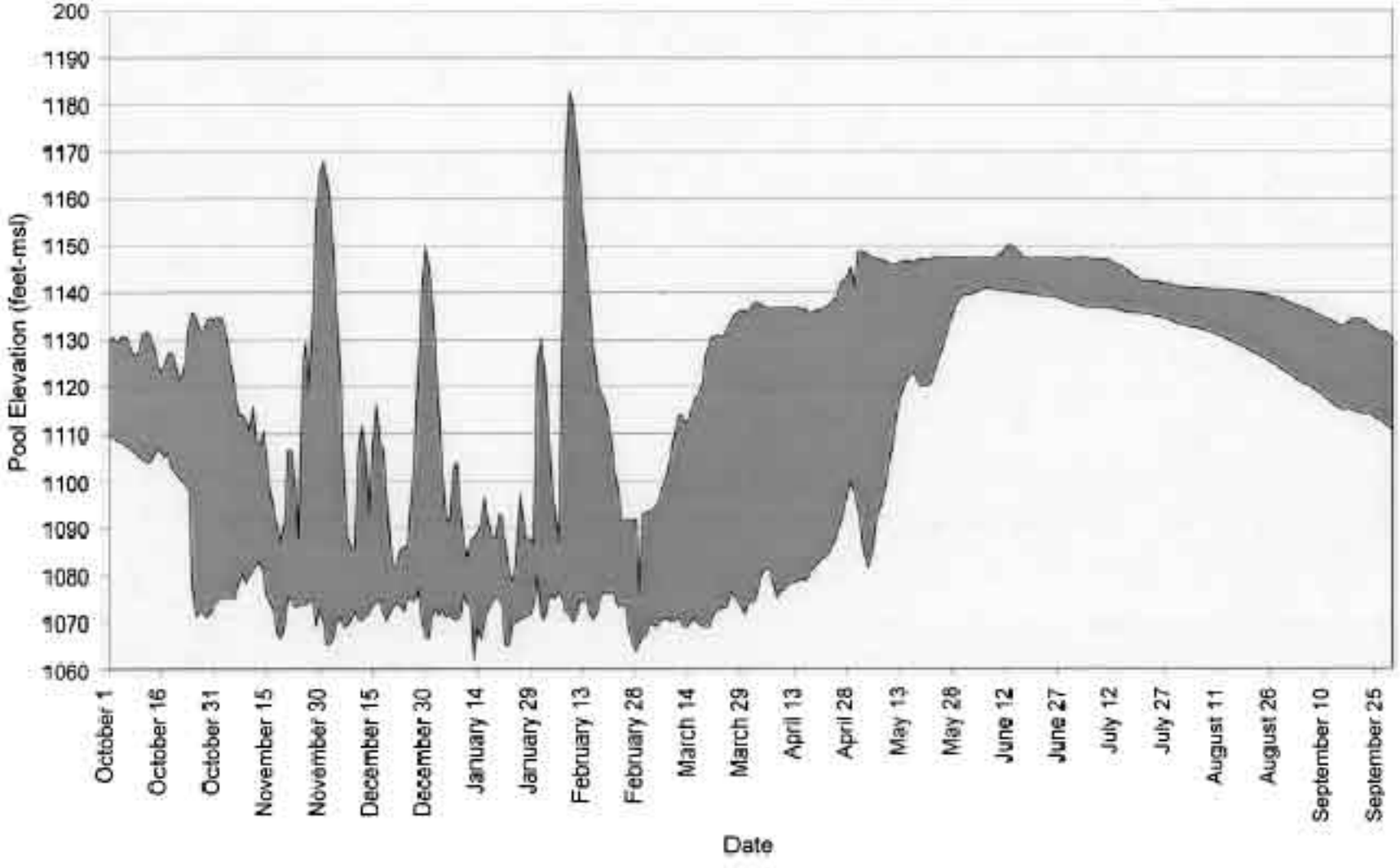
Summary of Howard Hanson Reservoir Elevations in Recent Years
Range of Pool Elevations Since 1995



SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 GENERAL

The contract price for each item shall constitute full compensation for furnishing all plant, labor, materials, appurtenances, and incidentals and performing all operations necessary to construct and complete the items in accordance with these specifications and the applicable drawings, including surveying performed by the Contractor. Payment for each item shall be considered as full compensation, notwithstanding that minor features may not be mentioned herein. Work paid for under one item will not be paid for under any other item. No separate payment will be made for the work, services, or operations required by the Contractor, as specified in DIVISION 1, GENERAL REQUIREMENTS, to complete the project in accordance with these specifications; all costs thereof shall be considered as incidental to the work.

1.2 MEASUREMENT

1.2.1 Measurement of Hookups to Grout Curtain Holes

The quantity of hookups for hydraulic pressure tests and placement of cement grout curtains will be measured for payment as the number of hookups performed as required.

1.2.2 Measurement of Portland Cement and Bentonite by 94-Pound Bag

Portland cement and bentonite used in grout curtains will be measured for payment as the number of bags of portland cement (94 pounds of cement per bag) mixed into grout and satisfactorily pumped into the grout holes.

1.2.3 Measurement of HRWRA Water Reducing Admixture by Gallon

Cement Grout HRWRA (High Range Water Reducing Admixture) water reducing Admixture use in grout curtains will be measured for payment as the number of gallons of admixture used for the cement grouting, unless wasted or used for the convenience of the Contractor.

1.3 PAYMENT

1.3.1 ITEM 0001 (BASE ITEM)

Payment will be made at the contract lump sum price for Item No. 0001, All Work for Fish Passage Facility Cofferdam and Excavation, Except for Items 0002 Through 0020, payment of which shall constitute full compensation for Item No. 0001, complete.

1.3.2 ITEM 0002 (BASE ITEM)

Payment will be made at the contract lump sum price for Item No. 0002, Mobilization and Demobilization, payment of which shall constitute full compensation for Item No. 0002, complete, including costs for assembling

all plant and equipment at the site preparatory to initiating the work and for removing it when all work has been completed, in accordance with Special Clause SC-11. This also shall include payment for any interim Demobilization and Remobilization that may be necessary. It is not, however, to be confused with Item No. 0018 below.

1.3.3 ITEM 0003 (BASE ITEM)

Payment will be made at the contract unit price for Item No. 0003, Reservoir Excavation & Debris Removal From Trash Racks, payment of which shall constitute full compensation for Item No. 0003, complete.

1.3.4 ITEM 0004 (BASE ITEM)

Payment will be made at the contract lump sum price for Item No. 0004, All Work for Multi-Point Borehole Extensometers, payment of which shall constitute full compensation for Item No. 0004, complete, including costs for drilling, groutable anchors, stainless steel rods, pvc tubes, vibrating wire displacement transducers of the appropriate range, the appropriate lengths of transducer cable and conduit, vibrating wire head assembly, grout, surface completion, installation of all components, and for furnishing all labor and supplies incidental to the work.

1.3.5 ITEM 0005 (BASE ITEM)

Payment will be made at the contract lump sum price for Item No. 0005, All Work for Piezometers, payment of which shall constitute full compensation for Item No. 0005, complete, including costs for core drilling, vibrating wire pressure transducers of the appropriate range, the appropriate lengths of transducer cable and conduit, bentonite seals, sand, grout, surface completion, installation of all components, and for furnishing all labor and supplies incidental to the work.

1.3.6 ITEM 0006 (BASE ITEM)

Payment will be made at the contract lump sum price for Item No. 0006, All Work for Inclinometers, payment of which shall constitute full compensation for Item No. 0006, complete, including costs for core drilling, inclinometer casing, grout, the appropriate lengths of inclinometer cable and conduit, surface completion, one portable inclinometer probe and readout box used for reading all inclinometers, installation of all components, and for furnishing all labor and supplies incidental to the work.

1.3.7 ITEM 0007 (BASE ITEM)

Payment will be made at the contract lump sum price for Item No. 0007, All Work for Load Cells, payment of which shall constitute full compensation for Item No. 0007, complete, including costs for vibrating wire load cells, test bolts, grout, the appropriate lengths of cable and conduit, installation of all components, and for furnishing all labor and supplies incidental to the work.

1.3.8 ITEM 0008 (BASE ITEM)

Payment will be made at the contract unit price for Item No. 0008,All Work for Passive Relief Wells, payment of which shall constitute full compensation for Item No. 0008, complete.

1.3.9 ITEM 0009 (BASE ITEM)

Payment will be made at the contract unit price for Item No. 0009, All Work for Dewatering Wells, payment of which shall constitute full compensation for Item No. 0009, complete.

1.3.10 ITEM 0010 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0010, Hookups To Grout Holes for Hydraulic Pressure Tests and Placement of Cement Grout Curtains, payment of which shall constitute full compensation for Item No. 0010, complete, including costs associated with satisfactorily placing grout in grout holes.

1.3.11 ITEM 0011 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0011, Portland Cement in Grout Curtains, payment of which shall constitute full compensation for Item No. 0011, complete.

1.3.12 ITEM 0012 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0012, Bentonite in Grout Curtains, payment of which shall constitute full compensation for Item No. 0012, complete.

1.3.13 ITEM 0013 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0013, HRWR Water Reducing Admixture in Grout Curtains, payment of which shall constitute full compensation for Item No. 0013, complete.

1.3.14 ITEM 0014 (BASE ITEM)

Payment will be made that the contract lump sum price for Item No. 0014, Tie Back Anchors for Permanent Retaining Wall, payment of which shall constitute full compensation for Item No. 0014, complete, including furnishing, installing, grouting, tensioning, and tie off of all permanent tie back anchors, as specified and as approved.

1.3.15 ITEM 0015 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0015, Emergency Mobilization & Demobilization For When Water Elevation Is Above Elevation 1150, payment of which shall constitute full compensation for Item No. 0015, complete.

1.3.16 ITEM 0016 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0016, Emergency Mobilization & Demobilization For When Water Elevation Is Above Cofferdam Elevation 1165, payment of which shall constitute full compensation for Item No. 0016, complete.

1.3.17 ITEM 0017 (BASE ITEM)

Payment will be made that the contract unit price for Item No. 0017, Emergency Mobilization & Demobilization For When Water Elevation Is Above Cofferdam Elevation 1169, payment of which shall constitute full

compensation for Item No. 0017, complete.

1.3.18 ITEM 0018 (BASE ITEM)

Payment will be made that the contract lump sum price for Item No. 0018, All Work for As-Built Drawings as specified in Section 01702 from preparation to final approval payment of which shall constitute full compensation for Item No. 0018, complete.

1.3.19 ITEM 0019 (OPTIONAL ITEM)

Payment will be made that the contract lump sum price for Item No. 0019, Horizontal Trash Rack Seismic Reinforcement, payment of which shall constitute full compensation for Item No. 0019, complete.

1.3.20 ITEM 0020 (OPTIONAL ITEM)

Payment will be made that the contract lump sum price for Item No. 0020, Excavation, Phase 1C, Below Elevation 1075, payment of which shall constitute full compensation for Item No. 0020, complete.

1.4 PROGRESS PAYMENT INVOICE

Requests for payment shall be submitted in accordance with Federal Acquisition Regulations (FAR) Subpart 32.9, entitled "PROMPT PAYMENT", and Paragraphs 52.232-5 and 52.232-27, entitled "Payments Under Fixed-Price Construction Contracts", and "Prompt Payment for Construction Contracts", respectively. In addition each request shall be submitted in the number of copies and to the designated billing office as shown in the Contract.

1.3.1 When submitting payment requests, the Contractor shall complete Blocks 1 through 12 of the "PROGRESS PAYMENT INVOICE" Form as directed by the Contracting Officer. (A sample form is attached at the end of this Technical Specification Section.) The completed form shall then become the cover document to which all other support data shall be attached.

1.3.2 One additional copy of the entire request for payment, to include the "PROGRESS PAYMENT INVOICE" cover document, shall be forwarded to a separate address as designated by the Contracting Officer.

1.3.3 The Contractor shall submit with each pay request, a list of subcontractors that have worked during that pay period. The listing shall be broken down into weeks, identifying each subcontractor that has worked during a particular week, and indicate the total number of employees that have worked on site for each subcontractor for each week. The prime Contractor shall also indicate the total number of employees for its on site staff for each week.

PART 2 NOT USED

PART 3 NOT USED

PROGRESS PAYMENT INVOICE

See Federal Acquisition Regulations (FAR) 32.900, 52.232-5, & 52.232-27

1. PROJECT AND LOCATION	2. DATE
3. CONTRACTOR NAME AND ADDRESS (Must be the same as in the Contract)	4. CONTRACT NO. _____ 5. INVOICE NO.
6. DESCRIPTION OF WORK	7. PERIOD OF PERFORMANCE From: To:
8. DISCOUNT TERMS	
9. OFFICIAL TO WHOM PAYMENT IS TO BE FORWARDED Name: Title: Phone: ( ) -	10. OFFICIAL TO BE NOTIFIED OF DEFECTIVE INVOICE Name: Title: Phone ( ) -

11. CERTIFICATION: I hereby certify, to the best of my knowledge and belief, that

(1) The amounts requested are only for the performance in accordance with the specifications, terms, and conditions of this contract;

(2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements and the requirements of Chapter 39 of Title 31, United States Code; and

(3) This request for progress payment does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract.

_____ _____ _____

(Signature) **(Title)** **(Date)**

12. OTHER INFORMATION OR DOCUMENTATION required by Contract. Provide two (2) copies of each (check and attach if applicable): _____ Updated Progress Chart/Schedule _____ Progress Narrative _____ Certified Payrolls (submitted weekly) _____ Safety Exposure Report _____ Updated Submittal \register _____ Progress Photos _____ Subcontractor/Employee Listings	(FOR GOVERNMENT USE ONLY) Retainage: _____% Amt.: $_____ Withholdings: $ _____ Reason: _____ _____ Following items are current: As-Builts _____ Yes _____ No O & M Manuals _____ Yes _____ No 1354 Data _____ Yes _____ No Submittal Register _____Yes _____No

END OF SECTION

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SECTION 01030

DIVING

PART 1 GENERAL

1.1 GENERAL

This section covers the general requirements for contract diving operations to be performed as specified within this contract. Diving shall be performed in accordance with the latest edition of the U.S. Army Corps of Engineers Safety and Health Requirements Manual EM 385-1-1, referenced in SECTION 00700, Clause ACCIDENT PREVENTION including ALT. 1. All diving must be done in accordance with the Water Quality Protection requirements of this document as presented in Sections 01060 and 01061. All diving operations shall be considered incidental to the work specified elsewhere herein. No separate payment for diving work will be made.

1.2 DIVING ENVIRONMENT

The estimated maximum working depth is approximately 50 feet below water surface. The estimated maximum depth the diver(s) will be exposed is approximately 50 feet below water surface. Turbidity may limit visibility to less than 6 feet. The maximum current flow through the work area has not been measured but has been estimated to be less than 1.3 knots under the conditions expected for the work. The Contractor is required to measure current flow in the area of consideration prior to any diving operations according to EM 385-1-1. Water temperatures are estimated to vary between 40 and 45 degrees F. The overall work site is a restricted access area and is not open to navigation by commercial and private vessels.

1.3 SUBMITTALS

The Contractor shall submit all documents as required by EM 385-1-1, Section 30 including the Dive Operations Plan no later than 10 calendar days before the first planned diving operation.

PART 2 PRODUCTS

2.1 DIVE TEAM COMPOSITION AND DIVE EQUIPMENT

All dive teams shall, as a minimum, be comprised of personnel levels as stated in the latest edition of EM 385-1-1, Appendix N (a single diver requires a 5-man crew as defined in this reference and for two working divers, a 7-man crew shall be required (addition of 1 diver and 1 tender to the 5-man crew). No scuba diving shall be permitted. In addition to the dive team personnel addressed in the above references, minimum required chamber crew personnel shall be provided as diving operations dictate. If a crane is used, a certified crane operator, who shall not be included as a member of the dive team, must operate the crane. Only surface-supplied air diving equipment with 2-way voice communication shall be used for divers and standby divers. An independent reserve air system (bailout bottle) for all divers is required as specified by EM 385-1-1, paragraph 30.E. As a minimum, all diver surface air supply compressors, tanks, helmets, and other related equipment must comply with the requirements of EM 385-1-1,

paragraph 30.C & E.

2.2 CONTRACTOR-FURNISHED DIVING SUPPORT EQUIPMENT

A dual lock recompression chamber(s) capable of recompression to a minimum of 165 Feet of Sea Water (FSW) shall be required to be on-site and available for immediate use for divers. Sufficient on-site chamber facilities shall be furnished to service multiple divers working simultaneously on differing recompression schedules. A dive vessel or a floating or suspended dive platform shall be furnished from which diving operations will be staged. Man-basket(s) shall be provided for each working diver as needed. All necessary top-side equipment such as cranes, trucks, and personnel vehicles shall be furnished that are needed to accomplish all required dive work as well as all necessary underwater hand and power tools.

2.3 CONTRACTOR SPECIAL UNDERWATER EQUIPMENT

The Contractor is expected to furnish all tools, equipment, and materials needed for diver work.

PART 3 EXECUTION

3.1 FLOOD CONTROL AND DIVING RESTRICTIONS

The diving work associated with this contract will of necessity be done at low pool, which corresponds to flood control season at Howard Hanson Dam. The diving work will be done in the immediate vicinity of the flood control intake. It is important to note that diving operations will be ordered stopped for safety reasons by the Contracting Officer with little or no notice to the Contractor due to the unpredictable nature of the flood season reservoir inflows. Such inflows can cause flow velocities above those considered safe for diving operations.

3.2 WATER QUALITY FOR DIVING OPERATIONS

The Contractor is advised that all the water quality requirements of this contract also apply to diving operations.

3.3 DIVING WORK DESCRIPTION

A description of the various diving tasks to be accomplished will be according to the Contractor's work plan and proposal as required in Section 00100. Such work may or may not include:

Drilling and grouting rebar dowels in existing concrete
Inspect sills and clean prior to stoplog and weir gate placement to ensure seal.
Form and place concrete.

-- End of Section --

SECTION 01035

MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 PROPOSED PROJECT MODIFICATIONS:

Price proposals for proposed modifications shall be submitted in accordance with the requirements of the Contract Clause MODIFICATION PROPOSALS - PRICE BREAKDOWNS. If change order work impacts or delays other unchanged contract work, the costs of such impacts or delays shall be included in the proposals and separately identified. Additional instructions for submitting price proposals can be found in NPSP-415-1-1, INSTRUCTION AND INFORMATION FOR CONTRACTORS, a copy of which will be furnished to the Contractor at the Preconstruction Conference. For information applicable to equipment rates used in contract modifications, refer to 00800 - SPECIAL CLAUSES, clause "EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE".

PART 2 NOT USED

PART 3 NOT USED

-- End of Section --

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SECTION 01050

EMERGENCY DEMOBILIZATION

PART 1 GENERAL

1.1 SCOPE

A. This section describes the responsibilities of the Contractor during an emergency demobilization of construction related equipment and activities from behind the cofferdam and other areas potentially subject to flooding during storm and similar events in the Howard Hanson Dam Reservoir Watershed during the annual flood control season. Flood control is the main mission of Howard Hanson Dam and must be maintained throughout the construction period. However, flood control season only occurs during the period November 1st and March 1st annually. See Section 00800 of this document for more information. This section also summarizes the re-mobilization following an emergency demobilization.

B. Emergency demobilization shall be defined as an unplanned demobilization of construction equipment and activities for the objective of safety and maintenance of water quality when the reservoir level is forecasted to rise above a certain elevation during flood control season as described below. Emergency demobilization will be required in the event of natural precipitation events during flood control season and the resultant rise in reservoir water elevation that may affect the Contractor's base of operations at the time of the event. For such an emergency demobilization, the Contractor will be required to remove his equipment to areas above the project maximum design flood elevation of 1220 as shown on the drawings, or a lesser elevation dependent upon forecasting and as directed by the Contracting Officer. Because forecasting is required to initiate the emergency de-mobilization, false alarms can be expected. Emergency demobilization, including false alarms, will be paid for at the contract price. However, the Contractor will only be paid for actual demobilization events as described in Section 01025.

1. It is assumed in this Section that the Contractor shall define in his proposal the area at elevation 1150 for use as a base of operations for a large crane. The Contractor will be notified that an emergency de-mobilization must be executed when the reservoir is forecasted to rise above the elevation of 1150.

2. The Contractor may use the area in front of the spillway at elevation 1165 for staging. The Contractor will be notified that an emergency de-mobilization must be executed when the reservoir is forecasted to rise above the elevation of 1165.

3. Similarly, when the cofferdam has been installed and the Contractor is excavating areas behind the protection of the cofferdam, the Contractor will be notified that an emergency demobilization must be executed when the reservoir is forecasted to rise above the elevation of 1169 (top of cofferdam).

4. The Contractor must include in his proposal costs associated with the activities described in this section according to Section 00100 of

this document. Note that emergency demobilization events for activities at elevation 1150, 1165, and 1169 are mutually exclusive.

5. The definition of Emergency Demobilization does not include work stoppages due to flooding when working in the reservoir areas below 1150. Such work stoppages are to be expected by the Contractor due to the unpredictable nature of working in the flood control reservoir. The Contractor must stop work below elevation 1150 whenever it is necessary to comply with the requirements of section 01060 of this document for the objective of safety and maintenance of water quality. The Contractor's work plan and proposal must allow for working in these harsh conditions and no additional payment will be made to the Contractor for any such work stoppages. The Contractor is required to consult Section 00800 of this document for historical records and probability parameters in order to account for working in harsh conditions and include such costs in his proposal.

C. This activities described in this section are not to be confused with the Contractor's general mobilization and de-mobilization work as described in Special Clause 11 of this document.

1.2 REFERENCE SPECIFICATIONS

A. Section 01101, WATERSHED ACCESS AND REGULATORY REQUIREMENTS.

B. Section 01563, POLLUTION CONTROL.

1.3 SUBMITTALS

The Contractor shall submit for approval by the Contracting Officer an Emergency Demobilization Submittal as detailed in Section 01100 ENVIRONMENTAL MANAGEMENT.

1.4 WATERSHED PRECIPITATION MONITORING

1.4.1 Snow Pack and Storm Event Monitoring

The Contracting Officer will monitor snow pack, soil moisture content, weather patterns, reservoir levels and other related items to predict reservoir water elevation and dam releases. From this information the Contracting Officer will project snow pack runoff and wintertime storm events that can result in flooding or rapid increases in reservoir levels.

1.4.2 Flood Event Prediction

Based upon historical data, weather forecast information, and real-time monitoring equipment at the dam and in the watershed, the Contracting Officer will provide the Contractor a minimum of 8 hours notification prior to a probable flood event as defined in this section.

1.5 OBJECTIVE OF EMERGENCY DEMOBILIZATION

The objectives of emergency demobilization are:

A. To prevent the submergence of construction related equipment and supplies that can adversely affect the water quality of Howard Hanson Dam Reservoir.

B. To prevent damage to the Contractor's equipment from submergence.

C. To prevent loss of construction supplies that may float if subjected to submergence.

PART 2 NOT USED

PART 3 EXECUTION

3.1 EMERGENCY DEMOBILIZATION

A. If the Contracting Officer determines by forecast that a runoff or storm event may occur that will overtop:

1. elevation 1150 in the construction period before the cofferdam is complete, or

2. elevation 1165, coinciding with the area in front of the emergency spillway that may be used by the Contractor for staging.

3. the cofferdam elevation of 1169,

the Contracting Officer may issue an Emergency Demobilization Order. The Contracting Officer will provide a minimum of 8 hours notice of such an event.

B. If an Emergency Demobilization Order is issued, the Contractor is expected to respond immediately and shall begin to demobilize equipment from the construction area according to the approved Emergency Demobilization Submittal.

C. The Contractor shall prioritize removal of equipment in the following order:

1. Larger equipment with self-contained gas, diesel, or oil tanks.
2. Smaller equipment with self-contained gas, diesel, or oil tanks.
3. Loose or stock piled equipment or supplies with the potential to float. This includes, but is not limited to storage containers, form wood, etc.
4. Other equipment outside the cofferdam in areas subject to flooding.

D. The Contractor shall take any other actions he deems necessary to prevent contamination of the Howard Hanson Dam Reservoir or loss of equipment or supplies during the event.

3.2 EMERGENCY DEMOBILIZATION EQUIPMENT

The Contractor shall, at all times, maintain equipment on-site capable lifting or removing all construction related equipment and supplies from behind the cofferdam to above the elevation 1220 high water mark that may have to be removed during an emergency demobilization.

3.3 RE-MOBILIZATION

A. The Contracting Officer will be responsible for issuing a Re-mobilization Order after the danger of flooding of the construction areas has passed. The contractor is advised that some time, up to several weeks, may pass before such an order is issued.

B. The Contractor shall begin re-mobilization of equipment and supplies

within one (1) workday following the issuance of a Re-mobilization Order.

C. The Contractor shall be responsible for dewatering of floodwaters of the area behind the cofferdam if overtopping should occur.

-- End of Section --

SECTION 01060

WATER QUALITY STANDARDS

PART 1 GENERAL

1.1 SCOPE

A. This section summarizes the pertinent surface water and drinking water quality standards relating to public water supply and to surface waters of the State of Washington. The Howard Hanson Dam Reservoir and Green River provide drinking water for the Tacoma Public Utilities and surrounding communities. The regulations and requirements regarding water quality will be strictly enforced.

B. This section also explains the water quality monitoring and management measures which the Contracting Officer uses and which require Contractor's cooperation and compliance.

1.2 REFERENCE SPECIFICATIONS

A. Section 01561, DUST CONTROL.

B. Section 01563, POLLUTION CONTROL.

C. Section 01565, CONSTRUCTION SPOILS HANDLING.

1.3 WATER QUALITY STANDARDS

A. Public Water Supply

1. Water from Howard Hanson Dam Reservoir and Green River is used for municipal water supply for over 300,000 people in Pierce County. The source is unfiltered. Extreme care shall be taken by the Contractor to protect water quality during the construction period.

The documents that contain the relevant criteria for Howard Hanson Dam Reservoir and Green River surface water and public water supply quality are:

a. National Primary Drinking Water Regulations plus amendments promulgated as part of the Safe Drinking Water Act, PL 93-523.

b. Rules and Regulations of the State Department of Health Regarding Public Water Systems, Revised July 1999, WAC 246-290 Public Water Systems and amendments.

c. State of Washington Department of Ecology Surface Water Quality Regulations.

d. Howard Hanson Dam Additional Water Storage Project Phase I - Construction, Water Quality and Supply Protection Plan, June 2002.

e. Howard Hanson Dam Additional Water Storage Project Phase I -

Construction, Water Quality and Supply Emergency Response Plan for Construction Related Activities, June 2002.

2. The Contracting Officer measures a number of water quality parameters at a variety of locations on an ongoing basis to verify that water quality is maintained. The Contractor shall not cause monitored water quality parameters to exceed acceptable levels. Violation of water quality action limits due to construction activity may result in a shut down of construction until water quality is restored and the source of contamination identified and rectified. The Contractor may be required to take additional measures to protect water quality or mitigate certain construction activities that threaten water quality standards.

3. The standards for which the Contracting Officer measures and to which the Contractor must adhere in the Howard Hanson Dam Reservoir and Green River are:

a. A "scheduled window of disturbing activity" will be defined as predetermined construction periods, verified by the Contracting Officer, during which reservoir sediments may be disturbed as a result of construction activity. Such windows shall be limited to 72 hours maximum. During these predetermined "windows" turbidity levels may be exceeded. Outside of "scheduled windows of disturbing activity" turbidity shall not exceed 5 NTU over background when turbidity is <50 NTU. When background turbidity is >50 NTU, turbidity may not exceed 10% greater than background. This applies to all locations in the reservoir impacted by construction or related activities. The Contractor shall take all precautions to limit turbidity to as low as possible regardless of scheduled activities.

b. Fecal coliform shall be less than the geometric average of 50 colonies/100 ml. No more than 10% of samples shall exceed 100 colonies/ml.

c. Temperature shall not exceed 16°C due to construction activities. If natural temperature exceeds 16°C, no temperature increase shall raise receiving water temperature by more than 0.3°C. Incremental increases from point sources shall not exceed $t = 23/(T +5)$; where t = maximum allowable temperature at mixing zone and T = background temperature.

d. No visible construction related sheens shall be allowed.

e. pH shall remain within the 6.5 to 8.5 range and construction related variation shall be less than 0.2 units.

f. Total dissolved oxygen shall exceed 9.5 mg/L at all times.

g. Aesthetic values must not be impaired by the presence of construction related material that offends sight, smell, touch or taste.

1.4 POINTS OF MEASUREMENT FOR WATER QUALITY COMPLIANCE

A. Seven monitoring locations upstream and downstream of construction have been established by the Contracting Officer to monitor changes caused by construction activity.

B. Surface Water: The point of measurement for surface water quality criteria shall be within an identified mixing zone approximately 200 feet from the point of construction related activity.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 WATER QUALITY VIOLATIONS RESPONSE MEASURES

A. Ambient water quality levels shall be determined by results of monitoring in upstream areas unaffected by Contractor operations. Actions will be taken by the Contracting Officer in response to spills or to any actions that violate water quality standards as described in Sections 01100, ENVIRONMENTAL MANAGEMENT and 01563, POLLUTION CONTROL. If the Contractor's activities result in a violation of the water quality standards, action to stop the violation, including a shutdown of the activity causing the violation, may be taken by the Contracting Officer in accordance with Section 01100, ENVIRONMENTAL MANAGEMENT. The Contracting Officer and Environmental Monitor will make water quality measurements and review Contractor activity based on those measurements. Contractor shall bear all costs associated with a stop work order due to a water quality violation related to construction activity.

B. In event of any spill, the Contractor shall follow the procedures noted in the Emergency Planning and Response Submittal.

1. The Contractor is expected to respond immediately to notification of potential construction related water quality degradation as directed by the Contracting Officer or representative designated by the Contracting Officer. Response shall be immediate and the Contractor shall follow the provisions of the Emergency Planning and Response Submittal.

2. In event of a detrimental impact to water quality as defined by the water quality criteria the Contractor shall help determine whether the source of degradation is directly or indirectly construction related. If there is evidence that the failure is construction related, the Contractor shall immediately rectify the problems that caused the failure. The Contractor shall provide immediate response, access to work areas, labor, materials and equipment, and any other items necessary to meet these requirements at no additional cost to the Contracting Officer.

3.2 SURFACE WATER TURBIDITY AND pH MEASURES

A. Routine turbidity and pH monitoring will be conducted by the Contracting Officer at upstream, construction zone, and downstream locations. pH monitoring may be increased during tremie concrete activities. Additional turbidity and pH monitoring may be performed by the Contracting Officer at any time.

B. The Contractor's goal shall be to keep the turbidity of the water entering the Green River from exceeding background turbidity level (i.e., no contribution from construction activities). The overall goal shall be to keep turbidity as low as possible at all times.

C. Turbidity levels in the Howard Hanson Dam Reservoir and Green River will be impacted by sources outside of construction. At all times the Contractor shall use best management practices and operational control strategies to minimize turbidity contributions from construction activities. The Contractor shall be subject to shutdown in the event of best management practice failure or construction related turbidity generation outside of approved and scheduled disturbing activity construction windows. These shutdowns will continue until sources of turbidity are located and corrected at no cost to the Contracting Officer.

D. The Government's Environmental Monitor (see Section 01100) shall monitor turbidity at several locations to determine if in-lake and river turbidity is rising as a result of construction activities.

1. Turbidity shall remain below the specified levels at any location 200 feet from the construction activity or in the Green River. Turbidity may be measured at any depth within the water column.

2. If the turbidity in the Howard Hanson Dam Reservoir continues to increase even after appropriate actions have been taken to eliminate the source of the increase, the Contractor shall stop work on all construction activity causing the violation of standards until the turbidity level is reduced to specified acceptable levels.

3.3 WATER QUALITY MONITORING LOCATIONS AND PROCEDURES

A. Water quality monitoring will be performed by the Government's Environmental Monitor (see Section 01100). Contractor shall cooperate with monitoring activities and shall provide a boat appropriate for, and dedicated to, environmental protection activity and water quality monitoring.

B. Monitoring will consist of a set of parameters that compares water quality upstream, within, and downstream of the construction site. Monitoring locations and frequency will vary depending on the construction activities.

C. If any monitoring indicates an exceedance of any water quality action level, the Contracting Officer may arrange for additional monitoring. Additional monitoring may be performed during critical operations such as clam shelling, excavation, blasting, and cofferdam construction. Contractor shall cooperate with monitoring activities and provide access to necessary construction areas for the Contracting Officer and Environmental Monitor.

D. In event of a petroleum, chemical, or sanitary waste spill, the emergency procedures in the approved Emergency Planning and Response Submittal shall be followed. The Contracting Officer will work with the Environmental Monitor to implement appropriate monitoring.

E. Water from the construction site shall not be discharged or allowed to directly enter the Howard Hanson Dam Reservoir, except as necessary to perform the in-lake construction portions of the project. All water from construction activities must pass through the oil/water separators and enhanced turbid water sedimentation pond facilities as identified on the CONSTRUCTION DRAWINGS.

3.4 POTABLE WATER BACTERIOLOGICAL QUALITY PROTECTION MEASURES

A. Use of temporary sanitation facilities will be required at all work areas. Such facilities must be maintained on a regular basis.

B. All materials and equipment planned to come in contact with the water supply shall first be cleaned and disinfected by the Contractor.

3.5 PETROLEUM AND CHEMICAL CONTROL MEASURES

The Contractor shall implement all measures to prevent introduction of petroleum and chemicals to Howard Hanson Dam Reservoir and the Green River.

3.6 WATER SUPPLY OPERATIONS

A. Construction operations shall be staged and scheduled so that the Tacoma Public Utilities water supply operations are not impacted.

B. The Contractor shall coordinate with the Contracting Officer and Environmental Monitor to properly schedule and sequence construction activities for no impact on water supply and availability. The Contractor shall work with the Contracting Officer to identify all activities requiring temporary shutdowns of Tacoma Public Utilities water supply facilities and to schedule such events. Such Shutdown, bypass, and/or drawdown operations will require 10 construction days notification for Tacoma Public Utilities to arrange, shall be limited to 72 hours maximum, and will not be possible during certain periods when water supply is critical. Contractor requests for shutdown "windows" shall be limited to 2 per month throughout the contract period. The Contractor shall work within the available times to perform tasks requiring shutdown or bypass of water supply operations.

3.7 SURFACE WATER QUALITY MEASURES

A. The Contractor shall plan and conduct the work in a manner that minimizes the possibility of discharging pollution to surface waters.

B. The Contracting Officer will coordinate water quality, water releases, fishery, and other environmental concerns and activities during construction. Contractor and Contracting Officer will comply with local, state, and federal permit, reporting, and monitoring requirements.

C. The Contracting Officer may conduct meetings with interested agencies and parties. These meetings may include site visits. Contractor shall provide access for such site visits and shall participate in meetings as requested by the Contracting Officer.

D. Clearing for work access and staging areas shall be minimized, and disposal sites shown on the plans shall be utilized. Additional permits and approvals will be required if Contractor proposes use or clearing of areas not shown in the Contract Documents. Contractor shall assume all responsibility for obtaining such permits and approvals, and for any time delays associated with the permitting process.

-- End of Section --

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SECTION 01061

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 SCOPE

This Section covers prevention of environmental pollution and damage as the result of construction operations under this contract. For the purpose of this specification, environmental pollution, and damage is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for esthetic, cultural, and/or historical purposes. The control of environment pollution and damage requires consideration of air, water, and land, and includes management of visual esthetics, noise, and solid waste, as well as other pollutants.

1.2 REFERENCE SPECIFICATIONS

Section No.	Section Title
01060	Water Quality Standards
01100	Environmental Management
01560	Diversion and Care of Water
01561	Dust Control
01563	Pollution Control
01565	Construction Spoils Handling

1.3 QUALITY CONTROL

The Contractor shall establish and maintain quality control for environmental protection of all items set forth herein. The Contractor shall record any problems in complying with laws, regulations, and ordinances, and corrective action taken.

1.3.1 Subcontractors

Assurance of compliance with this Section by subcontractors will be the responsibility of the Contractor.

1.4 NOTIFICATION

When the Contracting Officer notifies the Contractor in writing of any observed noncompliance with Federal, state, or local laws, regulations, or permits, the Contractor shall, after receipt of such notice, inform the Contracting Officer of proposed corrective action and take such action as may be approved. If the Contractor fails to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions will be granted or costs or damage allowed to the Contractor for any such suspension.

1.5 PROTECTION OF ENVIRONMENTAL RESOURCES

The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract shall be protected during the entire period of this contract. The Contractor shall confine his activities to areas defined by the drawings and specifications. Environmental protection shall be as stated in the following subparagraphs:

1.5.1 Protection of Land Resources

The Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without special permission from the Contracting Officer except as otherwise specified or indicated. See Paragraph 1.6 for additional requirements relating to protection of trees during excavation in the vicinity of a tree.

1.5.2 Disposal of Garbage

Garbage shall be placed in containers which are emptied on a regular schedule. All handling and disposal shall be conducted to prevent contamination.

1.5.3 Refuse Disposal and Cleanup

Refuse shall be defined as debris other than such organic materials as brush or tree stumps.

1.5.3.1 Refuse Disposal

The cost of refuse disposal, such as transportation, handling, dumping fees as applicable, and similar cost, shall be included in the contract price. Refuse shall be disposed of off site, in accordance with all local, state, and Federal rules and regulations, at the Contractor's expense.

1.5.3.2 Fire Hazard

Cloths, cotton waste, and other combustible materials that might constitute a fire hazard shall be placed in closed metal containers and placed outside or destroyed at the end of each day.

1.5.4 Restrictions

The Contractor will not be permitted to deposit refuse in existing garbage cans or refuse dumpsters. Cleaners shall not be poured, drained, or washed into plumbing fixtures or sanitary or storm sewers. Debris, dirt, dust, and stains attributable to or resulting from the work effort shall be removed, cleaned, or effaced by the Contractor to the satisfaction of the Contracting Officer prior to acceptance of the job. Refuse shall not be burned. Burning of vegetation or tree stumps will not be allowed unless the worksite is in an area approved for burning.

1.5.5 Disposal of Chemical or Hazardous Waste

Chemical or hazardous waste shall be stored in corrosion-resistant containers, removed from the work area, and disposed of in accordance with Federal, State, and local regulations.

1.5.6 Disposal of Discarded Materials

Discarded materials, other than those which can be included in the solid waste category, shall be handled as directed.

1.5.7 Protection of Water Resources

The Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters.

1.5.8 Particulates

Dust particles, aerosols, and gaseous byproducts from construction activities, processing, and preparation of materials shall be controlled at all times, including weekends, holidays, and hours when work is not in progress. Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and state allowable limits at all times.

1.6 PROTECTION OF TREES DURING EXCAVATION

Care shall be exercised by the contractor when excavating trenches in the vicinity of trees. Where roots are 2 inches in diameter or greater, the trench shall be excavated by hand and tunneled. When large roots are exposed, they shall be wrapped with a heavy burlap for protection and to prevent drying. Trenches dug by machines adjacent to trees having roots less than 2 inches in diameter shall have the sides hand trimmed making a clean cut of the roots. Trenches having exposed tree roots shall be backfilled within 24 hours unless adequately protected by moist burlap or canvas.

1.7 MAINTENANCE OF POLLUTION CONTROL FACILITIES

The Contractor shall maintain all constructed facilities and portable pollution control devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

1.8 RESTORATION OF LANDSCAPE (VEGETATION - SUCH AS TREES, PLANTS, AND GRASS) DAMAGE

All landscape features (vegetation - such as trees, plants, and grass) damaged or destroyed during Contractor operations outside and within the work areas shall be restored to a condition similar to that which existed prior to construction activities unless otherwise indicated on the drawings or in the specifications. This restoration shall be done at no additional cost to the Government. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

Trees shall be replaced in kind with a minimum 4-inch caliper nursery stock. Shrubs, vines, and ground cover shall be replaced in kind; size to be approved by the Contracting Officer.

All plant material shall meet specifications outlined in ANSI Z60.1 - current publication, "American Standard for Nursery Stock."

Grass areas shall be replaced in kind by sodding or seeding. Sod shall be required in all regularly maintained lawn areas and shall be installed according to American Sod Producers Association Guideline Specifications to Sodding.

Grass seeding shall be installed on a minimum 2-inch topsoil and according to Section 02921 SEEDING.

1.9 STORMWATER PERMIT

1.9.1 The Washington State Department of Ecology requires a storm water discharge permit for construction that involves any soil disturbing activities, such as clearing, grading, excavating and/or demolition that will disturb 1 acre or more of land area AND that will have a discharge of stormwater from the site into surface water(s), or into storm drainage systems that discharge to surface waters. Surface waters include wetlands, ditches, rivers, unnamed creeks, lakes, estuaries, rivers, reservoirs, and marine waters. As required, based on the above, the Contractor shall apply for a construction stormwater general permit from the Department of Ecology. Necessary information for permit requirements and application procedures can be obtained at:

http://www.ecy.wa.gov/programs/wq/stormwater/construction/cnst_prmt_fin.pdf

1.9.2 If applicable, the Contractor shall provide the Contracting Officer with a copy of the construction stormwater general permit and all necessary supporting documentation required by the permit. This includes a Construction Stormwater Pollution Prevention Plan (SWPPP) designed by qualified personnel. The SWPPP must be approved by Washington State Department of Ecology and by the Contracting Officer prior to construction activities. The objective of the plan is to minimize erosion of disturbed areas during the construction and post construction phases of a project. The Contractor will be required to control all construction operations in strict compliance with the approved SWPPP.

PART 2 NOT USED.

PART 3 NOT USED.

-- End of Section --

SECTION 01100

ENVIRONMENTAL MANAGEMENT

PART 1 GENERAL

1.1 SCOPE

This section describes the project on-site management structure relative to environmental protection. The section describes the role, responsibilities, and authority of the Government's Environmental Monitor. Described are environmental submittal requirements, environmental coordination, reporting, and documentation of environmental protection activity. This Section describes requirements for environmental management, which may supplement such provisions of federal, state and local statutes, ordinances and regulations.

1.2 GENERAL REQUIREMENTS

The Contractor shall comply with all provisions of federal, state and local statutes, ordinances and regulations pertaining to the prevention of environmental pollution and the preservation of public natural resources.

1.3 REFERENCE SPECIFICATIONS

A. Section 01060, WATER QUALITY STANDARDS
B. Section 01561, DUST CONTROL
C. Section 01563, POLLUTION CONTROL
D. Section 01565, CONSTRUCTION SPOILS HANDLING

1.4 SUBMITTALS

1.4.1 ENVIRONMENTAL MANAGEMENT SUBMITTALS

The Contractor shall plan and conduct all work in a manner that will prevent environmental pollution and preserve public natural resources within the Green River Watershed. The Contractor shall submit to the Contracting Officer for review and approval an Environmental Management Plan that shall include detailed submittals for:

- erosion and sediment control;
- diversion and care of water;
- emergency demobilization;
- spill prevention, containment and response;
- pollution control;
- emergency planning and response;
- watercraft preparation and operation;

Descriptions, sketches, and calculations shall be included as appropriate in all submittals. The Contracting Officer will review and return the Environmental Management Plan submittals to the Contractor. Supplements to the Environmental Management Plan addressing new construction activities not included in the initial Environmental Management Plan shall be prepared and submitted to the Contracting Officer for approval. The Contractor will not be permitted to perform any work or conduct any activity within the Green River Watershed until the Contractor's initial Environmental

Management Plan and subsequent supplements have been approved by the Contracting Officer.

1.4.2 ENVIRONMENTAL MANAGEMENT PLAN CONTENTS

1.4.2.1 The Contractor shall submit an Erosion and Sediment Control Submittal addressing, at a minimum, the following:

· How the Contractor intends to construct, inspect, operate, and maintain sediment and erosion control elements.

· Show that all erosion control work is to be completed before any construction disturbance begins in any given area. The Contractor may schedule the erosion control work in phases, providing no construction activity, including truck traffic, occurs in a segment with incomplete erosion control work.

· Methods for sediment and erosion control measures for all work not shown on the Drawings, including:

§ Additional earthwork proposed by Contractor.
§ Temporary access or haul roads.
§ Staging, Contractor's field office, and Contracting Officer's field office.
§ Material storage areas.
§ Spoils areas.

· Methods and schedules for operating, inspecting, and maintaining erosion control facilities and equipment.

· The name and 24-hour-a-day phone number and alternate contacts for contractor personnel responsible for operating and maintaining erosion and sediment control facilities.

· Methods for site restoration of the following areas:

§ Work areas.
§ Spoils areas.
§ Office area.
§ Staging and storage areas.

· Shop drawings, samples, and product data.

· Samples of all fabrics.

· Manufacturer's data on all products.

· Include in the submittal facilities not shown on the Drawings that the Contractor requires to accomplish the work. Such facilities include, but are not limited to, staging areas, parking areas, and a cleaning/disinfection area.

1.4.2.2. The Contractor shall submit a Diversion and Care of Water Submittal addressing, at a minimum, the following:

· Drawings showing the location, size, and construction details of water diversion and handling features such as sedimentation ponds, ditches, and sumps.

· Manufacturers' literature on each of the elements described in the submittal showing the equipment.

· Drawings of the designated decontamination and wash down sites indicating the location and size of the facilities and means of water conveyance to the holding tank.

· Description of turbid water conveyance treatment and disposal systems to be used on the project. The system shall meet the criteria noted in this and other sections of the Specifications. The overall goal of these systems is to prevent release of turbid or contaminated water into surface waters. These systems shall include:

§ Source of waters and disposal locations for water and solids;
§ Plans showing method of pumping and system control.
§ Plans showing storage, treatment, and disposal features (tanks and valves).
§ Calculations showing all items meet design criteria.
§ Information on pumps, piping, and fittings showing they meet the design criteria.
§ Description of the activities that will potentially generate turbid water.
§ Proposed methods and details of collection and transmission of turbid water to the settling ponds and dispersal facility.
§ Description of procedures for operating and maintaining turbid water treatment facilities.
§ Procedure for pressure and leak testing of pipe transporting turbid waters.
§ Action Plan for activities in case of turbid water facility damage/failure.

1.4.2.3. The Contractor shall submit an Emergency Demobilization Submittal addressing, at a minimum, the following:

§ Criteria for demobilization.
§ Communication structure of Contracting Officer and Contractor emergency demobilization status.
§ Decision responsibility to demobilize.
§ Sequence of performing demobilization, indicating demobilization activities with high priorities.
§ Handling of construction site water following re-mobilization.
§ Contingency for incomplete demobilization.
§ Interim staging and storage for demobilized equipment.
§ Estimates on the amount of time needed to demobilize based on activities being carried out.
§ Schedule and format of desktop and field demobilization drills.
§ Plans for handling fixed equipment such as crane that may not be able to be removed in an 8-hour period.

1.4.2.4. The Contractor shall submit a Spill Prevention, Containment, and Response Submittal addressing, at a minimum, the following:

§ Location of chemical and petroleum storage and refueling area.
§ List and use of chemicals stored on-site.
§ Drawings of chemical and petroleum storage and refueling area detail.
§ Fueling and chemical/petroleum station layout and construction features.
§ Description of spill prevention best management practices to be

implemented by the Contractor.
§ Spill Response Decision Tree for spills on land and in water.
§ Prioritized Notification List for spills on land and in water.
§ Spill Containment Kit contents and locations.
§ Description of Spill Containment Procedures.
§ Land Spill
§ Water Spill
§ Personnel Responsibilities
§ Spill reporting protocol following containment.
§ Spill clean-up product details.

1.4.2.5. The Contractor shall submit a Pollution Control Submittal addressing, at a minimum, the following:

§ Personnel access controls.
§ Vehicle access controls
§ Signage.
§ Mobilization and demobilization controls.
§ Controlling equipment and materials to be in contact with the reservoir.
§ Stationary equipment containment.
§ Disinfection and cleaning procedures.
§ Methods to minimize and preclude tremie concrete from entering the water column.
§ Chemical and petroleum housekeeping measures.
§ Construction rubbish and garbage controls.
§ Sanitary waste controls.
§ Equipment maintenance and refueling controls.
§ Personnel training.
§ Dust control.
§ A list of products and quantities of petroleum/chemical products proposed for use during the work.
§ Material Data Safety Sheets and other relevant environmental documentation for all proposed petroleum/chemical products.
§ Documentation of environmentally acceptable petroleum/chemical products in processes and equipment wherever possible.
§ List of hydraulic equipment on-site and type of hydraulic fluid used.
§ Method for tracking and monitoring the type and amounts of chemicals stored and used on site.

1.4.2.6. The Contractor shall submit an Emergency Planning and Response Submittal addressing, at a minimum, the following:

§ Description of circumstances under which emergency response will be needed.
§ Signed agreement with the Emergency Response Firm for 24-hour services to address spills or other environmental emergencies.
§ Verification that the contracted firm can address all substances to be used on-site and firm credentials.
§ Description of roles and responsibilities of entities affected by an emergency situation, including the Contractor, emergency response firm, Corps, and TPU.
§ Timing of emergency response firm site visit.
§ Prioritized notification list.
§ Specific responsibilities of on-site personnel during emergency situations.
§ Emergency response decision tree.
§ Schedule of periods critical to TPU's drinking water supply.

1.4.2.7. The Contractor shall submit a Watercraft Preparation and Operation Submittal addressing, at a minimum, the following:

§ Detailed information about proposed watercraft including a photo and prior uses. Watercraft shall not have been previously used in polluted water or sewage.
§ Methods for inspecting, cleaning, and disinfecting watercraft and immersed materials and equipment. Cleaning and disinfection shall be done in the presence of the Environmental Monitor or his representative.
§ Plans for containment on watercraft.
§ Method for removing bilge and other accumulated water on watercraft.
§ Containment trays or methods for all equipment, chemicals, and petroleum on watercraft.
§ List of all motors and equipment to be used on watercraft. Motors for propulsion and equipment on watercraft shall not release any fluids to the water.
§ Methods for launching, loading and landing of all watercraft. The launching and landing methods must minimize disturbance of bottom sediments in order to reduce turbidity.
§ Methods for mooring, anchoring and docking methods and location of oil containment booms.

1.4.3 ENVIRONMENTAL MANAGEMENT PLAN

1.4.3.1 The separate submittal elements of the approved Environmental Management Plan shall be assembled into a working document that shall be readily available for reference during project construction. The approved submittals shall be bound in loose-leaf style in 1-1/2-inch 3-ring notebooks with each submittal clearly indexed. The notebook shall be clearly labeled on the cover and the side as Howard Hanson Dam Fish Passage Facility Project - Environmental Management Plan Volume (volume number required only if more than 1 volume). The Contractor shall provide the Contracting Officer with four copies of the approved Environmental Management Plan. The Environmental Management Plan working document shall be kept current by inserting supplements including, but not limited to, approved submittals addressing new construction activities, minutes and records of attendance at environmental meetings, reports issued by the Environmental Monitor, and any reports issued by regulatory or permitting agencies.

1.4.3.2 Upon completion of the work the Contractor shall submit four copies of the project final Environmental Management Plan to the Contracting Officer.

1.5 Environmental Monitor

The Contracting Officer will provide an Environmental Monitor tasked with monitoring environmental management activities and water quality for the Green River Watershed. The Environmental Monitor will monitor construction activities to verify that the Contractor complies with the environmental management requirements of these Specifications and project submittals. The Environmental Monitor will monitor Howard Hanson Dam Reservoir and Green River turbidity and other water quality parameters to verify that the requirements of these specifications are being met. Monitoring shall also be conducted by the Environmental Monitor at borrow sites, waste sites, and staging areas to verify environmental protection. The Contractor shall provide access to all areas of its operations and cooperate with the

Environmental Monitor in the execution of monitoring operations. The Environmental Monitor is not authorized to direct the Contractor to perform work functions or work site clean up. Presence or absence of the Environmental Monitor shall not relieve the Contractor of its responsibility to maintain environmental protection controls and practices and all provisions of federal, state, and local statutes, ordinances and regulations pertaining to the prevention of environmental pollution and preservation of public natural resources.

1.6 CONTRACTOR'S ENVIRONMENTAL COORDINATOR

The Contractor shall appoint an Environmental Coordinator from the supervisory level of its staff to coordinate environmental matters. This person shall work directly with the Contracting Officer concerning water quality permits and other environmental matters.

1.7 ENVIRONMENTAL COORDINATION

The Contracting Officer, Environmental Monitor, and Contractor's Environmental Coordinator shall attend weekly environmental meetings with personnel responsible for the environmental management at the jobsite. Subcontractors shall also be in attendance at the discretion of the Contracting Officer. Meetings shall be scheduled and conducted by the Contracting Officer. The discussions at such meetings shall include, but not be limited to, the requirements of the Environmental Management Submittals. Records of meeting attendance and meeting minutes shall be kept by the Contractor and submitted to the Contracting Officer within five days following the meeting. Attendance records and minutes shall also be inserted into the Environmental Management Plan working document. The frequency of the environmental meetings may be reduced at the discretion of the Contracting Officer.

1.8 ENVIRONMENTAL EDUCATION

The Contractor shall conduct weekly environmental education meetings with its personnel and subcontractors on the subjects in the Environmental Management Plan. The subjects shall emphasize proper handling of sanitary waste, petroleum products and chemicals and control of turbid waters and pollution. Records of the meetings shall be kept and submitted to the Contracting Officer. All new personnel on the project shall be informed as to the contents of the ENVIRONMENTAL MANAGEMENT PLAN before coming on-site. The Environmental Monitor may attend the meeting at Monitor's discretion.

1.9 ENVIRONMENTAL REPORTING AND DOCUMENTATION

A. Records will be kept by the Environmental Monitor on Contract compliance and compliance with environmental permits and regulations. These records and reports will be submitted to the agencies issuing permits and other health and resource management agencies. A copy of all reports will be given to the Contractor for insertion into the Environmental Management Plan working document.

B. There will be periodic visits to the jobsite by regulating agencies including, but not limited to, King County Department of Public Health, Washington State Department of Ecology, Department of Fish and Wildlife, and Department of Health. The purpose of these visits is to enable the representatives of these agencies to review jobsite conditions and ensure that applicable regulations are being followed and permit conditions are being fulfilled. The Contracting Officer, Environmental Monitor and, if

requested, the Contractor shall participate in these periodic visits. The Environmental Monitor will prepare minutes of visits and provide copies to the Contracting Officer.

PART 2 PRODUCTS Not used.

PART 3 EXECUTION

The Contractor shall submit the Environmental Management Plan in its entirety according to the submittal scheduling and timeline requirements of Section 01330 SUBMITTAL PROCEDURES. The Contractor shall execute the Environmental Management Plan.

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SECTION 01312

QUALITY CONTROL SYSTEM (QCS)

PART 1 GENERAL

1.1 GENERAL

The Government will use the Resident Management System for Windows (RMS) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS, referred to as QCS, to record, maintain, and submit various information throughout the contract period. This joint Government-Contractor use of RMS and QCS will facilitate electronic exchange of information and overall management of the contract. QCS provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

Administration
Finances
Quality Control
Submittal Monitoring
Scheduling
Import/Export of Data

1.1.1 Correspondence and Electronic Communications

For ease and speed of communications, both Government and Contractor will, to the maximum extent feasible, exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

1.1.2 Other Factors

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01320, PROJECT SCHEDULE, Section 01330, SUBMITTAL PROCEDURES, and Section 01451, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through QCS. Also, there is no separate payment for establishing and maintaining the QCS database; all costs associated therewith shall be included in the contract pricing for the work.

1.2 QCS SOFTWARE

QCS is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the QCS software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor shall be responsible to download, install and use the latest version of the QCS software from the Government's RMS Internet Website. Upon specific justification and request by the Contractor, the Government can provide QCS on 3-1/2 inch high-density diskettes or CD-ROM. Any program updates of QCS will be made available to the Contractor via the Government RMS Website as they become available.

1.3 SYSTEM REQUIREMENTS

The following listed hardware and software is the minimum system configuration that the Contractor shall have to run QCS:

Hardware

IBM-compatible PC with 200 MHz Pentium or higher processor

32+ MB RAM

4 GB hard drive disk space for sole use by the QCS system

3 1/2 inch high-density floppy drive

Compact disk (CD) Reader

Color monitor

Laser printer compatible with HP LaserJet III or better, with minimum 4 MB installed memory.

Connection to the Internet, minimum 28 BPS

Software

MS Windows 95 or newer version operating system (MS Windows NT 4.0 or newer is recommended)

Word Processing software compatible with MS Word 97 or newer

Internet browser

The Contractor's computer system shall be protected by virus protection software that is regularly upgraded with all issued manufacturer's updates throughout the life of the contract.

Electronic mail (E-mail) compatible with MS Outlook

1.4 RELATED INFORMATION

1.4.1 QCS User Guide

After contract award, the Contractor shall download instructions for the installation and use of QCS from the Government RMS Internet Website; the Contractor can obtain the current address from the Government. In case of justifiable difficulties, the Government will provide the Contractor with a CD-ROM containing these instructions.

1.4.2 Contractor Quality Control(CQC) Training

The use of QCS will be discussed with the Contractor's QC System Manager during the mandatory CQC Training class.

1.5 CONTRACT DATABASE

Prior to the pre-construction conference, the Government shall provide the

Contractor with basic contract award data to use for QCS. The Government will provide data updates to the Contractor as needed, generally by files attached to E-mail. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

1.6 DATABASE MAINTENANCE

The Contractor shall establish, maintain, and update data for the contract in the QCS database throughout the duration of the contract. The Contractor shall establish and maintain the QCS database at the Contractor's site office. Data updates to the Government shall be submitted by E-mail with file attachments, e.g., daily reports, schedule updates, payment requests. If permitted by the Contracting Officer, a data diskette or CD-ROM may be used instead of E-mail (see Paragraph DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM). The QCS database typically shall include current data on the following items:

1.6.1 Administration

1.6.1.1 Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver Contractor administrative data in electronic format via E-mail.

1.6.1.2 Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade shall be assigned a unique Responsibility Code, provided in QCS. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver subcontractor administrative data in electronic format via E-mail.

1.6.1.3 Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office shall be prefixed with "S". Letters initiated by the Contractor's home (main) office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

1.6.1.4 Equipment

The Contractor's QCS database shall contain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

1.6.1.5 Management Reporting

QCS includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of QCS. Among these reports are: Progress Payment Request worksheet, QA/QC comments, Submittal Register Status, Three-Phase Inspection checklists.

1.6.2 Finances

1.6.2.1 Pay Activity Data

The QCS database shall include a list of pay activities that the Contractor shall develop in conjunction with the construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. The total of all CLINs equals the Contract Amount.

1.6.2.2 Payment Requests

All progress payment requests shall be prepared using QCS. The Contractor shall complete the payment request worksheet and include it with the payment request. The work completed under the contract, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using QCS. The Contractor shall submit the payment requests with supporting data by E-mail with file attachment(s). If permitted by the Contracting Officer, a data diskette may be used instead of E-mail. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

1.6.3 Quality Control (QC)

QCS provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the QCS generated daily report. The Contractor shall provide the Government a Contractor Quality Control (CQC) Plan within the time required in Section 01451, CONTRACTOR QUALITY CONTROL. Within seven calendar days of Government acceptance, the Contractor shall submit a data diskette or CD-ROM reflecting the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

1.6.3.1 Daily Contractor Quality Control (CQC) Reports.

QCS includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by QCS shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the QCS-generated Daily CQC Report. Daily CQC Reports shall be submitted as required by Section 01451, CONTRACTOR QUALITY CONTROL. Reports shall be submitted electronically to the Government using E-mail or diskette within 24 hours after the date covered by the report. Use of either mode of submittal shall be coordinated with the Government representative. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

1.6.3.2 Deficiency Tracking.

The Contractor shall use QCS to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC punch list items. The Contractor shall maintain a current log of its QC punch list items in the QCS database. The Government will log the deficiencies

it has identified using its QA punch list items. The Government's QA punch list items will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of both QC and QA punch list items.

1.6.3.3 Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in QCS.

1.6.3.4 Accident/Safety Tracking.

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize QCS to advise the Government of any accidents occurring on the jobsite. This brief supplemental entry is not to be considered as a substitute for completion of mandatory reports, e.g., ENG Form 3394 and OSHA Form 200.

1.6.3.5 Features of Work

The Contractor shall include a complete list of the features of work in the QCS database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

1.6.3.6 QC Requirements

The Contractor shall develop and maintain a complete list of QC testing, transferred and installed property, and user training requirements in QCS. The Contractor shall update all data on these QC requirements as work progresses, and shall promptly provide this information to the Government via QCS.

1.6.4 Submittal Management

The Contractor shall provide the initial submittal register, ENG Form 4288, SUBMITTAL REGISTER in electronic format. Thereafter, the Contractor shall maintain a complete list of all submittals, including completion of all data columns. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use QCS to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update, ENG Form 4288, shall be produced using QCS. RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

1.6.5 Schedule

The Contractor shall develop a construction schedule consisting of pay activities, in accordance with Contract Clause "Schedules for Construction Contracts", or Section 01320, PROJECT SCHEDULE, as applicable. This schedule shall be input and maintained in the QCS database either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01320 PROJECT SCHEDULE). The updated schedule data shall be included with each pay request submitted by the Contractor.

1.6.6 Import/Export of Data

QCS includes the ability to export Contractor data to the Government and to import submittal register and other Government-provided data, and schedule data using SDEF.

1.7 IMPLEMENTATION

Contractor use of QCS as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its QCS database, and to provide the Government with regular database updates. QCS shall be an integral part of the Contractor's management of quality control.

1.8 DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

The Government-preferred method for Contractor's submission of updates, payment requests, correspondence and other data is by E-mail with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of computer diskettes or CD-ROM for data transfer. Data on the disks or CDs shall be exported using the QCS built-in export function. If used, diskettes and CD-ROMs will be submitted in accordance with the following:

1.8.1 File Medium

The Contractor shall submit required data on 3-1/2 inch double-sided high-density diskettes formatted to hold 1.44 MB of data, capable of running under Microsoft Windows 95 or newer. Alternatively, CD-ROMs may be used. They shall conform to industry standards used in the United States. All data shall be provided in English.

1.8.2 Disk or CD-ROM Labels

The Contractor shall affix a permanent exterior label to each diskette and CD-ROM submitted. The label shall indicate in English, the QCS file name, full contract number, contract name, project location, data date, name and telephone number of person responsible for the data.

1.8.3 File Names

The Government will provide the file names to be used by the Contractor with the QCS software.

1.9 MONTHLY COORDINATION MEETING

The Contractor shall update the QCS database each workday. At least monthly, the Contractor shall generate and submit an export file to the Government with schedule update and progress payment request. As required in Contract Clause "Payments", at least one week prior to submittal, the Contractor shall meet with the Government representative to review the planned progress payment data submission for errors and omissions. The Contractor shall make all required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Government will not process progress payments until an acceptable QCS export file is received.

1.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification.

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SECTION 01320

PROJECT SCHEDULE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of the specification to the extent referenced. The publications are referenced in the text by basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

ER 1-1-11	(1995) Progress, Schedules, and Network Analysis Systems

1.2 QUALIFICATIONS

The Contractor shall designate an authorized representative who shall be responsible for the preparation of all required project schedule reports.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

Pursuant to the Contract Clause, SCHEDULE FOR CONSTRUCTION CONTRACTS, a Project Schedule as described below shall be prepared. The scheduling of construction shall be the responsibility of the Contractor. Contractor management personnel shall actively participate in its development. Subcontractors and suppliers working on the project shall also contribute in developing and maintaining an accurate Project Schedule. The approved Project Schedule shall be used to measure the progress of the work, to aid in evaluating time extensions, and to provide the basis of all progress payments.

3.2 BASIS FOR PAYMENT

The schedule shall be the basis for measuring Contractor progress. Lack of an approved schedule or scheduling personnel will result in an inability of the Contracting Officer to evaluate Contractor's progress for the purposes of payment. Failure of the Contractor to provide all information, as specified below, shall result in the disapproval of the entire Project Schedule submission and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. In the case where Project Schedule revisions have been directed by the Contracting Officer and those revisions have not been included in the Project Schedule, the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until revisions to the Project Schedule have been made.

3.3 PROJECT SCHEDULE

The computer software system utilized by the Contractor to produce the

Project Schedule shall be capable of providing all requirements of this specification. Failure of the Contractor to meet the requirements of this specification shall result in the disapproval of the schedule. Manual methods used to produce any required information shall require approval by the Contracting Officer.

3.3.1 Use of the Critical Path Method

The Critical Path Method (CPM) of network calculation shall be used to generate the Project Schedule. The Contractor shall provide the Project Schedule in the Precedence Diagram Method (PDM).

3.3.2 Level of Detail Required

The Project Schedule shall include an appropriate level of detail. Failure to develop or update the Project Schedule or provide data to the Contracting Officer at the appropriate level of detail, as specified by the Contracting Officer, shall result in the disapproval of the schedule. The Contracting Officer will use, but is not limited to, the following conditions to determine the appropriate level of detail to be used in the Project Schedule:

3.3.2.1 Activity Durations

Contractor submissions shall follow the direction of the Contracting Officer regarding reasonable activity durations. Reasonable durations are those that allow the progress of activities to be accurately determined between payment periods (usually less than 2 percent of all non-procurement activities' Original Durations are greater than 20 days).

3.3.2.2 Procurement Activities

Tasks related to the procurement of long lead materials or equipment shall be included as separate activities in the project schedule. Long lead materials and equipment are those materials that have a procurement cycle of over 90 days. Examples of procurement process activities include, but are not limited to: submittals, approvals, procurement, fabrication, and delivery.

3.3.2.3 Critical Activities

The following activities shall be listed as separate line activities on the Contractor's project schedule:

a. Submission and approval of mechanical/electrical layout drawings.

b. Submission and approval of O & M manuals.

c. Submission and approval of as-built drawings.

d. Submission and approval of 1354 data and installed equipment lists.

e. Submission and approval of testing and air balance (TAB).

f. Submission of TAB specialist design review report.

g. Submission and approval of fire protection specialist.

h. Submission and approval of testing and balancing of HVAC plus

commissioning plans and data.

i. Air and water balance dates.

j. HVAC commissioning dates.

k. Controls testing plan.

l. Controls testing.

m. Performance Verification testing.

n. Other systems testing, if required.

o. Prefinal inspection.

p. Correction of punchlist from prefinal inspection.

q. Final inspection.

3.3.2.4 Government Activities

Government and other agency activities that could impact progress shall be shown. These activities include, but are not limited to: approvals, inspections, utility tie-in, Government Furnished Equipment (GFE) and Notice to Proceed (NTP) for phasing requirements.

3.3.2.5 Responsibility

All activities shall be identified in the project schedule by the party responsible to perform the work. Responsibility includes, but is not limited to, the subcontracting firm, contractor work force, or government agency performing a given task. Activities shall not belong to more than one responsible party. The responsible party for each activity shall be identified by the Responsibility Code.

3.3.2.6 Work Areas

All activities shall be identified in the project schedule by the work area in which the activity occurs. Activities shall not be allowed to cover more than one work area. The work area of each activity shall be identified by the Work Area Code.

3.3.2.7 Modification or Claim Number

Any activity that is added or changed by contract modification or used to justify claimed time shall be identified by a mod or claim code that changed the activity. Activities shall not belong to more than one modification or claim item. The modification or claim number of each activity shall be identified by the Mod or Claim Number. Whenever possible, changes shall be added to the schedule by adding new activities. Existing activities shall not normally be changed to reflect modifications.

3.3.2.8 Bid Item

All activities shall be identified in the project schedule by the Bid Item to which the activity belongs. An activity shall not contain work in more than one bid item. The bid item for each appropriate activity shall be identified by the Bid Item Code.

3.3.2.9 Phase of Work

All activities shall be identified in the project schedule by the phases of work in which the activity occurs. Activities shall not contain work in more than one phase of work. The project phase of each activity shall be by the unique Phase of Work Code.

3.3.2.10 Category of Work

All Activities shall be identified in the project schedule according to the category of work which best describes the activity. Category of work refers, but is not limited, to the procurement chain of activities including such items as submittals approvals, procurement, fabrication, delivery, installation, start-up, and testing. The category of work for each activity shall be identified by the Category of Work Code.

3.3.2.11 Feature of Work

All activities shall be identified in the project schedule according to the feature of work to which the activity belongs. Feature of work refers, but is not limited to, a work breakdown structure for the project. The feature of work for each activity shall be identified by the Feature of Work Code.

3.3.3 Scheduled Project Completion

The schedule interval shall extend from NTP to the contract completion date.

3.3.3.1 Project Start Date

The schedule shall start no earlier than the date on which the NTP was acknowledged. The Contractor shall include as the first activity in the project schedule an activity called "Start Project". The "Start Project" activity shall have an "ES" constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

3.3.3.2 Constraint of Last Activity

Completion of the last activity in the schedule shall be constrained by the contract completion date. Calculation on project updates shall be such that if the early finish of the last activity falls after the contract completion date, then the float calculation shall reflect a negative float on the critical path. The Contractor shall include as the last activity in the project schedule an activity called "End Project". The "End Project" activity shall have an "LF" constraint date equal to the completion date for the project, and a zero day duration.

3.3.3.3 Early Project Completion

In the event the project schedule shows completion of the project prior to the contract completion date, the Contractor shall identify those activities that have been accelerated and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. Contractor shall specifically address each of the activities noted in the narrative report at every project schedule update period to assist the Contracting Officer in evaluating the Contractor's ability to actually complete prior to the contract period.

3.3.4 Interim Completion Dates

Contractually specified interim completion dates shall also be constrained to show negative float if the early finish date of the last activity in that phase falls after the interim completion date.

3.3.4.1 Start Phase

The Contractor shall include as the first activity for a project phase an activity called "Start Phase X" where "X" refers to the phase of work. The "Start Phase X" activity shall have an "ES" constraint date equal to the date on which the NTP was acknowledged, and a zero day duration.

3.3.4.2 End Phase

The Contractor shall include as the last activity in a project phase an activity called "End Phase X" where "X" refers to the phase of work. The "End Phase X" activity shall have an "LF" constraint date equal to the completion date for the project, and a zero day duration.

3.3.4.3 Phase X

The Contractor shall include a hammock type activity for each project phase called "Phase X" where "X" refers to the phase of work. The "Phase X" activity shall be logically tied to the earliest and latest activities in the phase.

3.3.5 Default Progress Data Disallowed

Actual Start and Finish dates shall not be automatically updated by default mechanisms that may be included in CPM scheduling software systems. Actual Start and Finish dates on the CPM schedule shall match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the Actual Start and Finish dates on the Daily Quality Control report for every in-progress or completed activity, and failure to ensure that the data contained on the Daily Quality Control reports is the sole basis for schedule updating shall result in the disapproval of the Contractor's schedule and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. Updating of the percent complete and the remaining duration of any activity shall be independent functions. Program features which calculate one of these parameters from the other shall be disabled.

3.3.6 Out-of-Sequence Progress

Activities that have posted progress without all preceding logic being satisfied (Out-of-Sequence Progress) will be allowed only on a case-by-case approval of the Contracting Officer. The Contractor shall propose logic corrections to eliminate all out of sequence progress or justify not changing the sequencing for approval prior to submitting an updated project schedule.

3.3.7 Negative Lags

Lag durations contained in the project schedule shall not have a negative value.

3.4 PROJECT SCHEDULE SUBMISSIONS

The Contractor shall provide the submissions as described below. The data

disk, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

3.4.1 Preliminary Project Schedule Submission

The Preliminary Project Schedule, defining the Contractor's planned operations for the first 60 calendar days shall be submitted for approval within 20 calendar days after the NTP is acknowledged. The approved preliminary schedule shall be used for payment purposes not to exceed 60 calendar days after NTP.

3.4.2 Initial Project Schedule Submission

The Initial Project Schedule shall be submitted for approval within 40 calendar days after NTP. The schedule shall provide a reasonable sequence of activities which represent work through the entire project and shall be at a reasonable level of detail.

3.4.3 Periodic Schedule Updates

Based on the result of progress meetings, specified in "Periodic Progress Meetings," the Contractor shall submit periodic schedule updates. These submissions shall enable the Contracting Officer to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgement of the Contracting Officer or authorized representative is necessary for verifying the Contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made.

3.4.4 Standard Activity Coding Dictionary

The Contractor shall use the activity coding structure defined in the Standard Data Exchange Format (SDEF) in ER 1-1-11, Appendix A. This exact structure is mandatory, even if some fields are not used.

3.5 SUBMISSION REQUIREMENTS

The following items shall be submitted by the Contractor for the preliminary submission, initial submission, and every periodic project schedule update throughout the life of the project:

3.5.1 Data Disks

Two data disks containing the project schedule shall be provided. Data on the disks shall adhere to the SDEF format specified in ER 1-1-11, Appendix A.

3.5.1.1 File Medium

Required data shall be submitted on 3.5 disks, formatted to hold 1.44 MB of data, under the MS-DOS Version 5. or 6.x, unless otherwise approved by the Contracting Officer.

3.5.1.2 Disk Label

A permanent exterior label shall be affixed to each disk submitted. The label shall indicate the type of schedule (Preliminary, Initial, Update, or Change), full contract number, project name, project location, data date, name and telephone number or person responsible for the schedule, and the

MS-DOS version used to format the disk.

3.5.1.3 File Name

Each file submitted shall have a name related to either the schedule data date, project name, or contract number. The Contractor shall develop a naming convention that will ensure that the names of the files submitted are unique. The Contractor shall submit the file naming convention to the Contracting Officer for approval.

3.5.2 Narrative Report

A Narrative Report shall be provided with the preliminary, initial, and each update of the project schedule. This report shall be provided as the basis of the Contractor's progress payment request. The Narrative Report shall include: a description of activities along the 2 most critical paths, a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken or required to be taken. The narrative report is expected to relay to the Government, the Contractor's thorough analysis of the schedule output and its plans to compensate for any problems, either current or potential, which are revealed through that analysis.

3.5.3 Approved Changes Verification

Only project schedule changes that have been previously approved by the Contracting Officer shall be included in the schedule submission. The Narrative Report shall specifically reference, on an activity by activity basis, all changes made since the previous period and relate each change to documented, approved schedule changes.

3.5.4 Schedule Reports

The format for each activity for the schedule reports listed below shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float. Actual Start and Actual Finish Dates shall be printed for those activities in progress or completed.

3.5.4.1 Activity Report

A list of all activities sorted according to activity number.

3.5.4.2 Logic Report

A list of Preceding and Succeeding activities for every activity in ascending order by activity number. Preceeding and succeeding activities shall include all information listed above in paragraph Schedule Reports. A blank line shall be left between each activity grouping.

3.5.4.3 Total Float Report

A list of all incomplete activities sorted in ascending order of total float. Activities which have the same amount of total float shall be listed in ascending order of Early Start Dates. Completed activities shall not be shown on this report.

3.5.4.4 Earnings Report

A compilation of the Contractor's Total Earnings on the project from the NTP until the most recent Monthly Progress Meeting. This report shall reflect the Earnings of specific activities based on the agreements made in the field and approved between the Contractor and Contracting Officer at the most recent Monthly Progress Meeting. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining Contractor Payment. Activities shall be grouped by bid item and sorted by activity numbers. This report shall: sum all activities in a bid item and provide a bid item percent; and complete and sum all bid items to provide a total project percent complete. The printed report shall contain, for each activity: the Activity Number, Activity Description, Original Budgeted Amount, Total Quantity, Quantity to Date, Percent Complete (based on cost), and Earnings to Date.

3.5.5 Network Diagram

The network diagram shall be required on the initial schedule submission and on monthly schedule update submissions. The network diagram shall depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

3.5.5.1 Continuous Flow

Diagrams shall show a continuous flow from left to right with no arrows from right to left. The activity number, description, duration, and estimated earned value shall be shown on the diagram.

3.5.5.2 Project Milestone Dates

Dates shall be shown on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.5.5.3 Critical Path

The critical path shall be clearly shown.

3.5.5.4 Banding

Activities shall be grouped to assist in the understanding of the activity sequence. Typically, this flow will group activities by category of work, work area and/or responsibility.

3.5.5.5 S-Curves

Earnings curves showing projected early and late earnings and earnings to date.

3.6 PERIODIC PROGRESS MEETINGS

Progress meetings to discuss payment shall include a monthly onsite meeting or other regular intervals mutually agreed to at the preconstruction conference. During this meeting the Contractor shall describe, on an activity by activity basis, all proposed revisions and adjustments to the project schedule required to reflect the current status of the project. The Contracting Officer will approve activity progress, proposed revisions, and adjustments as appropriate.

3.6.1 Meeting Attendance

The Contractor's Project Manager and Scheduler shall attend the regular progress meeting.

3.6.2 Update Submission Following Progress Meeting

A complete update of the project schedule containing all approved progress, revisions, and adjustments, based on the regular progress meeting, shall be submitted not later than 4 working days after the monthly progress meeting.

3.6.3 Progress Meeting Contents

Update information, including Actual Start Dates, Actual Finish Dates, Remaining Durations, and Cost-to-Date shall be subject to the approval of the Contracting Officer. As a minimum, the Contractor shall address the following items on an activity by activity basis during each progress meeting.

3.6.3.1 Start and Finish Dates

The Actual Start and Actual Finish dates for each activity currently in-progress or completed .

3.6.3.2 Time Completion

The estimated Remaining Duration for each activity in-progress. Time-based progress calculations shall be based on Remaining Duration for each activity.

3.6.3.3 Cost Completion

The earnings for each activity started. Payment will be based on earnings for each in-progress or completed activity. Payment for individual activities will not be made for work that contains quality defects. A portion of the overall project amount may be retained based on delays of activities.

3.6.3.4 Logic Changes

All logic changes pertaining to NTP on change orders, change orders to be incorporated into the schedule, contractor proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress, lag durations, and other changes that have been made pursuant to contract provisions shall be specifically identified and discussed.

3.6.3.5 Other Changes

Other changes required due to delays in completion of any activity or group of activities include: 1) delays beyond the Contractor's control, such as strikes and unusual weather. 2) delays encountered due to submittals, Government Activities, deliveries or work stoppages which make re-planning the work necessary. 3) Changes required to correct a schedule which does not represent the actual or planned prosecution and progress of the work.

3.7 REQUESTS FOR TIME EXTENSIONS

In the event the Contractor requests an extension of the contract completion date, or any interim milestone date, the Contractor shall

furnish the following for a determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract: justification, project schedule data, and supporting evidence as the Contracting Officer may deem necessary. Submission of proof of delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is obligatory to any approvals.

3.7.1 Justification of Delay

The project schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved with this request. The Contracting Officer's determination as to the number of allowable days of contract extension shall be based upon the project schedule updates in effect for the time period in question, and other factual information. Actual delays that are found to be caused by the Contractor's own actions, which result in the extension of the schedule, will not be a cause for a time extension to the contract completion date.

3.7.2 Submission Requirements

The Contractor shall submit a justification for each request for a change in the contract completion date of under 2 weeks based upon the most recent schedule update at the time of the NTP or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

a. A list of affected activities, with their associated project schedule activity number.

b. A brief explanation of the causes of the change.

c. An analysis of the overall impact of the changes proposed.

d. A sub-network of the affected area.

Activities impacted in each justification for change shall be identified by a unique activity code contained in the required data file.

3.7.3 Additional Submission Requirements

For any requested time extension of over 2 weeks, the Contracting Officer may request an interim update with revised activities for a specific change request. The Contractor shall provide this disk within 4 days of the Contracting Officer's request.

3.8 DIRECTED CHANGES

If the NTP is issued for changes prior to settlement of price and/or time, the Contractor shall submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The proposed revisions to the schedule will be approved by the Contracting Officer prior to inclusion of those changes within the project schedule. If the Contractor fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor with suggested revisions to the project schedule. The Contractor shall include these revisions in the project schedule until revisions are submitted, and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer, the Contractor shall advise the Contracting Officer within 2 weeks of receipt of the revisions. Regardless

of the objections, the Contractor shall continue to update the schedule with the Contracting Officer's revisions until a mutual agreement in the revisions is reached. If the Contractor fails to submit alternative revisions within 2 weeks of receipt of the Contracting Officer's proposed revisions, the Contractor will be deemed to have concurred with the Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

3.9 OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

-- End of Section --

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SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 CONTROL AND SCHEDULING OF SUBMITTALS

1.1.1 Submittal Coordination Meeting

After the preconstruction conference and before any submittals are sent to the Contracting Officer's Representative (COR), the Contractor shall meet with the COR and provide and further develop an approved preliminary submittal register, ENG Form 4288. The contractor shall provide a suitable electronic copy for import to the RMS system prior to the submittal coordination meeting. During the meeting all required items will be identified and grouped into three categories:

·Government Approved (G)

Government approval is required for extensions of design, critical materials, variations/deviations, an "or equal" decision, equipment whose compatibility with the entire system must be checked, architectural items such as Color Charts/Patterns/Textures, and other items as designated by the COR. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," these submittals will be acted on as "shop drawings."

·For Information Only (FIO)
Submittals not requiring Government approval, but require submission, will be for information only. These are items such as Installation Procedures, Certificates of compliance, Samples, Qualifications, etc. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," these submittals will not be acted on as "shop drawings."

·For Contractor Only (KIO)
Those items that can be visually inspected by the Contractor's Quality Control Representative (CQC) on site or are provided to the Government other than with an ENG Form 4025: The items that fall into this category shall not be included on the register and shall not be submitted to the COR. For these items, the contractor shall maintain a separate method of tracking and make them available at the appropriate preparatory inspection(s).

1.1.2 Final Submittal Register

The final submittal register shall be coordinated with the progress schedule and submitted within 40 days of Notice to Proceed. In preparing the final document, adequate time (minimum of 30 days) shall be allowed for review and approval, and possible resubmittal of each item on the register.

1.1.3 Submittal Register Updates

The Contractor's quality control representative shall review the listing at least every 30 days and take appropriate action to maintain an effective

system. Copies of updated or corrected listings shall be submitted to the COR at least every 30 days in the quantity specified.

1.2 SUBMITTAL TYPES

Throughout these specifications submittals may be identified with the prefix "SD" (submittal data) followed by a number (category, i.e., data, drawings, reports, etc.). This is for bookkeeping and record sorting in the system:

SD-01 Preconstruction Submittals

Certificates of insurance.
Surety bonds.
List of proposed subcontractors.
List of proposed products.
Construction Progress Schedule.
Submittal register.
Schedule of values.
Health and safety plan.
Work plan.
Quality control plan.
Environmental protection plan.

SD-02 Shop Drawings

Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.

Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.

SD-03 Product Data
Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials or equipment for some portion of the work.

Samples of warranty language when the contract requires extended product warranties.

SD-04 Samples

Physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

SD-O5 Design Data

Calculations, mix designs, analyses or other data pertaining to a part of work.

SD-06 Test Reports

Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project.)

Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

Investigation reports

Daily checklists

Final acceptance test and operational test procedure

SD-07 Certificates

Statements signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

Document required of Contractor, or of a supplier, installer or subcontractor through Contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications. Confined space entry permits.

SD-08 Manufacturer's Instructions

Preprinted material describing installation of a product, system or material, including special notices and Material Safety Data sheets concerning impedances, hazards and safety precautions.

SD-09 Manufacturer's Field Reports
Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

Factory test reports.

SD-10 Operation and Maintenance Data

Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel. This data is needed by operating and maintenance personnel for the safe and efficient

operation, maintenance and repair of the item.

SD-11 Closeout Submittals

Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

1.3 APPROVED SUBMITTALS

The approval of submittals by the COR shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error which may exist. The Contractor, under the CQC requirements of this contract, is responsible for the dimensions and design of adequate connections, details, and satisfactory construction of all work. After submittals have been approved by the COR, no resubmittal for the purpose of substituting materials or equipment will be given consideration.

1.4 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the COR and promptly furnish a corrected submittal in the format and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, written notice, as required under the Contract Clause entitled "Changes," shall be given to the COR.

1.5 PAYMENT

Separate payment will not be made for submittals, and all costs associated therein shall be included in the applicable unit prices or lump sum prices contained in the schedule. Payment will not be made for any material or equipment which does not comply with contract requirements.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

Prior to submittal, all items shall be checked and approved by the Contractor's CQC and each item of the submittal shall be stamped, signed, and dated. Each respective transmittal form (ENG Form 4025) shall be signed and dated by the CQC certifying that the accompanying submittal complies with the contract requirements. This procedure applies to all submittals. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including, but not limited to, catalog cuts, diagrams; operating charts or curves; test reports; test cylinders; samples; O&M manuals including parts lists; certifications; warranties and other such required items. Units of weights and measures used on all submittals shall be the same as the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Government-approval submittals shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. The COR may request submittals in addition to those listed when deemed necessary to adequately describe the work covered in the respective sections. The Contractor shall maintain a complete and up-to-date file of all

submittals/items on site for use by both the Contractor and the Government.

3.2 SUBMITTAL REGISTER (ENG Form 4288)

An electronic copy of the submittal register - ENG Form 4288 - for Divisions 1 through 16 in a format compatible for import into RMS shall be provided by the Contractor and a hard copy shall be further developed by the Contractor prior to the submittal coordination meeting and list each item of equipment and material for which submittals are required in the Technical Specifications. (See paragraph SUBMITTALS at the beginning of each specification section.)The Contractor shall approve all items listed on the submittal register. During the submittal coordination meeting, a preliminary submittal register will be created by annotating this Form 4288. When the final submittal register is submitted for approval, the Contractor shall complete the column entitled "Item No." and all data under "Contractor Schedule Dates" and return five completed copies to the COR for approval. The Contractor shall review the list to ensure its completeness and may expand general category listings to show individual entries for each item. The numbers in column "Item No." are to be assigned sequentially starting with "1" for each specification section. DO NOT preassign transmittal numbers when preparing the submittal register. When a conflict exists between the submittal register and a submittal requirement in the technical sections, other than those submittals referenced in Paragraph 3.9: Field Test Reports, the approved submittal register shall govern. The preliminary, and then the final approved submittal register, will become the scheduling documents and will be updated monthly and used to control submittals throughout the life of the contract. Names and titles of individuals authorized by the Contractor to approve shop drawings shall be submitted to COR with the final 4288 form. Supplier or subcontractors certifications are not acceptable as meeting this requirement.

3.3 SCHEDULING

Submittals covering component items forming a system, or items that are interrelated, shall be coordinated and submitted concurrently. Certifications shall be submitted together with other pertinent information and/or drawings. Additional processing time beyond 30 days, or number of copies, may be shown by the COR on the submittal register attached in the "Remarks" column, or may be added by the COR during the coordination meeting. No delays damages or time extensions will be allowed for time lost due to the Contractor not properly scheduling and providing submittals.

3.4 TRANSMITTAL FORM (ENG Form 4025)

Transmittal Form 4025 (sample at end of this section) shall be used for submitting both Government-approval and information-only submittals in accordance with the instructions on the reverse side of the form. Transmittal numbers shall be assigned sequentially. Electronic generated 4025 forms shall be printed on carbonless paper and be a reasonable facsimile of the original 4025. If electronic forms are not used, the original 4025 forms shall be used (do not photo copy) and will be furnished by the COR. These forms shall be filled in completely prior to submittal. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.. Each submittal item shall be listed separately on the form, naming subcontractor, supplier, or manufacturer, applicable specification paragraph number(s), drawing/sheet number, pay item number, and any other information needed to identify the item, define its use, and locate it in the work. One or more 4025 forms

may be used per specification section, however, DO NOT include more than one specification section per transmittal.

3.5 CROSS-REFERENCE (ENG FORM 4288/ENG FORM 4025)

To provide a cross-reference between the approved submittal register and transmittal forms, the Contractor shall record the "transmittal numbers" assigned when submitting items in column "Transmittal No." of the ENG FORM 4288. The item numbers in column "Item No." of submittal register shall correspond to the item numbers on ENG Form 4025.

3.6 SUBMITTAL PROCEDURE

3.6.1 General

Shop drawings with 4025 forms shall be submitted in the number of copies specified in subparagraphs "Government Approved Submittals" and "Information Only Submittals," or as indicated on the submittal register in the "Remarks" column. Submit a complete collated "reviewers copy" with one 4025 form and attachments (not originals). The remaining copies (4 for Government-approval, 2 for information-only) of 4025 forms and attachments shall not be collated. This would not apply to a series of drawings.

3.6.2 Approval of Submittals by the Contractor

Before submittal to the COR, the Contractor shall review and correct shop drawings prepared by subcontractors, suppliers, and itself, for completeness and compliance with plans and specifications. The Contractor shall not use red markings for correcting material to be submitted. Red markings are reserved for COR's use. Approval by the Contractor shall be indicated on each shop drawing by an approval stamp containing information as shown in this section. Submittals not conforming to the requirements of this section will be returned to the Contractor for correction and resubmittal.

3.6.3 Variations

For submittals which include proposed variations requested by the Contractor, column "h" of ENG Form 4025 shall be checked and the submittal shall be classified as G, and submitted accordingly. The Contractor shall set forth in writing the justification for any variations and annotate such variations on the transmittal form in the REMARKS block. Variations are not approved unless there is an advantage to the Government. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted variations.

3.6.4 Drawings

Each drawing shall be not larger than A1 size (841 mm wide by 594 mm high, or 28 inches high by 40 inches wide), with a title block in lower right hand corner and a 75 mm by 100 mm (3 by 4 inch) clear area adjacent. The title block shall contain the subcontractor's or fabricator's name, contract number, description of item(s), bid item number, and a revision block. Provide a blank margin of 20 mm (3/4 inch) at bottom, 50 mm (2 inches) at left, and 10 mm (1/2 inch) at top and right. Where drawings are submitted for assemblies of more than one piece of equipment or systems of components dependent on each other for compatible characteristics, complete information shall be submitted on all such related components at the same time. The Contractor shall ensure that information is complete and that

sequence of drawing submittal is such that all information is available for reviewing each drawing. Drawings for all items and equipment, of special manufacture or fabrication, shall consist of complete assembly and detail drawings. All revisions after initial submittal shall be shown by number, date, and subject in revision block.

3.6.4.1 Submittals Containing Drawings Larger than 11 inch by 17 inch

For Government-approval submittals containing drawings larger than 11 inch by 17 inch, one reproducible and one blue line copy will be required to be submitted with five copies of the ENG Form 4025. The marked-up reproducible (and/or any review comments contained on the page-size comment sheet(s) at the Government's option) will be returned to the Contractor upon review. The Contractor shall provide three copies of blue line drawings (generated from the reviewed reproducible) to the Government within 10 days of Contractor's receipt of the reviewed reproducible. The Contractor shall not incorporate approved work into the project until the Government has received the three blue line copies. The Contractor shall use the marked-up reproducible to make any additional copies as needed. For information-only submittals, one reproducible and two blue line copies shall be submitted with the appropriate number of copies of ENG Form 4025.

3.6.5 Printed Material

All requirements for shop drawings shall apply to catalog cuts, illustrations, printed specifications, or other data submitted, except that the 75 mm by 100 mm (3 inch by 4 inch) clear area adjacent to the title block is not mandatory. Inapplicable portions shall be marked out and applicable items such as model numbers, sizes, and accessories shall be indicated by arrow or highlighted.

3.7 SAMPLES REQUIRING LABORATORY ANALYSIS

See Section 01451CONTRACTOR QUALITY CONTROL for procedures and address for samples requiring Government testing.

3.8 SAMPLES REQUIRING VISUAL INSPECTION

Samples requiring only physical inspection for appearance and suitability shall be coordinated with the on-site Government quality assurance representative (QAR).

3.9 FIELD TEST REPORTS

Routine tests such as soil density, concrete deliveries, repetitive pressure testing shall be delivered to the QAR with the daily Quality Control reports. See SECTION: 01451 CONTRACTOR QUALITY CONTROL.

3.10 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

3.11 GOVERNMENT APPROVED SUBMITTALS (G)

The Contractor shall submit 5 copies of G submittals with 5 corresponding 4025 forms. Upon completion of G submittal review, copies as specified below will be marked with an action code, dated, and returned to the

Contractor. See "Drawings" above for special instructions if drawings larger than size A3 (11 inch by 17 inch) are used.

3.11.1 Processing of G Submittals

Submittals will be reviewed and processed as follows:

a. Approved as Submitted (Action Code "A"): Shop drawings which can be approved without correction will be stamped "Approved" and two copies will be returned to the Contractor. No resubmittal required.

b. Approved Except as Noted (Action Code "B"): Shop drawings which have only minor discrepancies will be annotated in red to indicate necessary corrections. Marked material will be stamped "Approved Except as Noted" and two copies returned to the Contractor for correction. No resubmittal required.

c. Approved Except as Noted (Action Code "C"): Shop drawings which are incomplete or require more than minor corrections will be annotated in red to indicate necessary corrections. Marked material will be stamped "Approved Except as Noted - Resubmission Required" and two copies returned to the Contractor for correction. Resubmittal of only those items needing correction required.

d. Disapproved (Action Code "E"): Shop drawings which are fundamentally in error, cover wrong equipment or construction, or require extensive corrections, will be returned to the Contractor stamped "Disapproved." An explanation will be furnished on the submitted material or on ENG Form 4025 indicating reason for disapproval. Complete resubmittal required.

e. Resubmittal will not be required for shop drawings stamped "A" or "B" unless subsequent changes are made by Contractor or a contract modification. For shop drawings stamped "C" or "E," Contractor shall make corrections required, note any changes by dating the revisions to correspond with the change request date, and promptly resubmit the corrected material. Resubmittals shall be associated with the "parent" by use of sequential alpha characters (for example, resubmittal of transmittal 8 will be 8A, 8B, etc). Government costs incurred after the first resubmittal may be charged to the Contractor.

3.12 INFORMATION ONLY SUBMITTALS

The Contractor shall submit three copies of data and four copies of ENG Form 4025. Information-only submittals will not be returned. Government approval is not required on information-only submittals. These submittals will be used for information purposes. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the Contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications and will not prevent the COR from requiring removal and replacement if nonconforming material is incorporated in the work. This does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or check testing by the Government in those instances where the technical specifications so prescribe.

3.12.1 Processing of Information-Only Submittals

Information-only submittals shall be submitted prior to delivery of the

material or equipment to the job site. ENG Form 4025 shall be marked with the words "contractor approved - information copy only" in the REMARKS block of the form. Submittals will be monitored and spot checks made. When such checks indicate noncompliance, the Contractor will be notified by the same method used for Government-approval submittals. Resubmittal of nonconforming information-only submittals shall be reclassified Government-approval and shall be in five copies.

3.13 CONTRACTOR APPROVAL STAMP

The stamp used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

CONTRACTOR

(Firm Name)

_____ Approved

_____ Approved with corrections as noted on submittal data and/or attached sheets(s).

SIGNATURE: _____

TITLE: _____

DATE: _____

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE *(Read instructions on the reverse side prior to initiating this form)*	DATE	TRANSMITTAL NO.

SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS *(This section will be initiated by the contractor)*

TO:	FROM:	CONTRACT NO.	CHECK ONE: ☐ THIS IS A NEW TRANSMITTAL ☐ THIS IS A RESUBMITTAL OF TRANSMITTAL _____
SPECIFICATION SEC. NO. *(Cover only one section with each transmittal)*	PROJECT TITLE AND LOCATION		CHECK ONE: THIS TRANSMITTAL IS FOR GOV'T. APPROVAL ☐ FIO

ITEM NO. *a.*	DESCRIPTION OF ITEM SUBMITTED ***(Type size, model number/etc.)*** *b.*	MFG OR CONTR. CAT., CURVE DRAWING OR BROCHURE NO. ***(See instruction no. 8)*** *c.*	NO. OF COPIES *d.*	CONTRACT REFERENCE DOCUMENT		FOR CONTRACTOR USE CODE *g.*	VARIATION ***(See instruction No. 6)*** *h.*	FOR CE USE CODE *i.*
				SPEC. PARA. NO. *e.*	DRAWING SHEET NO. *f.*			

REMARKS

I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as other wise stated.

NAME AND SIGNATURE OF CONTRACTOR

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED *(List by Item No.)*	NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY	DATE

INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.

2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new submittal number.

3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288-R for each entry on this form.

4. Submittals requiring expeditious handling will be submitted on a separate form.

5. Separate transmittal form will be used for submittals under separate sections of the specifications.

6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications--also, a written statement to that effect shall be included in the space provided for "Remarks".

7. Form is self-transmittal, letter of transmittal is not required.

8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.

9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g, to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

A	--	Approved as submitted.	E	--	Disapproved (See attached).
B	--	Approved, except as noted on drawings.	F	--	Receipt acknowledged.
C	--	Approved, except as noted on drawings. Refer to attached sheet resubmission required.	FX	--	Receipt acknowledged, does not comply as noted with contract requirements.
D	--	Will be returned by separate correspondence.	G	--	Other *(Specify)*

10. Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.

(Reverse of ENG Form 4025-R)

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION
Cofferdam & Excavation

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION		
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		02212	SD-01 Preconstruction Submittals														
			General Blasting Plan	3.2	G												
			Individual Blast Plans	3.2	G												
			Blasting Safety Plan	3.2	G												
			Emergency Response Plan	3.2	G												
			Pre-Blast Inspection Survey														
			SD-03 Product Data														
			Material Safety Data Sheets	3.2	G												
			Vibration Monitoring Software		G												
			SD-07 Certificates														
			Quality Control Submittals		G												
		02214	SD-01 Preconstruction Submittals														
			Installation Plan	1.7.2	G												
			Installation Plan	3.2	G												
			Instrumentation Site Plan	3.7	G												
			Implementation of Action Plans	3.15	G												
			SD-02 Shop Drawings														
			As-Built Location Plan		G												
			SD-03 Product Data														
			Manufacturer's Product Data		G												
			SD-06 Test Reports														
			Pre-Installation Test Record														
			Report														
			Instrument Test Report														
			Installation Record Sheet														
			Instrument Reading Report	3.10.1													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Cofferdam & Excavation

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		02214	Groundwater Control															
			Summary of Support System															
			Construction Activities															
			Summary of Excavation and															
			Filling Activities															
			Summary of Construction															
			Activities other than Excavation															
			Summary Report of Unusual															
			Events															
			Inclinometer/Multi-point borehole															
			Extensometer Cross Section															
			SD-07 Certificates															
			Personnel Qualifications		G													
		02217	SD-01 Preconstruction Submittals															
			Equipment		G													
			Personnel		G													
			Foundation Preparation Plan		G													
			SD-03 Product Data															
			Tools	3.2.1.1	G													
		02220	SD-03 Product Data															
			Work Plan		G													
		02251	SD-03 Product Data															
			Drilling Equipment	3.1.2														
			Grouting Equipment	3.1.3														
			Grout Material	1.2.1.2	G													
			Grout Material	2.1	G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Cofferdam & Excavation

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		02251	Grout Plant	3.1.3	G													
			SD-06 Test Reports															
			Grouting Operations	3.3.9														
			SD-07 Certificates															
			Contractor Qualifications															
		02300	SD-01 Preconstruction Submittals															
			Excavation Plan															
			SD-03 Product Data															
			Earthwork		G													
			Rockfall Control Measures		G													
			SD-06 Test Reports															
			Testing		G													
			SD-07 Certificates															
			Testing		G													
		02330	SD-01 Preconstruction Submittals															
			Earth Berm Cut-off Wall Design		G													
			and Plan															
		02464	SD-02 Shop Drawings															
			Metal Sheet Piling	2.1	G													
		02490	SD-01 Preconstruction Submittals															
			Fabrication and Installation		G													
			Drawings															
			Equipment	3.1														
			Fabricator Qualifications	1.5.1	G													
			Installer Qualifications	1.5.2	G													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Cofferdam & Excavation

CONTRACTOR

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		02490	Core Logging and Soil Sampling		G												
			Qualifications														
			Installation Plan		G												
			SD-06 Test Reports														
			Prestressing Steel	2.5													
			Cement Grout Mixture Proportions	2.3.5.1													
			SD-07 Certificates														
			Prestressing Steel	2.5													
			SD-11 Closeout Submittals														
			Anchor Records	3.5.4													
		02491	SD-01 Preconstruction Submittals														
			Fabrication and Installation		G												
			Drawings														
			Equipment	3.1													
			Fabricator Qualifications	1.6.1	G												
			Installer Qualifications	1.6.2	G												
			Installation Plan		G												
			SD-06 Test Reports														
			Grade 75 and 150 Steel														
			Cement Grout Mixture Proportions	2.2.4.1													
			Rock Bolt Performance Testing	3.5.2	G												
			SD-07 Certificates														
			Grade 75 and 150 Steel														
			Epoxy-Coated Rock Bolts	2.1.1.1													
			SD-11 Closeout Submittals														
			Rock Bolt Records	3.5.4													

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Cofferdam & Excavation

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		02491	Drilling Logs														
		02521	SD-02 Shop Drawings														
			Installation Diagrams	3.14.1													
			SD-03 Product Data														
			Well Installation Plan	1.5	G												
			Dewatering	1.6	G												
			Dewatering	3.6	G												
			Catalog Data														
			Qualifications	1.7													
			Permits	1.12													
			SD-06 Test Reports														
			Survey Maps and Notes	3.14.4													
			Well Development Records	3.14.2													
			Decommissioning/Abandonment	3.13													
			Records														
			Decommissioning/Abandonment	3.14.3													
			Records														
			Filter Pack	2.3													
			Tests														
			Well Capacity Test	1.5													
			Well Capacity Test	3.7													
			Water Source	3.2.1	G												
			Weekly Monitoring Report	3.6													
		02525	SD-01 Preconstruction Submittals														
			Protection from Damage														
			SD-02 Shop Drawings														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Cofferdam & Excavation

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION	GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY						REMARKS
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		02525	Shop Drawings	1.4.1	G													
			SD-03 Product Data															
			Well Screen	2.1	G													
			Filter Pack	2.3	G													
			Cement Grout Mixture Proportion		G													
			SD-06 Test Reports															
			Tests	3.5														
		02845	SD-01 Preconstruction Submittals															
			Tieback Wall Work Plan		G													
			Tieback Installation		G													
			Mix Design		G													
			SD-02 Shop Drawings															
			Tieback Drawings		G													
			SD-03 Product Data															
			Steel Solider Piles		G													
			Concrete		G													
			Reinforcing Steel		G													
			Geocomposite		G													
			SD-06 Test Reports															
			Concrete Mix Design		G													
			SD-07 Certificates															
			Piles		G													
			Tiebacks		G													
		02921	SD-03 Product Data															
			Surface Erosion Control Material	2.5														
			Chemical Treatment Material	1.2.3														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Cofferdam & Excavation

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY						
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		02921	Equipment	3.1.3													
			Delivery	1.2.1													
			Quantity Check	3.5													
			Seed Establishment Period	3.7													
			Maintenance Record	3.7.3.2													
			SD-06 Test Reports														
			Equipment Calibration	3.1.3													
			Soil Test	2.2.1													
			Soil Test	3.2.2													
			SD-07 Certificates														
			Seed	2.1													
			Fertilizer	2.2.1													
			Mulch	2.3													
			Asphalt Adhesive														
			Temporary Erosion Control Plan	3.4.1	G												
		03100	SD-02 Shop Drawings														
			Formwork	3.1.1													
			SD-03 Product Data														
			Design	1.3													
			Form Materials	2.1													
			Form Releasing Agents	2.1.5													
			SD-07 Certificates														
			Fiber Voids	2.1.6													
		03151	SD-02 Shop Drawings														
			Bladder Seals, Waterstops, and		G												
			Neoprene Sheet Expansion Joint														

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Cofferdam & Excavation

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		03151	SD-03 Product Data														
			Preformed Expansion Joint Filler,		G												
			Polyethylene Joint Filler Foam,														
			Sealant, Bladder Grouted Seals,														
			and Waterstops														
			SD-04 Samples														
			Preformed Compression Seals	3.1.1.5													
			Lubricants														
			Field-Molded Sealants and Primer	2.1.4.1													
			Field-Molded Sealants and Primer	2.2.1.1													
			Non-Metallic Waterstops and														
			Splices														
			Bladder Grouted Seals	2.1.6													
			Bladder Grouted Seals	2.2.3													
			SD-07 Certificates														
			Preformed Expansion Joint Filler,														
			Polyethylene Joint Filler Foam,														
			Sealant, Waterstops, and														
			Neoprene														
			SD-08 Manufacturer's Instructions														
			Preformed Expansion Joint Filler,														
			Polyethylene Joint Filler Foam,														
			Sealant, Waterstops, and														
			Neoprene														
		03201	SD-02 Shop Drawings														
			Fabrication and Placement	3.2	G												

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Cofferdam & Excavation

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY						
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		03201	SD-03 Product Data														
			Butt-Splices	3.2.4.2	G												
			Materials	2.1	G												
			SD-06 Test Reports														
			Material	2.2	G												
			Tests, Inspections, and	2.2	G												
			Verifications														
			SD-07 Certificates														
			Qualification of Steel Bar	2.2.2	G												
			Butt-Splicers														
		03301	SD-01 Preconstruction Submittals														
			Concrete Placement Plan		G												
			Construction Joint Treatment	3.2.3													
			Curing and Protection	3.5													
			SD-03 Product Data														
			Concrete Mixture Proportioning	2.2	G												
			Batch Plant	3.1.2													
			Concrete Mixers	3.1.3													
			Capacity	3.1.1													
			Conveying Equipment	3.1.4													
			Placing Equipment	3.1.1													
			Cold-Weather Placing	3.3.4	G												
			Hot-Weather Placing	3.3.5	G												
			Finishing	3.4	G												
			SD-04 Samples														
			Aggregates	1.3.1.1	G												

SUBMITTAL REGISTER

CONTRACT NO.

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		03301	Cementitious Materials,	1.3.1.2	G												
			Admixtures, and Curing Compound														
			SD-06 Test Reports														
			Quality of Aggregates	3.7.2.3	G												
			Mixer Uniformity	3.7.2.13													
			Tests and Inspections	3.7													
			SD-07 Certificates														
			Tests and Inspections	3.7													
			Testing Technicians	3.7.1													
			Concrete Transportation	3.7.1													
			Construction Inspector (CTCI)														
			Cementitious Materials	2.1.1	G												
			Impervious-Sheet Curing		G												
			Materials														
			Air-Entraining Admixture	2.1.3.1	G												
			Other Chemical Admixtures	2.1.3.3	G												
			Membrane-Forming Curing	2.1.4.1	G												
			Compound														
			Epoxy Resin	2.1.7	G												
			Latex Bonding Compound		G												
			Nonshrink Grout	2.1.6	G												
		03371	SD-06 Test Reports														
			Mixture Proportions	1.4	G												
			Aggregates	2.1.2	G												
			Accelerator Compatibility	2.1.4.1	G												
			Preconstruction Test Panels	1.7	G												

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Cofferdam & Excavation

CONTRACTOR

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		03371	SD-07 Certificates															
			Portland Cement	2.1.1.1	G													
			Pozzolans		G													
			Silica Fume	2.1.1.2	G													
			Accelerating Admixtures	2.1.4.1	G													
			Curing Materials	2.1.5	G													
			Steel Fiber Reinforcement	2.1.6	G													
			Qualifications	1.6	G													
		03400	SD-01 Preconstruction Submittals															
			Concrete Materials		G													
			Concrete and Grout Placement	3.4.1	G													
			Pre & Post Survey		G													
		03440	SD-02 Shop Drawings															
			Shop Drawings		G													
			SD-06 Test Reports															
			Test Reports		G													
			SD-07 Certificates															
			Mix Design		G													
			Manufacturer's Qualifications		G													
			Certificates															
		03730	SD-05 Design Data															
			Mix Proportions		G													
			SD-07 Certificates															
			Epoxy Resin for Drilled-In		G													
			Reinforcing Bars and Anchor Bolts															
			Environmental Control															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Cofferdam & Excavation

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		03730	Handling of Materials															
			Certificates of Compliance															
			SD-08 Manufacturer's Instructions															
			Application Control		G													
		05055	SD-02 Shop Drawings															
			Detail Drawings	1.3	G													
			SD-03 Product Data															
			Welding of Structural Steel	2.2.2.1	G													
			Welding of Aluminum	2.2.2.3	G													
			Structural Steel Welding Repairs	2.3.4	G													
			Materials Orders	2.1.1														
			Materials List	2.1.2														
			Shipping Bill	2.1.3														
			SD-06 Test Reports															
			Tests, Inspections, and Verifications	2.3														
			SD-07 Certificates															
			Qualification of Welders and Welding Operators	1.4														
			Application Qualification for Steel Studs	2.2.2.4	G													
			Welding of Aluminum	2.2.2.3														
		05120	SD-02 Shop Drawings															
			Structural Steel System		G													
			Structural Connections	3.2.1	G													
			SD-03 Product Data															

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Cofferdam & Excavation

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
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		05120	Erection	3.2	G												
			Welding	3.3	G												
			SD-04 Samples														
			High Strength Bolts and Nuts	2.5													
			Carbon Steel Bolts and Nuts	2.6													
			Nuts Dimensional Style	2.7													
			Washers	2.8													
			SD-07 Certificates														
			Mill Test Reports														
			Welder Qualifications														
			Welding Inspector	1.5													
			Fabrication	3.1													
		05500	SD-02 Shop Drawings														
			Miscellaneous Metal Items	1.6	G												
		05616	SD-02 Shop Drawings														
			Detail Drawings	2.3.1	G												
			SD-03 Product Data														
			Welding	2.3.3	G												
			Materials	2.1													
			Materials Disposition Records														
			SD-06 Test Reports														
			Tests, Inspections, and Verifications	2.4													
		09965	SD-01 Preconstruction Submittals														
			Waste Classification, Handling, and Disposal Plan		G												

SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION: Cofferdam & Excavation

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH #	CLASSIFICATION GOVT OR A/E REVWR	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION			APPROVING AUTHORITY						
						SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	ACTION CODE	DATE OF ACTION	DATE FWD TO APPR AUTH/ DATE RCD FROM CONTR	DATE FWD TO OTHER REVIEWER	DATE RCD FROM OTH REVIEWER	ACTION CODE	DATE OF ACTION	MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)
		09965	SD-04 Samples														
			Special Paint Formulas		G												
			Specification and Proprietary		G												
			Paints														
			Thinners		G												
			SD-06 Test Reports														
			Inspections and Operations		G												

SECTION 01451

CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740	(1999b) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(1998a) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable unit prices or lump-sum prices contained in the Bidding Schedule.

1.3 LABORATORY VALIDATION

The testing laboratory shall be validated by Corps of Engineers Material Testing Center (MTC) for all tests required by contract. See paragraph 3.7 TESTS.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. The site project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with the quality requirements specified in the contract. The site project superintendent in this context shall be the highest level manager responsible for the overall construction activities at the site, including quality and production. The site project superintendent shall maintain a physical presence at the site at all times, except as otherwise acceptable

to the Contracting Officer, and shall be responsible for all construction and construction related activities at the site.

3.2 QUALITY CONTROL PLAN

The Contractor shall furnish for review by the Government, not later than 10 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, tests, records, and forms to be used. The Government will consider an interim plan for the first 60 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.2.1 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project superintendent.

b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.

c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Government.

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01330 SUBMITTAL PROCEDURES.

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Contracting Officer.)

f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.

h. Reporting procedures, including proposed reporting formats.

i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

3.2.2 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.3 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of 5 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 Personnel Requirements

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure safety and contract compliance. The Safety and Health Manager shall receive direction and authority from the CQC System Manager and shall serve as a member of

the CQC staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization.The Contractor's CQC staff shall maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer. The Contractor shall provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Complete records of all letters, material submittals, show drawing submittals, schedules and all other project documentation shall be promptly furnished to the CQC organization by the Contractor. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer, graduate architect, or a graduate of construction management, with a minimum of 5 years construction experience on construction similar to this contract. or a construction person with a minimum of 10 years in related work. This CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. The CQC System Manager shall be assigned no other duties. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager.

3.4.3 Additional Requirement

In addition to the above experience and/or education requirements the CQC System Manager shall have completed the course entitled "Construction Quality Management For Contractors". This course is periodically offered at AGC offices throughout the state of Washington and Oregon.

3.4.4 Organizational Changes

The Contractor shall maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5 SUBMITTALS AND DELIVERABLES

Submittals, if needed, shall be made as specified in Section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements. When Section 15950A HEATING, VENTILATING AND AIR CONDITIONING (HVAC) CONTROL SYSTEMS, 15951A DIRECT DIGITAL CONTROL FOR HVAC; 15990A TESTING, ADJUSTING, AND BALANCING OF HVAC SYSTEMS; or 15995A COMMISSIONING OF HVAC SYSTEMS are included in the contract, the submittals required by these sections shall be coordinated with Section 01330 SUBMITTAL PROCEDURES to ensure adequate time is allowed for each type of submittal required. All Contractor forms for submitting test results are subject to Contracting Officer approval.

3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

a. A review of each paragraph of applicable specifications, reference codes, and standards. A copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field shall be made available by the Contractor at the preparatory inspection. These copies shall be maintained in the field and available for use by Government personnel until final acceptance of the work.

b. A review of the contract drawings.

c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.

d. Review of provisions that have been made to provide required control inspection and testing.

e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.

f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.

g. A review of the appropriate activity hazard analysis to assure safety requirements are met.

h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.

i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.

j. Discussion of the initial control phase.

k. The Government shall be notified at least 48 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to

the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.

b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.

c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

d. Resolve all differences.

e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

f. The Government shall be notified at least 24 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if: the quality of on-going work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

3.7 TESTS

3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that

control measures are adequate to provide a product which conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

a. Verify that testing procedures comply with contract requirements.

b. Verify that facilities and testing equipment are available and comply with testing standards.

c. Check test instrument calibration data against certified standards.

d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2 Testing Laboratories

a. Validation

The testing laboratory shall be validated by the Corps of Engineers Materials Testing Center (MTC) for all tests required by the contract prior to the performance of any such testing. The validation of a laboratory is site specific and cannot be transferred or carried over to a facility at a different location. Any and all costs associated with this Government laboratory validation shall be borne by the laboratory and/or the Contractor. Validation of a laboratory is not granted for the entire laboratory activity, but only for the specific procedures requested by the inspected laboratory. The inspected laboratory has full choice of the procedures to be inspected except that the Quality Assurance portion of ASTM E 329 is mandatory to be inspected.

(1) Validation Procedures

Validation of a laboratory may consist of either an inspection or audit as defined herein. Validation of all material testing laboratories shall be performed by the MTC. Validation may be accomplished by one of the following processes:

(a) Inspection. Inspection shall be performed by the MTC in accordance with American Society for Testing and Materials (ASTM) standards ASTM E 329 and ASTM D 3740.

(b) Audit. A laboratory may be validated by auditing if it has been accredited by the Concrete and Cement Reference Laboratory (CCRL) or AASHTO Materials Reference Laboratory (AMRL) within the past two years in accordance with ASTM E329. Audit shall be performed by the MTC. Inspection by MTC may be required after auditing if one or more of the critical testing procedures required in the project specification were not included in the CCRL or AMRL inspection report or if there is any concern that the laboratory may not be able to provide required services.

b. Standards of Acceptability

(1) Aggregate, concrete, bituminous materials, soil, and rock. Laboratories for testing aggregate, concrete, bituminous materials, soil, and rock shall be validated for compliance with ASTM E 329, Engineer Manual (EM) 1110-2-1906, or project specifications, as applicable.

(2) Water, sediment, and other samples. Laboratories engaged in analysis of water, sediment, and other samples for chemical analysis shah be inspected to assure that they have the capability to perform analyses and quality control procedures described in references in Appendix A as appropriate. The use of analytical methods for procedures not addressed in these references will be evaluated by the CQAB for conformance with project or program requirements.

(3) Steel and other construction materials, Laboratories testing steel and other construction materials shall be validated for capabilities to perform tests required by project requirements and for compliance with ASTM E 329.

c. Validation Schedule

(1) For all contracted laboratories and project Quality Assurance (QA) laboratories testing aggregate, concrete, bituminous materials, soils, rock, and other construction materials, an initial validation shall be performed prior to performance of testing and at least every two (2) years thereafter.

(2) Laboratories performing water quality, wastewater, sludge, and sediment testing shall be approved at an interval not to exceed eighteen (18) months.

(3) All laboratories shall be revalidated at any time at the discretion of the Corps of Engineers when conditions are judged to differ substantially from the conditions when last validated.

d. Validation Process

If a validated laboratory is unavailable or the Contractor selects to use a laboratory which has not been previously validated, Contractor shall coordinate with Corps of Engineers Material Testing Center (MTC) to obtain validation and pay all associated costs. Point of contact at MTC is Daniel Leavell, telephone (601) 634-2496, fax (601) 634-4656, email daniel.a.leavell@erdc.usace.army.mil, at the following address:

U.S. Army Corps of Engineers
Materials Testing Center
Engineering Research and Development Center (ERDC)
3909 Hall Ferry Road
Vicksburg, MS 39180-6199

Procedure for Corps of Engineers validation, including qualifications and inspection/audit request forms are available at the MTC web site:

http://www.wes.army.mil/SL/MTC/mtc.htm

Contractor shall coordinate directly with the MTC to obtain validation. Contractor is cautioned the validation process is complicated and lengthy, may require an onsite inspection by MTC staff, correction of identified deficiencies, and the submittal and approval of significant documentation. Estimate a minimum of 60 days to schedule an inspection/submittal and receive a validation. Cost of onsite inspections is $4500 plus travel time and cost from Vicksburg MS. Cost of audits is $2500. If an onsite inspection is required following an audit, the cost of the inspection shall be $2500 plus travel time and cost. The Contractor will be invoiced for actual travel costs and shall submit payment direct to the MTC made payable to the ERDC Finance and Accounting Officer prior to the scheduling of the inspection and/or audit. The Contractor shall copy the Contracting Officer of all correspondence and submittals to the MTC for purposes of laboratory validation.

3.7.3 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials shall be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered to the Corps of Engineers Division Laboratory, f.o.b., at the following address:

U.S. Army Corps of Engineers
Materials Testing Center
Engineering Research and Development Center (ERDC)
3909 Hall Ferry Road
Vicksburg, MS 39180-6199
Phone: (601) 634-2496 or (601) 634-3261

ATTN: Project _____, Contract Number _____

Coordination for each specific test, exact delivery location and dates will be made through the Area Office. If samples are scheduled to arrive at the laboratory on a weekend (after 1700 Friday through Sunday) notify the laboratory at least 24 hours in advance at (601) 634-2496 to arrange for delivery.

3.8 COMPLETION INSPECTION

3.8.1 Punch-Out Inspection

Near the completion of all work or any increment thereof established by a completion time stated in the Special Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a punch list of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

3.8.2 Pre-Final Inspection

The Government will perform the pre-final inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government, so that a Final inspection with the customer can be scheduled. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate completion dates.

3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance at the final acceptance inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notice shall be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and shall include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work

performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

a. Contractor/subcontractor and their area of responsibility.

b. Operating plant/equipment with hours worked, idle, or down for repair.

c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.

d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase shall be identified (Preparatory, Initial, Follow-up). List of deficiencies noted, along with corrective action.

e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.

f. Submittals and deliverables reviewed, with contract reference, by whom, and action taken.

g. Offsite surveillance activities, including actions taken.

h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

i. Instructions given/received and conflicts in plans and/or specifications.

j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System

Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.10 SAMPLE FORMS

Sample forms enclosed at the end of this section.

3.11 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

(sample of typical Contractor's Daily Report)
DAILY CONSTRUCTION QUALITY CONTROL REPORT

Contract Number: _____ Date: _____ Rpt. No._____

Contract Title: _____ Location: _____

Weather: Clear __ P. Cloudy __ Cloudy __ Rainfall __ (__% of workday)

Temperature during workday: High _____ degrees F. Low ___ degrees F.

1. WORK PERFORMED BY CONTRACTOR/SUBCONTRACTOR(S):
Contractor Name No. of Workers Crafts/Hours Work performed

2. EQUIPMENT DATA:
Type, Size, Etc. Owned/Rented Hours Used Hours Standby

3. QUALITY CONTROL INSPECTIONS AND RESULTS: (Include a description of preparatory, initial, and/or follow up inspections or meetings; check of subcontractors work and materials delivered to the site compared to submittals and/or specifications; comments on the proper storage of materials; include comments on corrective actions to be taken):

4. QUALITY CONTROL TESTING AND RESULTS (comment on tests and attach test reports):

5. DAILY SAFETY INSPECTIONS (Include comments on new hazards to be added to the Hazard Analysis and corrective action of any safety issues):

_____

_____

6. REMARKS (Include conversations with or instructions from the Government representatives; delays of any kind that are impacting the job; conflicts in the contract documents; comments on change orders; environmental considerations; etc.):

_____

_____

_____

_____

_____

CONTRACTOR'S VERIFICATION: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the contract documents except as noted above.

_____
CONTRACTOR QC REPRESENTATIVE

(Sample of Typical Contractor's Test Report)

TEST REPORT

STRUCTURE OR BUILDING _____

CONTRACT NO. _____

DESCRIPTION OF ITEM, SYSTEM, OR PART OF SYSTEM TESTED:
_____

_____

DESCRIPTION OF TEST: _____

_____

_____

NAME AND TITLE OF PERSON IN CHARGE OF PERFORMING TESTS FOR THE CONTRACTOR:

NAME_____

TITLE_____

SIGNATURE_____

I HEREBY CERTIFY THAT THE ABOVE DESCRIBED ITEM, SYSTEM, OR PART OF SYSTEM HAS BEEN TESTED AS INDICATED ABOVE AND FOUND TO BE ENTIRELY SATISFACTORY AS REQUIRED IN THE CONTRACT SPECIFICATIONS.

SIGNATURE OF CONTRACTOR
QUALITY CONTROL

INSPECTOR_____

DATE_____

REMARKS
_____

_____

_____

-- End of Section --

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SECTION 01501

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 AVAILABILITY OF UTILITY SERVICES

1.1.1 The Contractor shall be responsible for providing his or her own water and electricity. Water may be drawn from the reservoir but such water is not regarded as potable. If the contractor intends to use reservoir water for concrete, the ACI provisions on the use of non-potable water shall govern. To ensure water quality, the Contractor shall provide a backflow prevention device, approved by the Contracting Officer, for use in drawing water from the reservoir.

1.1.2 Water can also be obtained from the well shown on the drawings.

1.2 SANITARY PROVISIONS

Contractor shall provide sanitary accommodations for the use of employees as may be necessary and shall maintain accommodations approved by the Contracting Officer and shall comply with the requirements and regulations of the State Health Department, County Sanitarian, or other authorities having jurisdiction.

1.3 TEMPORARY ELECTRIC WIRING

1.3.1 Temporary Power and Lighting

The Contractor shall provide construction power facilities in accordance with the safety requirements of the National Electric Code NFPA No. 70 and the SAFETY AND HEALTH REQUIREMENTS MANUAL EM 385-1-1. The Contractor, or its delegated subcontractor, shall enforce the safety requirements of electrical extensions for the work of subcontractors. Work shall be accomplished by journeyman electricians.

1.3.2 Construction Equipment

In addition to the requirements of SAFETY AND HEALTH REQUIREMENTS MANUAL, EM 385-1-1, temporary wiring conductors installed for operation of construction tools and equipment shall be either Type TW or THW contained in metal raceways, or shall be hard usage or extra hard usage multiconductor cord. Temporary wiring shall be secured above the ground or floor in a workmanlike manner and shall not present an obstacle to persons or equipment. Open wiring may only be used outside of buildings, and then only in accordance with the provisions of the National Electric Code.

1.3.3 Submittals

Submit detailed drawings of temporary power connections. Drawings shall include, but not be limited to, main disconnect, grounding, service drops, service entrance conductors, feeders, GFCI'S, and all site trailer connections.

1.3.4 Phone Facilities

The Government will provide telephone service for the project. The service

will include 3 separate lines for the sole use of the contractor.

1.4 FIRE PROTECTION

During the construction period, the Contractor shall provide fire extinguishers in accordance with the safety requirements of the SAFETY AND HEALTH REQUIREMENTS MANUAL, EM 385-1-1. The Contractor shall remove the fire extinguishers at the completion of construction.

1.5 STAGING AREA

Contractor will be provided adequate open staging area as directed by the Contracting Officer. Area is unsecured, and Contractor shall make provisions for its own security.

Contractor shall be responsible for keeping staging area, and office area clean and free of weeds and uncontrolled vegetation growth. Weeds shall be removed by pulling or cutting to within 1-inch of ground level. Lawn areas shall be mown to keep growth to less than 2-inches. All loose debris and material subject to being moved by prevailing winds in the area shall be picked up or secured at all times.

If the area is not maintained in a safe and clean condition as defined above the Contracting Officer may have the area cleaned by others with the costs being deducted from the Contractor's payment.

The Contractor may use the area in front of the spillway for staging subject to the following:

A. TThe Contractor's equipment located in that area must be removed within 8 hours upon forecast of a flood that has the potential to inundate the area. The Contractor's equipment shall be moved to areas above elevation 1,220 ft. and must remain until the Contracting Officer allows re-mobilization to that area as specified in Section 01050 of this document.

B. The Contractor's use of the area allows for unimpeded access for normal operations by the Dam operations personnel.

1.6 HOUSEKEEPING AND CLEANUP

Pursuant to the requirements of Clause CLEANING UP and Clause ACCIDENT PREVENTION, of the CONTRACT CLAUSES, the Contractor shall assign sufficient personnel to ensure compliance. The Contractor shall submit a detailed written plan for implementation of this requirement. The plan will be presented as part of the preconstruction safety plan and will provide for keeping the total construction site, structures, and accessways free of debris and obstructions at all times. Work will not be allowed in those areas that, in the opinion of the Contracting Officer, have unsatisfactory cleanup and housekeeping at the end of the preceding day's normal work shift. At least once each day all areas shall be checked by the Quality Control person of the Contractor and the findings recorded on the Quality Control Daily Report. In addition, the Quality Control person shall take immediate action to ensure compliance with this requirement. Housekeeping and cleanup shall be assigned by the Contractor to specific personnel. The name(s) of the personnel shall be available at the project site.

1.7 PROJECT SIGN

Contractor shall furnish and install one project identification sign and one safety performance sign in accordance with conditions hereinafter specified and layout shown on drawings attached at end of this section, except Corps communication mark will be Government furnished. Corps communication mark shall be secured with galvanized screws. All lettering shall be block type, upper case. Letters shall be painted black on white background using exterior-type paint. Sign shall be maintained in excellent condition throughout life of job. Project sign shall be located as directed. Upon completion of project, sign shall be removed and shall remain the property of Contractor except Corps communication mark will remain property of the Government.

1.8 ELEVATED WORK AREAS

Workers in elevated work areas in excess of 6 feet above an adjoining surface require special safety attention. In addition to the provisions of SAFETY AND HEALTH REQUIREMENTS MANUAL, EM 385-1-1, the following safety measures are required to be submitted to the Contracting Officer's Representative. Prior to commencement of work in elevated work areas, the Contractor shall submit drawings depicting all provisions of his positive fall protection system including, but not limited to, all details of guardrails. If safety belts and harnesses are used, the positive fall protection plan will address fall restraint versus fall arrest. Body belts will ONLY be used for fall restraint, they will not be used for fall arrest.

1.9 CONSTRUCTION COORDINATION MEETINGS

Contractor shall attend a weekly coordination meeting with the Contracting Officer's Representative and representatives of the using service. During the meeting, the Contractor shall be required to present in writing, and discuss his specific construction plans for, the following 2-week period. The first week's schedule shall be firm and the second weeks' schedule may be tentative and subject to change as conditions warrant. The schedule shall be detailed describing planned work activities, crew sizes and locations, and any utility and access restrictions to base activity which may be caused by planned construction. Any scheduling of outages will be performed at this meeting. Any Contractor activity affecting base security needs, such as scattered crews and number of workers per crew, will be detailed in the written schedule and discussed during the meeting. This weekly meeting is in addition to the construction progress charts or network analysis submission requirements.

1.10 TRAFFIC CONTROL

1.10.1 Traffic Control Plan

The Contractor shall submit a Traffic Control Plan for moving traffic through and around the construction zone in a manner that is conducive to the safety of motorists, pedestrians, and workers. This plan shall indicate scheduling, placement, and maintenance of traffic control devices in accordance with the U.S. Department of Transportation, Federal Highway Administration publication, Manual on Uniform Traffic Control Devices. The Contractor shall obtain, in writing from the Contracting Officer, approval of the Traffic Control Plan. The Contractor shall submit his Traffic Control Plan at least 15 working days prior to commencement of street or road work Excavations shall not remain open for more than 1 working day without approval. The Contractor shall identify by site inspection and indicate on the plan all roads and trails used by military or civilian wheeled and tracked vehicular traffic and, by traffic control devices,

prevent this traffic from entering the construction zone.

1.10.2 Contractor's Vehicles

Contractor's vehicles shall carry proof of insurance at all times and shall be equipped with CB radios (to be tuned to Channel 10). Contractor employee parking will be provide in the designated areas at the TPU Watershed Office. The Contractor is responsible for providing shuttle transportation from the designated parking areas to the work at the dam (approx. 4 miles). Trade vehicles (e.g., pipefitting, electrical truck, etc.) will be permitted on the worksite as needed to perform construction activities. Contractor's trucks shall be preceded by pilot cars while traveling along the access road to the dam site. Pilot cars for lowboys shall be coordinated in advance with the Contracting Officer. Drivers shall report their positions at every mile marker (spaced at approximately half-mile intervals). When two trucks approach one another, the driver of the truck moving toward the project shall pull over, state where he has pulled over, and wait for the other truck to pass until the other truck has passed. Contractor's vehicles shall only park in approved areas in accordance with the parking plan provided by the Contracting Officer.

1.10.3 Bridge and tunnel limitations are as follows:

Access Bridge #79: 4-axle at 160 tons. Width - 16 feet, height - 22 feet.
Spillway and Tower Bridge: 20-ton, single axle.
Weyco RR Tunnel: Width - 16 feet, height - 22 feet.

1.11 UTILITIES NOT SHOWN

T he Contractor can expect to encounter, within the construction limits of the entire project, utilities not shown on the drawings and not visible as to the date of this contract. If such utilities will interfere with construction operations, he shall immediately notify the Contracting Officer verbally and then in writing to enable a determination by the Contracting Officer as to the necessity for removal or relocation. If such utilities are removed or relocated as directed, the Contractor shall be entitled to equitable adjustment for any additional work or delay. The types of utilities the Contractor may encounter are waterlines, sewerlines (storm and sanitary), gaslines, fueling lines, steamlines, buried fuel tanks, septic tanks, other buried tanks, communication lines, and powerlines. These utilities may be active or abandoned utilities.

1.12 GOVERNMENT WITNESSING AND SCHEDULING OF TESTING

The Contractor shall notify the Contracting Officer, by serial letter, of dates and agenda of all performance testing of the following systems: mechanical (including fire protection and EMCS), electrical (including fire protection) medical and food service systems a minimum of 10 calendar days prior to start of such testing. In this notification, the Contractor shall certify that all equipment, materials, and personnel necessary to conduct such testing will be available on the scheduled date and that the systems have been prechecked by him and are ready for performance and/or acceptance testing. Contractor shall also confirm that all operations and maintenance manuals have been submitted and approved. NO PERFORMANCE AND/OR ACCEPTANCE TESTING WILL BE PERMITTED UNTIL THE OPERATIONS AND MAINTENANCE MANUALS HAVE BEEN APPROVED.

Government personnel, at the option of the Government, will travel to the site to witness testing. If the testing must be postponed or canceled for

whatever reason not the fault of the government, the Contractor shall provide the Government not less than 3 working days advance notice (notice may be faxed) of this postponement or cancellation. Should this 3 working day notice not be given, the Contractor shall reimburse the Government for any and all out of pocket expenses incurred for making arrangements to witness such testing including, but not limited to airline, rental car, meal, and lodging expenses. Should testing be conducted, but fail and have to be rescheduled for any reason not the fault of the Government, the Contractor shall similarly reimburse the Government for all expenses incurred.

1.13 HARD HAT SIGNS

The Contractor shall provide 24 by 24 inch square Hard Hat Area signs at each entry to the project or work area as directed by the Contracting Officer. A minimum of two signs will be required. Signs shall be in accordance with the sketch at the end of this section.

1.14 FIELD OFFICE TRAILER

The Contractor shall furnish a trailer, containing not less than 600 square feet, in a location designated by and for the use of the Contracting Officer. The trailer shall be furnished with two desks. One desk shall be 5 feet long by 3 feet wide, with a side drawer and a center drawer that can be locked. The second desk shall be 3 feet by 4 feet minimum, suitable for laying out full-scale contract plans. Two chairs and one stool shall be furnished. A wall locker shall be furnished which is suitable for hanging coats and rain gear and as general storage. It shall be 60 inches to 72 inches high, 18 inches to 24 inches wide, and 18 inches deep (minimum). The building shall have two windows and shall have a door with a lock set with two keys. Each window shall have not less than 6 square feet of glass area, and the door shall be 2 feet, 8 inches wide by 6 feet, 8 inches high. Contractor shall provide a ten pound, multipurpose, dry chemical fire extinguisher, rated for type A, B, and C fires. Extinguisher shall be mounted at a strategic location, coordinated with the Contracting Officer. The Contractor shall furnish and maintain adequate electric lights and wall outlets, heat, air-conditioning, and drinking water for the building, and shall perform any necessary maintenance and disposal of waste to the building. Drinking water shall be either supplied and maintained daily in insulated water can or be provided via piping to an indoor sink. Suitable enclosed sanitary toilet and lavatory facilities shall be furnished in the immediate vicinity of the building and kept clean by the Contractor. Contractor shall be responsible for installing all utility hookups, tie downs, skirting, slabs, foundations, steps and landings as necessary to meet all local, county, state and federal codes and regulations. The trailer will remain property of the Contractor and shall be removed from the site upon completion of the project.

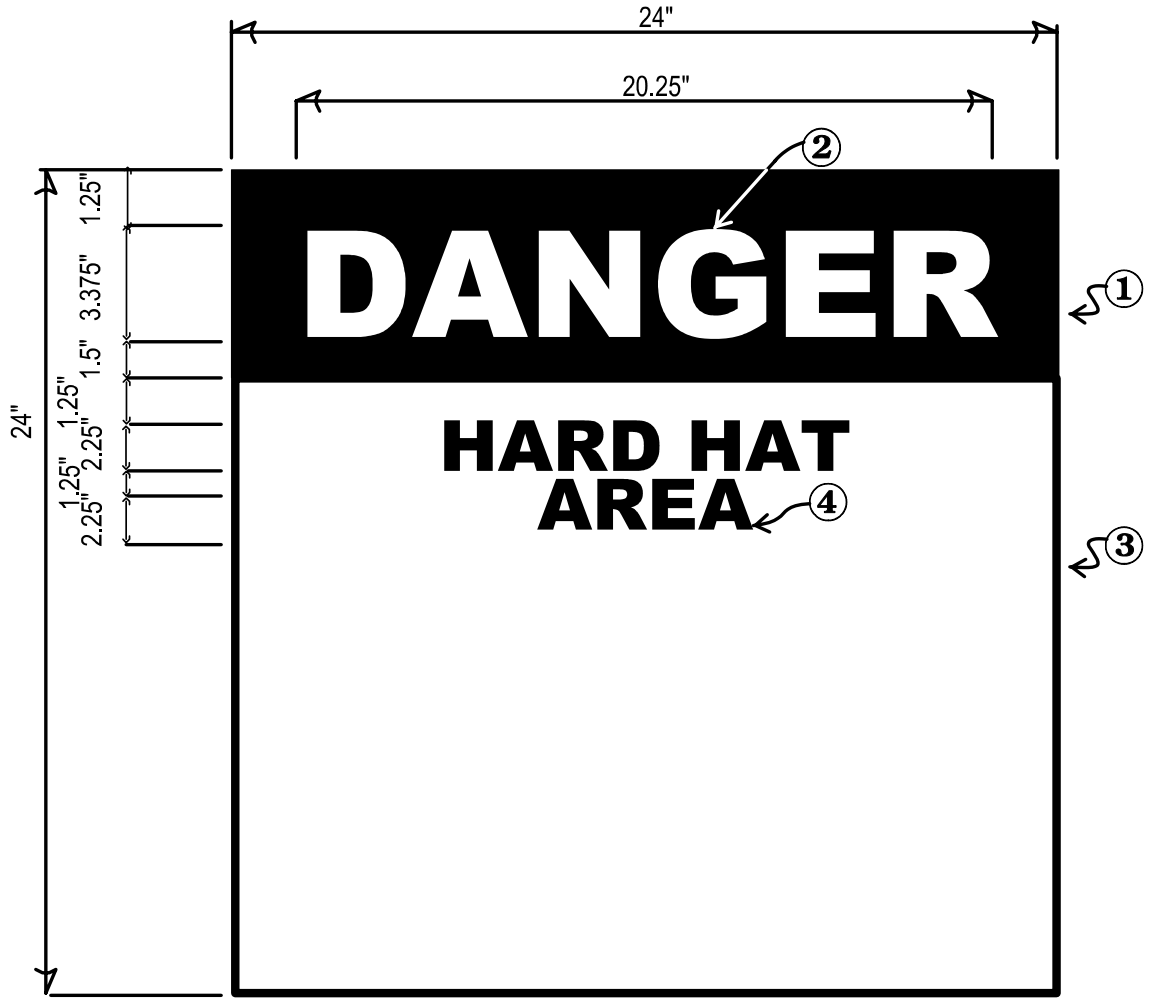
1.15 WATER QUALITY TRAILER

The Contractor shall furnish a smaller trailer, containing not less than 600 square feet, in a location designated by and for the use of the Contracting Officer for Water Quality verification work. The trailer shall be furnished a desk 5 feet long by 3 feet wide, with a side drawer and a center drawer that can be locked. A work table with two chairs and one stool shall also be furnished. A wall locker shall be furnished which is suitable for hanging coats and rain gear and as general storage. It shall be 60 inches to 72 inches high, 18 inches to 24 inches wide, and 18 inches deep (minimum). The building shall have a door with a lock set with two

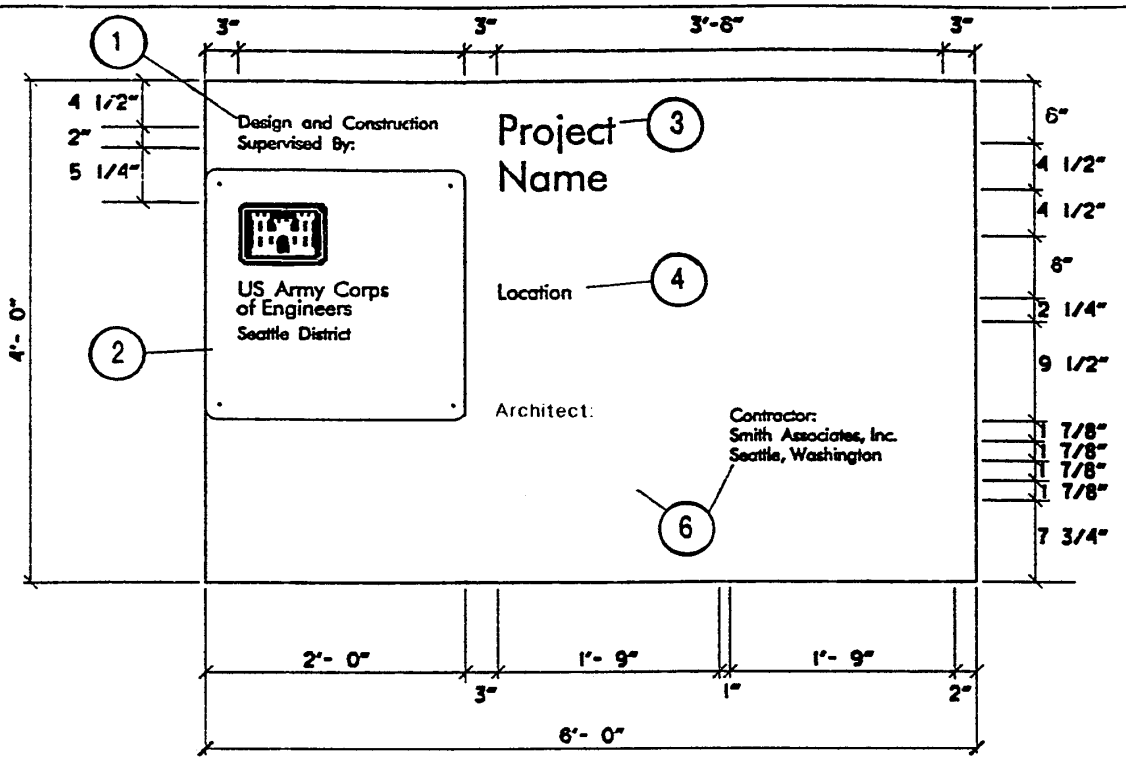
keys. The building shall feature at least one window with not less than 6 square feet of glass area. The door shall be 2 feet, 8 inches wide by 6 feet, 8 inches high. Contractor shall provide a ten pound, multipurpose, dry chemical fire extinguisher, rated for type A, B, and C fires. Extinguisher shall be mounted at a strategic location, coordinated with the Contracting Officer. The Contractor shall furnish and maintain adequate electric lights and wall outlets, heat, air-conditioning, and drinking water for the building, and shall perform any necessary maintenance and disposal of waste to the building. Drinking water shall be either supplied and maintained daily in insulated water can or be provided via piping to an indoor sink. Suitable enclosed sanitary toilet and lavatory facilities shall be furnished in the immediate vicinity of the building and kept clean by the Contractor. Contractor shall be responsible for installing all utility hookups, tie downs, skirting, slabs, foundations, steps and landings as necessary to meet all local, county, state and federal codes and regulations. The trailer will remain property of the Contractor and shall be removed from the site upon completion of the project.

PART 2 (NOT APPLICABLE)

PART 3 (NOT APPLICABLE)



- SIGN SHALL BE FABRICATED FROM .125 THICK 6061-T6 ALUMINUM PANEL
- COLOR
    1. SAFETY RED (SR)
    2. WHITE
    3. WHITE
    4. BLACK
- LETTERING SHALL BE HELVETICA BOLD TYPOGRAPHY.
- LETTERS AND BACKGROUND SHALL BE REFLECTIVE SHEETING MATERIAL.
- SIGNS SHALL BE POSTED AT 6'-6" (BOTTOM SIGN TO GRADE) OR AS DIRECTED BY THE CONTRACTING OFFICER.
- LETTERING TO BE CENTERED ON PANEL.



SCALE: 3/4"=1'-0"

NOTES

1. ONE-TO TWO-LINE DESCRIPTION OF CORPS RELATIONSHIP TO PROJECT.
   COLOR: BLACK
   TYPEFACE: 1.25" HELVETICA REGULAR
   MAX. LENGTH: 19"

2. CORPS COMMUNICATION MARK (2' X 2') WITH CASTLE AND DISTRICT NAME WILL BE GOVERNMENT FURNISHED. MOUNT AS SHOWN. DRILL 5/16" HOLES AND SECURE WITH 1/4"X 1 1/2" NC ALUMINUM BOLTS.

3. ONE-TO THREE-LINE PROJECT TITLE LEGEND DESCRIBES THE WORK BEING DONE UNDER THIS CONTRACT.
   COLOR: BLACK
   TYPEFACE: 3" HELVETICA BOLD
   MAX. LENGTH: 42"

4. ONE-TO TWO-LINE IDENTIFICATION OF PROJECT OR FACILITY
   COLOR: BLACK
   TYPEFACE: 1.5" HELVETICA REGULAR
   MAX. LENGTH: 42"

5. CROSS-ALIGN THE FIRST LINE OF PROJECT OR FACILITY WITH FIRST LINE OF THE CORPS SIGNATURE (US ARMY CORPS) AS SHOWN.

6. ONE-TO FIVE-LINE IDENTIFICATION OF PRIME CONTRACTORS INCLUDING:TYPE (ARCH., GENERAL CONTRACTOR, ETC.) CORPORATE OR FIRM NAME, CITY, STATE.
   COLOR: BLACK
   TYPEFACE: 1.25" HELVETICA REGULAR
   MAX. LENGTH: 21"

7. ALL TYPOGRAPHY IS FLUSH LEFT AND RAG RIGHT, UPPER AND LOWER CASE WITH INITIAL CAPITALS ONLY AS SHOWN.

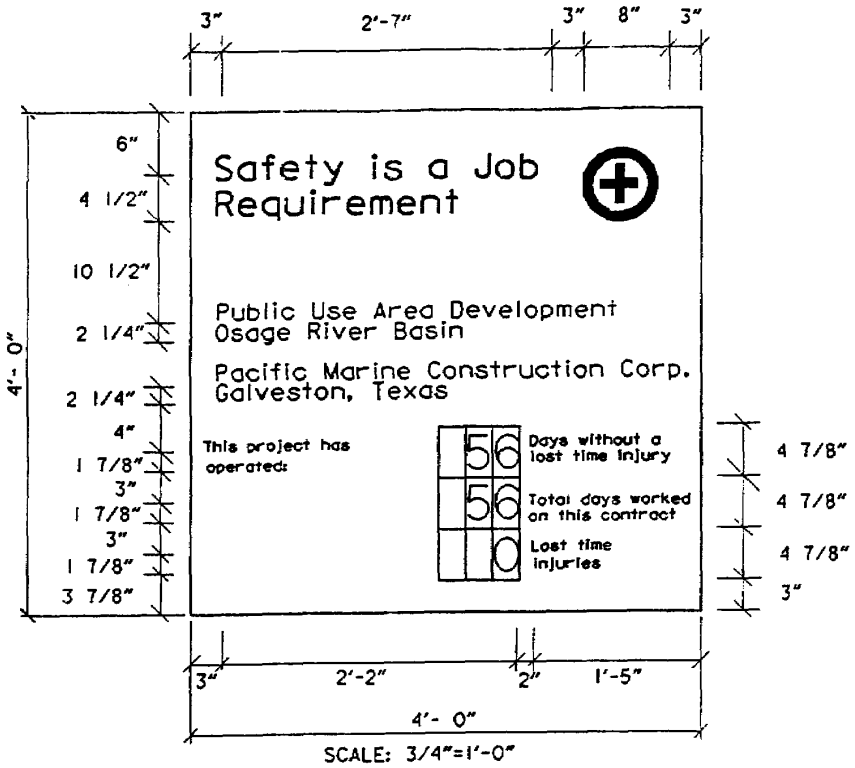
U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

CIVIL WORKS

PROJECT IDENTIFICATION SIGN

DRAWN BY: R.L.L.
CHECKED BY: R.L.M.
SCALE: AS SHOWN

REVISED 7 APRIL 1988
SHEET 1 OF 3



SCALE: 3/4"=1'-0"

NOTES

1. STANDARD TWO-LINE TITLE"SAFETY IS A JOB REQUIREMENT", WITH 8" O.D. SAFETY GREEN FIRST AID LOGO.
   COLOR: TO MATCH PMS 347.
   TYPEFACE: 3" HELVETICA BOLD
   COLOR: BLACK

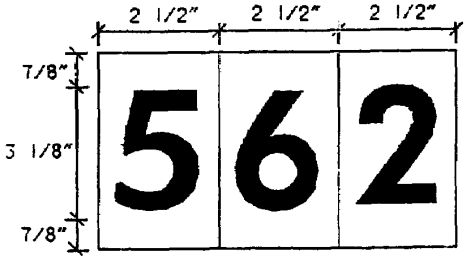
2. ONE-TO TWO-LINE PROJECT TITLE LEGEND DESCRIBES THE WORK BEING DONE UNDER THIS CONTRACT AND NAME OF HOST PROJECT.
   COLOR: BLACK
   TYPEFACE: 1.5" HELVETICA REGULAR
   MAX. LINE LENGTH: 42"

3. ONE-TO TWO-LINE IDENTIFICATION: NAME OF PRIME CONTRACTOR AND CITY, STATE ADDRESS.
   COLOR: BLACK
   TYPEFACE: 1.5" HELVETICA REGULAR
   MAX. LINE LENGTH: 42"

4. STANDARD SAFETY RECORD CAPTIONS SHOWN.
   COLOR: BLACK
   TYPEFACE: 1.25" HELVETICA REGULAR

5. REPLACEABLE NUMBERS ARE TO BE MOUNTED ON WHITE .060 ALUMINUM PLATES AND SCREW-MOUNTED TO BACKGROUND.
   COLOR: BLACK
   TYPEFACE: 3" HELVETICA REGULAR
   PLATE SIZE: 2.5" X 5"

6. ALL TYPOGRAPHY IS FLUSH LEFT AND RAG RIGHT, UPPER AND LOWER CASE WITH INITIAL CAPITALS ONLY AS SHOWN.



NO SCALE

U.S. ARMY CORPS OF ENGINEERS
SEATTLE DISTRICT

CIVIL WORKS
SAFETY PERFORMANCE SIGN

DRAWN BY: R.L.L.
CHECKED BY: R.L.M.

SCALE: AS SHOWN

REVISED 7 APRIL 1988

SHEET 2 OF 3

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SECTION 01560

DIVERSION AND CARE OF WATER

PART 1 GENERAL

1.1 SCOPE

The Howard Hanson Dam Reservoir stores water for use by over 300,000 people in the south Puget Sound region. It is of vital importance to protect the reservoir from contamination. This section describes the requirements for the diversion, collection, and conveyance of waters generated by construction processes, seepage, dewatering, precipitation or any other controllable waters falling onto or diverted around the construction site or waste and spoils area.

1.2 GENERAL REQUIREMENTS

1.2.1 The Contractor shall be responsible to supply, install, operate, maintain, and relocate or move as construction progresses, all equipment (including all portable pumps, generators, piping, valves, supports and appurtenances as required) for the complete conveyance and handling of all water from dewatering wells, seepage wells, static wells, surface water runoff from disturbed and non-disturbed areas as indicated in the construction Drawings in accordance with these Specifications.

1.2.2 The Contractor shall provide on-going maintenance and operation of water diversion systems until such time that construction of the Fish Passage Facility in the excavated areas of this contract begins (Phase 2 construction). Phase 2 construction will commence within 60 days of the scheduled completion date of the contract associated with this document.

1.3 SUBMITTALS

1.3.1 Prior to performing any work, the Contractor shall submit a Diversion and Care of Water Submittal as specified in Section 01061, ENVIRONMENTAL PROTECTION.

1.3.2 Any diversion systems the Contractor may add that are not shown on the drawings shall be designed, submitted for approval, installed, and tested using the criteria noted in this section. The Contractor shall obtain approval from the Contracting Officer of plans, installation tests, and ongoing performance.

1.4 CLEAN WATER SYSTEMS

The Contractor shall, when possible, capture and divert stormwater prior to contact with a disturbed construction area. Stormwater from undisturbed areas and dewatering water from dewatering wells shall be collected and discharged to the Green River and the reservoir at locations identified on the drawings. If at any time the Contractor is unable to control stormwater and dewatering water prior to contact with a disturbed area that water shall be treated as turbid water and conveyed to the sedimentation pond until such time that Contracting Officer approved diversion can be installed.

1.5 TURBID WATER SYSTEMS

1.5.1 Turbid water shall be defined as any water that through rain, snow, or seepage comes in contact with a disturbed construction area.

1.5.2 All stormwater and seepage water that cannot be diverted around the construction site shall be captured and conveyed to the sedimentation pond prior to discharge to the reservoir per the drawings.

1.5.3 A Civil Engineer licensed in the State of Washington shall design the turbid water conveyance, settling, and discharge systems. Sedimentation ponds shall conform to design criteria listed in this section. Submittals of sedimentation pond design shall include stamped calculations and drawings. The Contracting Officer shall review and approve all submittals from the Contractor.

1.5.4 All materials used in the portions of the turbid water systems that will or may reasonably come in contact with water draining to the reservoir shall be new and approved by the NSF, FDA, and/or UL for contact with potable water. All equipment and construction materials coming in contact with the reservoir shall be disinfected in accordance with Section 01061, ENVIRONMENTAL PROTECTION.

1.5.5 Design Criteria:

1.5.5.1 All turbid water systems shall be designed to protect water quality. All systems shall be subject to approval by the Contracting Officer.

1.5.5.2 Dispersion and erosion control shall be provided at water release points sufficient to ensure the force and velocity of flow does not cause erosion.

1.5.5.3 The conceptual design of the sedimentation pond is shown on the Drawings. Final design will be provided by the Contractor and included in the Diversion and Care of Water Submittal as described in Section 01061 - ENVIRONMENTAL PROTECTION for approval by the Contracting Officer. The Contractor's final design shall be stamped by a State of Washington licensed professional engineer and meet, at a minimum, the following design criteria:

a. Parallel oil water separators at the inlet.
b. Inlet energy dissipation.
c. Surface oil absorbent booms.
d. Primary outlets and emergency spillways per the King County Surface Water Manual.
e. Capability to handle storm flows for a 6-year return storm per the Drawings.
f. A minimum surface area of 7,500 ft2 measured at outlet riser.
g. A minimum total depth of seven feet.
h. A minimum length:width ratio of 3:1 and a maximum of 6:1.
i. The spillways shall convey, at a minimum twice the maximum pumped flow rate with 1 foot of freeboard.
j. The Pond #1 spillway shall discharge to Pond #2; no external discharge from Pond #1 shall be allowed.
k. A minimum riser pipe diameter of 42 inches.
l. Maximum discharge velocity measured at the diffuser pipe outfall shall not exceed 2.0 ft/sec.

1.5.5.4 The conveyance system shall have sufficient capacity, to carry all identified turbid flows to the disposal area(s). The pump(s) shall be capable of running with flows much less than its design capacity for long periods of time.

1.5.5.5 The conveyance system shall be installed as an element of mobilization and shall be activated prior to any disturbing activity.

1.5.6 Testing and Maintenance of Systems:

The Contracting Officer shall observe initial testing of all turbid water systems with non-turbid water. Water may be obtained from the reservoir for this purpose. The Contractor shall not be allowed to proceed until these systems operate to the satisfaction of the Contracting Officer. In the event of system failure or malfunction, the Contracting Officer may issue a stop work order for all work that depends on proper functioning of the failed system. Repairs shall be made at no additional cost to the Contracting Officer.

1.6 PROCESS WATER HANDLING OUTSIDE OF CONSTRUCTION AREA

1.6.1 Equipment washdown and decontamination operations will take place at a location downstream of the of the water supply intake pipe near the Headworks gate as identified in the drawings by the Contracting Officer. Wastewater from these processes shall be collected at the washdown and decontamination areas and conveyed to the appropriate temporary holding tanks for eventual off-site disposal.

1.6.2 The Contractor may conduct equipment washdown at an off-site location. Inspection and disinfection of all equipment shall occur immediately prior to entrance to the watershed.

PART 2 PRODUCTS

2.1 PORTABLE PUMPS, HOSE, AND PIPING

Portable pumps shall be of sufficient capacity and head to meet anticipated flows and pressure requirements. All hose, piping and appurtenances shall meet pressure requirements and be sized to allow for flow velocity within its capability. Hoses shall be free from leaks. Engine driven pumps shall meet the containment and fueling requirements of Section 01061, ENVIRONMENTAL PROTECTION. Submersible pumps, hose, pipe, and fittings immersed in water leading to or in the reservoir shall meet the requirements of Section 01061, ENVIRONMENTAL PROTECTION, regarding prior use, cleaning, and disinfection.

PART 3 EXECUTION

3.1 WATER HANDLING COLLECTION

The Contractor shall install, maintain and operate the facilities required to collect and convey stormwater, process water, dewatering discharge, seepage and all other dewatering systems within the work limits to the sediment treatment facilities or direct discharge locations as shown on the project drawings.

3.1.1 Dewatering Water

Systems for dewatering shall have the capability of operating continuously without interruption at their full discharge capacity for required periods to fully protect the work from flooding and to prevent discharge of turbid or polluted water.

3.1.2 Stormwater and Seepage

Ditches, swales, berms, sand bag walls, sumps, pumps and other means shall be employed to collect all stormwater and seepage and convey it from the construction area as shown on the Drawings. All stormwater and seepage water in contact with disturbed areas shall be piped to the sedimentation pond per the Drawings. Silt fences and straw bale check dams shall be used in conjunction with ditches, swales and berms. Alternate methods designed by the Contractor and approved by the Contracting Officer may be used to direct runoff if soil conditions, topography or other physical constraint prevents the use of methods shown on the Drawings.

3.1.3 Process Water

All waters originating from sources other than precipitation, snowmelt, or seepage and used for purposes including, but not limited to, disinfection, washdown, bilge, etc. shall be properly contained in a temporary storage tank and transported off-site for proper legal disposal.

3.2 SEDIMENTATION TREATMENT FACILITIES

All stormwater and seepage water in contact with disturbed construction areas shall be collected, conveyed to, and treated in, a sedimentation pond before discharge to the reservoir.

3.3 DISPERSAL SYSTEMS

The Contractor shall install, operate, and maintain the sediment pond dispersal system according to design criteria.

3.4 TURBID WATER TREATMENT FACILITY OPERATIONS

The Contractor will be responsible for constructing, operating and maintaining the turbid water sedimentation pond treatment facility as required to meet water quality regulations until such time that operation is taken over by the Contracting Officer. The facility shall include all piping, vaults, excavations, structures, etc. to convey, treat, and provide detention for all turbid water generated by the construction activities of the project.

3.5 CATCH BASINS

Catch basins shall be installed as indicated in the project drawings and shall be a Type 1, 1L, or 1P catch basin as required per Standard Plan B-1, B-1a, or B-1b, as noted in WSDOT Standard Plans for Road, Bridge and Municipal Construction, (latest edition).

3.6 PRESSURE PIPE

Piping to be used for conveying the turbid water to the sedimentation pond shall be designed by the Contractor and approved by the Contracting Officer.

3.7 NONPRESSURE PIPE

Piping layouts and details shall be submitted to Engineer for review and approval. The pipe shall be adequately restrained to prevent movement or damage due to pressure surges, water hammer or any other force on or in the pipe. The pipe shall be protected from damage by the construction equipment.

3.8 PIPING DEMOBILIZATION

All pressure and non-pressure piping will be flushed to remove sediment and drained to sediment pond prior to demobilization.

3.9 ELECTRICAL POWER

The Contractor shall supply a reliable source of electrical power for all facilities requiring such power. Backup power supply is required for the turbid water conveyance and treatment facilities. Distribution of power will be in accordance with all applicable codes.

-- End of Section --

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SECTION 01561

DUST CONTROL

PART 1 GENERAL

1.1 SCOPE

This Section describes the work required to control dust within the construction area and transport roads. Dust control measures to reduce the potential for polluting the reservoir and river upstream and downstream of the dam shall be in effect. The Contractor shall be responsible for control of dust caused by the Contractor's operations, including those roads used for construction access and haul roads.

1.2 SUBMITTALS

A. The Contractor shall submit as part of the Pollution Control Submittal as described in Section 01100 - ENVIRONMENTAL MANAGEMENT, methods of dust control. Dust control shall address, at a minimum, the following construction activities:

1. Earthwork
2. Concrete and masonry cutting and demolition
3. Roads, parking, office and administration, storage and work areas
4. Haul roads
5. Staging and Storage area.

Any other construction not identified herein but which may potentially generate dust shall be addressed.

B. Dust control shall, at a minimum, address the following elements:

1. Description of the activities which will potentially generate dust
2. Proposed methods to reduce dust generating potential
3. Proposed methods to control dust.

C. Water shall be the only allowable dust control agent.

PART 2 PRODUCTS

Water for dust control shall not contain dissolved or suspended matter which will be harmful to vegetation or animal life. The water, at a minimum, shall meet standards for class A surface water, such that its introduction into the public water source shall not harm the public water source. Water shall be obtained from clean dewatering sources at the clean water collection vault.

PART 3 EXECUTION

A. Water shall be applied to areas, earth, stockpiles, waste areas, and roads in the watershed used for construction activities that result in excessive dust.

B. Water shall be applied at such a rate as to sufficiently wet the

surface to prevent dust formation by subsequent activities. The rate shall not be so high as to cause the formation of excessive mud or pooling.

C. The number of applications of water per day will depend on weather and soil conditions, and the level of dust producing activity, but shall be sufficient to maintain the surface in a moist condition.

D. Equipment for applying water to the road surface shall be designed, equipped, maintained, and operated in such a way that the water can be applied uniformly on variable widths and grades of road surfaces. The equipment shall be capable of rapidly setting, changing, and determining rate applications. The equipment shall be capable of applying water at rates ranging from 0.10 to 0.75 gallons per square yard. The equipment shall be in satisfactory operating condition during application.

-- End of Section --

SECTION 01563

POLLUTION CONTROL

PART 1 GENERAL

1.1 SCOPE

This section describes the work required to control water pollution caused by construction activities.

1.2 REFERENCE SPECIFICATIONS

A. Section 01050, EMERGENCY DEMOBILIZATION

B. Section 01100, ENVIRONMENTAL MANAGEMENT

C. Section 01561, DUST CONTROL

D. Section 01565, CONSTRUCTION SPOILS HANDLING

E. Section 13202, FUEL STORAGE SYSTEMS

1.3 SUBMITTALS

The Contractor will submit, for approval by the Contracting Officer, submittals addressing:

- Pollution Control
- Spill Prevention, Containment, and Response
- Emergency Planning and Response
- Watercraft Preparation and Use

The minimum requirements for these submittals are outlined in Section 01100 - ENVIRONMENTAL MANAGEMENT.

1.4 PROJECT CONDITIONS

The Contractor shall maintain pollution control systems throughout the life of the contract including during periods when construction activities are reduced or shutdown. During the life of the contract the Contractor shall comply with all provisions of federal, state and local statutes, ordinances and regulations pertaining to the prevention of environmental pollution and the preservation of public natural resources.

PART 2 PRODUCTS

2.1 OIL SPILL CLEANUP KIT

The Contractor shall at all times maintain two emergency spill clean-up kits on site. The kits shall be secured and identified as "emergency use" only. Each oil spill cleanup kit shall contain the following items as a minimum:

a. Twelve medium weight metal fence posts, 6 feet long

b. 100 Feet of 1/4-inch rope for anchoring booms
c. Two axes
d. Two hammers
e. Two shovels
f. Two screened pitchforks
g. Two 6-Volt flashlights including extra batteries
h. 200 Feet of portable oil containment boom
i. 200 Feet of oil absorbent boom
j. Five 5-Gallon empty containers with lids
k. Two pair of cotton work gloves
l. 40 Feet of 1/4-inch mesh screen, minimum 3 feet high
m. A minimum of 100 oil absorbent pads
n. 25 Plastic garbage bags
o. A map of the drainage area
p. A copy of the Emergency Response Plan with notification procedures and telephone

2.2 OIL ABSORBING MATERIALS

2.2.1 GENERAL

Oil absorbing products shall be oleophilic and hydrophobic, constructed of blown polypropylene fibrous material meeting the requirements described below and shall be 3M Brand Oil Sorbent as manufactured by Occupational Health and Safety Products Division/3M, St. Paul, Minnesota or equal.

2.2.2 PHYSICAL PROPERTIES

Property	Test Method	Value
Mildew	MIL-I-631 Section 3.5.7	Mildew and rot resistant
Temperature Range		Performance unaffected between 20° F and 150° F
Humidity		Performance unaffected by 100% relative humidity at 100° F for 25 days
Flammability	ASTM D2859 ASTM D1929	Resistant to flammability. Shall not autoignite at temperature below 650° F
Oil Absorption	MIL-S-28600 Section 4.4.3	Absorb 20-30 times its weight in oil depending on the grade and time exposed
Water Repellency	MIL-S-28600 Section 4.4.3	Less than 0.5 grams water /gram Absorbent

2.2.3 OTHER PROPERTIES

Oil absorbing materials shall have sufficient strength to allow them to be secured and remain in position for the applications shown. The materials shall be reusable and shall not have any irritating or toxic effects on personnel which handle the material. The Contractor shall supply oil absorbing materials in the form of sheets, rolls, sweeps, pillows or booms as required for effective control of spilled oil at the various project

locations.

2.2.4 TYPES OF OIL ABSORBING MATERIALS

2.2.4.1 Oil Absorbent Pads

The oil absorbent pads shall be sorbent sheets approximately 18 inches by 18 inches by 3/8-inch thick. Pads shall be easy to apply, retrieve, and shall be reusable. They shall be new 3M Brand, Model No. T-1 56 or equal.

2.2.4.2 Oil Absorbent Booms

The oil absorbent boom shall come in minimum 10-foot sections and be at least 5 inches in diameter. Boom shall be constructed of oil absorbing material contained in an open mesh skin. The ends shall be constructed to allow easy attachment of one boom to another to form longer booms or for anchoring. The boom shall be 3M Brand Model T-270 Sorbent Booms or equal.

2.3 BOAT AND MOTOR

The Contractor shall provide a boat dedicated for use on environmental actions and monitoring. Minimum boat length shall be 14 feet. The boat shall be washed down, decontaminated, and inspected by a representative of Tacoma Public Utilities prior to use in the reservoir. The boat shall be equipped with a minimum 9-hp, 4-cycle gasoline powered motor, oars, and Coast Guard approved life jackets and other safety equipment as required by the appropriate regulatory agencies. The boat shall be rigid hull, fiberglass or aluminum, and shall be stored in the reservoir within an oil containment boom. The motor well shall be plugged such that it does not drain outside the boat and shall always contain oil-absorbing pads while operating in water. Bilge pumps shall not discharge into reservoir.

2.4 RESERVOIR OIL CONTAINMENT BOOM

The oil containment booms shall be used to contain oil slicks on surface waters as shown in the project Drawings. The boom shall be high visibility yellow, heavy-duty, vinyl or plastic coated polyester or nylon fabric (minimum weight 22 oz/sq. yd.) and be resistant to ripping, tearing, abrasion, weather, oils, and chemicals. It shall be designed for use in water. It shall have 12-inch flotation with a minimum 24-inch skirt. Minimum length per section shall be 50 feet. Boom sections shall be provided with connections to allow quick, secure, coupling which will not allow oil to pass through. Ballast shall be provided and shall be secured to the bottom edge of the boom. The fabric shall have a minimum tongue tear strength of 150 pounds per inch and a minimum grab tensile strength of 500 pounds per inch. The reservoir oil containment boom shall meet the requirements specified and shall be Action Petroleum Standard Oil Boom Model AP3601 or equal.

2.5 EMERGENCY SPILL KIT OIL CONTAINMENT BOOM

The emergency spill kit oil containment boom shall meet the requirements specified below and shall be Action Petroleum Spill Recovery Standard Oil Boom Model AP10 or equal. Minimum requirements include:

Boom Tensile Strength	5,000 pounds
Fabric Weight	22 ounces
Fabric Tensile Strength	5,000 pounds
Fabric Tongue Tear Strength	150 pounds

Buoy Ratio	3.25
Flotation	Air or Foam
Height	10 inches
Float diameter	4 inches
Skirt Length	6 inches
Ballast Chain	¼ inch

2.6 SPECIAL MESSAGE SIGNS

Special message signs shall be constructed as shown on the Drawings. The signs shall be of medium or high-density plywood with exterior glue, and shall conform to Section 9-28.5 of the Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT/APWA) (latest edition). Paint shall be enamel compatible with the environment and the length of the project and shall conform to the requirements of Section 9-28.5 of the Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT/APWA) (latest edition). Wood support posts shall conform to Section 9-28.15(2) of the Standard Specifications for Road, Bridge, and Municipal Construction (WSDOT/APWA) (latest edition).

2.7 REFUELING AND CHEMICAL/PETROLEUM STORAGE AREAS

A. The refueling and chemical/petroleum storage area shall be sized, designed, constructed, and maintained by the Contractor in accordance with those minimum requirements, dimensions, and design elements as indicated in the project Drawings.

B. Refueling and chemical/petroleum storage shall be located as indicated on the project Drawings. Liner materials shall be installed as indicated on the project Drawings. All edges shall be keyed into the earth and containment berms shall be continuous around the complete perimeter of the containment portion of the storage area.

2.8 LINER MATERIALS

2.8.1 Impermeable Liner

Impermeable liners for containment areas shall be a material meeting the minimum physical properties listed below and rated by the manufacturer and supplier for containing all chemical or petroleum products being contained. Liner shall also be suitable for exposed use with weathering and UV resistance provided. For containment of only petroleum products the liner material shall be 36-mil Coolguard HR. Tripolymer Alloy/Elvaloy, or other approved equal impermeable material. Contractor may wish to provide a heavier material and provide cover to protect the liner from weathering and UV exposure to limit required maintenance during the project. The liner shall not be degradable by the petroleum/chemical substances used by the Contractor and that will maintain its integrity due to abrasion.

2.8.2 Liner Protection

1. Liners placed in truck or equipment access pathways of the refueling and chemical/petroleum storage areas shall be protected above and below as follows:

   a. Roll smooth and compact subgrade to 95% maximum density per WSDOT Standard Plans for Road, Bridge and Municipal Construction, (latest edition), Section 2-03.3(14)D. Remove all sharp objects, sticks, debris. Install a single layer need punched GCL "Bentomat DN" by CETCO or equal. Install single layer of 30 mil PVC liner, "Enviro Liner", by

Layfield or approved equal followed above by 16 oz non-woven geotextile, "MIRIFY 1600" by TC Nicolon or approved equal. Cover geotextile with an 8" layer of 2" minus angular rock.

2. Liners not in truck or equipment access pathway shall be 2 layers of 30mil PVC liner, "Enviro Liner", by Layfield or approved equal. All penetrations shall be sealed and all pipe openings shall be made with a boot sized for the pipe opening and sealed to the liner material. Sand bag hold downs may used as ballast to hold liner in place.

3. Foot traffic or container storage areas shall be constructed with a minimum 4" layer of 5/8" minus crushed rock with a wood planking walkway or ¾" plywood covering constructed over the crushed rock to protect liner integrity

2.8.3 Contractor shall immediately repair all punctures, abrasions, tears, or any other damage due to use or aging of the liner to the satisfaction of the Contracting Officer at no additional cost to the Contracting Officer throughout the life of the construction contract. PVC Liner Minimum Physical properties:

Typical Property	Test Method	30 mil
Gauge (nominal)	--------	30
Thickness (mils)	ASTM D1593	28.5
Specific Gravity	ASTM D792	1.2
Tensile Properties	ASTM D882	
Break Strength, lbs/in.	Method A (MD & TD)	73
Elongation at Break %	Method A (MD & TD)	350
Modulus at 100%	Method A (MD & TD)	34
Tear Resistance, lbs/in.	ASTM D1004, Die C	8.5
Low Temp, pass	ASTM D1790	-29C
Dimensional Stability	ASTM D1204 (MD&TD)	3
Water Extraction	ASTM D3083	0.15
Volatile Loss	ASTM D1203 (A)	0.7
Resistance to Soil Burial	ASTM D3083	
Breaking Factor		5%
Elongation at Break		20%
100% Modulus		20%
Water Vapor Transmission	ASTM D814, max	5.0 X 10-9 cm/sec
Hydrostatic Resistance,lbs/in2	ASTM D751 (A)	100

Minimum Specifications for Factory Fabricated Seams:

Peel Strength, lbs/in.	15
Shear Strength, lbs/in.	58.4

2.9 CATCH BASINS

Catch basins shall be installed as indicated in the project drawings and

shall be a Type 1, 1L, or 1P catch basin as required per Standard Plan B-1, B-1a, or B-1b, as noted in WSDOT Standard Plans for Road, Bridge and Municipal Construction, (latest edition).

2.10 BACKFLOW PREVENTERS

Backflow preventers assemblies shall be approved by the Washington State Department of Health.

2.11 DISINFECTION AND CLEANING AREA

A. The construction of the truck and equipment access pathway through the disinfection wash-down area shall be similar to the refueling and chemical/petroleum storage area access.

B. Liners placed in truck or equipment access pathways of the refueling and chemical/petroleum storage areas shall be protected above and below as follows:

1. Roll smooth and compact subgrade to 95% maximum density per WSDOT Standard Plans for Road, Bridge and Municipal Construction, (latest edition), Section 2-03.3(14)D. Remove all sharp objects, sticks, debris. Install a single layer needle punched GCL "Bentomat DN" by CETCO or equal. Install single layer of 30mil PVC liner, "Enviro Liner", by Layfield or approved equal followed above by 16oz non-woven geotextile, "Mirify 1600" by TC Nicolon or approved equal. Cover geotextile with an 8" layer of 2" minus angular rock.
2. Liners not in truck or equipment access pathway shall be 2 layers of 30mil PVC liner, "Enviro Liner", by Layfield or approved equal. All penetrations shall be sealed and all pipe openings shall be made with a boot sized for the pipe opening and sealed to the liner material. Sand bag hold downs may used as ballast to hold liner in place.
3. Catch basins shall be installed as indicated in the project drawings and shall be a Type 1, 1L, or 1P catch basin as required per Standard Plan B-1, B-1a, or B-1b, as noted in WSDOT Standard Plans for Road, Bridge and Municipal Construction, (latest edition).

2.12 DECONTAMINATION EQUIPMENT AND SUPPLIES

Equipment cleaning may be conducted off-site at the Contractor's discretion. Off-site cleaning will be subject to verification prior to entering the watershed. All disinfection of equipment shall be conducted at a nearby location as identified by the Contracting Officer. Decontamination of construction materials, boats, and equipment entering the reservoir shall require the following items:

1. Pressure washer having a minimum pressure of 2,000 pounds per square inch.
2. Steam cleaner.
3. Pressurized tank sprayer or spray bottle suitable for chlorine application.
4. Chlorine bleach.
5. Biodegradable soap (for equipment and materials that would be damaged by chlorine).
6. Rubber boots.
7. Splash suit or full waterproof rain gear.
8. Rubber gloves and duct tape.
9. Goggles.
10. Chlorine dip tank (for small equipment and materials).
11. Washdown pad with drain to wastewater holding tank (for large

equipment and materials as shown on the Drawings).
12. Sodium thiosulfate or ascorbic acid or other dechlorinating chemical (for chlorine neutralization).
13. Field test kit for total residual chlorine.
14. Process water source

2.13 SMALL EQUIPMENT CONTAINMENT

All motorized, portable, stand alone, or stationary equipment shall have completely liquid tight, self supporting, containment pans placed under the equipment. The containment pan shall be sized to hold 110% of the volume of all fuels, oils, and liquids contained within the equipment. The equipment pan shall be accessible for easy monitoring and shall have a low point to facilitate the pumping or removal of contaminated liquids. All leaks, spills, accumulated storm water, or liquids shall be immediately removed from the containment pan and transferred off-site for proper disposal by the contractor.

PART 3 EXECUTION

3.1 GENERAL

A. The Contractor shall take all necessary precautions to assure that sediment, debris, petroleum products, chemicals or other contaminants will not enter the Eagle Gorge Reservoir or the Green River which is Tacoma Public Utilities public water supply and a valuable fishery resource. Acceptable levels of contaminants for the work shall be as specified under the rules and regulations of the State of Washington Administrative Code (WAC), the Water Quality Standards specified in Section 01060, or as required by the permits or agreements with all federal, state, and local agencies for this project.

B. Construction activities shall be performed by methods that will prevent entrance, or accidental spillage, of solid matter, contaminants, debris and other objectionable pollutants and wastes into streams, rivers, lakes, and flowing or dry watercourses. Such pollutants and wastes include, but are not restricted to, refuse, earth and earth products, garbage, cement, concrete, sewage effluent, & industrial waste, radioactive substances, mercury, oil and other petroleum products, aggregate processing tailings, mulching products, mineral salts, and thermal pollution. In addition to the Water Quality Standards specified herein, the Contractor shall comply with the requirement and water quality criteria of WAC Chapter 173-201 for Class A water use. All pollutants and all waste and sludge from the sedimentation and treatment facilities shall be disposed of in an approved manner and at legal disposal sites. The Contractor shall secure legal disposal sites.

C. Chemical emulsifiers, dispersants, coagulants or other cleanup compounds shall not be used without prior written approval. Contaminated soil and vegetation resulting from accidental spills shall be excavated and removed immediately to a legal disposal site.

D. Concrete preparation and placement activities shall not cause the pH of surface waters to violate water quality standards. Runoff from concrete preparation areas shall be controlled and routed to the wastewater treatment system or other approved system. The pH levels of wastewater discharge to the forest floor shall be within the range of 6.0 to 9.0. Treatment shall be provided as needed to maintain these levels.

E. Petroleum and chemical containment areas shall be designed consistent with design criteria in General Notes as shown on the Project Drawing. The Contractor may design such facilities for more adverse conditions at its discretion and expense. Damage to such facilities, which results from acts of nature beyond the reference criteria, shall be immediately repaired. The cost of such repairs shall be by Force Account as specified in Division 1 - General Terms and Conditions.

F. Domestic animals will not be allowed on the project site or in vehicles in the watershed.

G. Fishing or swimming will not be allowed in the Green River or the Eagle Gorge Reservoir or other surface waters. The Contractor shall dismiss any worker violating this rule.

H. Workboats and barges shall be operated in a manner to minimize wake and waves washing against the shoreline. Care in shallow areas shall be exercised to minimize disturbances of bottom sediments with prop wash or boat maneuvers.

I. The Contractor shall take all necessary precautions to assure that all equipment and materials (permanent or temporary) used in the reservoir are decontaminated according to the procedures outlined in this Specification.

J. Washing or flushing concrete delivery trucks or other equipment within the Green River Watershed area shall not be permitted.

K. The Contractor shall respond immediately to emergency situations as directed by the Contracting Officer, where the quality of the water is threatened and shall take corrective action to eliminate or at least temporarily contain the contaminants until a more permanent solution to the problem can be determined. Sheens and rainbows on surface waters shall be contained and mopped immediately.

3.2 OIL SPILL CLEANUP KITS

Use approved oil absorbing materials to remove oil. The Contractor shall provide and maintain two kits as specified in this Section with new spill cleanup and containment equipment. One kit shall be stored at the lower staging area and one kit at the upper maintenance facility area. Small, loose items of equipment shall be stored in secure boxes that can be easily carried by two workers, and transported in the bed of a pickup truck. Boxes shall be painted yellow and labeled OIL SPILL KIT - EMERGENCY USE ONLY. The contents of each kit shall be used only for emergency purposes and not in the routine execution of the work.

3.3 OIL ABSORBING

The materials shall be secured so as to effectively accomplish the task and shall not be disturbed by effects of wind, rain and other environmental factors, or construction activities. Oil absorbing material shall be reused according to the manufacturer's recommendations and shall be disposed of in a manner, which is approved by the regulatory agencies and is in accordance with the manufacturer's recommendations.

3.4 BOAT AND MOTOR

The Contractor shall provide a dedicated boat and motor as specified for Contractor and ENVIRONMENTAL MONITOR environmental protection and

monitoring activities. The boat and motor shall not be used in the routine prosecution of the work.

3.5 OIL CONTAINMENT BOOMS

Oil containment booms shall be moored to maintain a minimum 20-foot distance between barges or other work equipment located in the water and the boom unless otherwise shown or specified. The boom shall be placed around areas and activities where equipment is working at the water's edge or in the water. The boom shall be adequately anchored and secured. At the intersection of the boom and the shoreline, absorbent pillows shall be used to fill in any gaps to prevent leakage of floating debris or oil around the boom. Placement and anchoring of the boom shall be according to the manufacturer's approved methods. The boom shall be designed to accommodate changes in water level and rapid demobilization (< 8 hours). Boom shall be adjusted as other contaminants reach the water in the reservoir. The Contractor shall protect the water quality and shall not rely solely on the oil containment boom to provide that protection. Sheens and rainbows contained within booms shall be cleaned up immediately.

3.6 EMERGENCY SPILL KIT OIL CONTAINMENT BOOM

The emergency spill kit oil containment boom shall remain in the secured emergency spill kits until needed. The boom shall be constructed and designed to provide for full deployment within 30 minutes. Once a spill has been adequately contained and cleaned up, the boom shall be demobilized and returned to storage.

3.7 SPECIAL MESSAGE SIGNS

Provide one Type 1, Type 2 and one Type 3 signs. Provide a barricade with every Type 3 sign. The signs shall be installed as shown on the Drawings, in accordance with Standard Plan G-4a of the Standard Plans for Road, Bridge and Municipal Construction (WSDOT/APWA).

3.8 REFUELING AND CHEMICAL/PETROLEUM STORAGE AREA

The refueling and chemical/petroleum storage area shall function to store and dispense the anticipated Contractor's fueling and chemical needs throughout the course of the construction. The Contractor shall be responsible to supply and install all safety and operational equipment as may be necessary to support the use and operations of the facility consistent with these specifications, project Drawings, Washington State OSHA and WISHA regulations and codes for the Contractor's operations.

1. All spills shall be immediately contained and all contaminated water, fuels, or other liquids shall be pumped from the containment basin sump and removed from the site for disposal by the Contractor.

2. Contractor shall be responsible to maintain the refueling and chemical/petroleum storage area in a neat, clean and safe manner.

3. The refueling and chemical/petroleum containment area shall be subject to inspection by the Contracting Officer at the Contracting Officer's discretion. The Contractor shall immediately remedy any and all noted potential problems or conditions that may adversely affect water or environmental quality.

3.9 BACKFLOW PREVENTERS

Backflow preventers shall be installed on water systems which use water obtained from the reservoir, or any surface or ground water. The backflow preventer shall be as close to the water source as practical and shall be installed in accordance with, and approved by, the Washington State Department of Health.

3.10 PESTICIDES AND HERBICIDES AND INSECTICIDES

The Contractor shall not store, transport or apply pesticides, herbicides, insecticides or agents containing these materials in the Green River Watershed.

3.11 AGREEMENT WITH SPILL CLEANUP FIRM

The Contractor shall enter into an agreement with a commercial agency for spill containment and cleanup assistance at the reservoir in the event that a major spill occurs. The cleanup firm shall be regularly engaged in the business of prevention, containment, and removal of oil pollution; and shall be willing to maintain equipment and work force in a state of readiness to provide prompt response to oil pollution situations on a 24-hour basis. The agreement shall indicate that credit checks have been made and that all up front information has been collected and verified, so that the clean up firm is immediately available to respond. The agreement time period shall begin prior to work on or near the Eagle Gorge Reservoir and shall extend until all work is complete, including demobilization. A site visit prior to construction by a representative from the cleanup firm shall be conducted to review the situation and anticipate any unusual or special conditions at the reservoir. The agreement shall become part of the Environmental Management Plan.

3.12 DISINFECTION AND CLEANING OF EQUIPMENT

A. Before boats, barges, floating platforms or other equipment enter the reservoir, they shall be thoroughly steam cleaned and washed to remove dirt, oil, and chemical deposits, and sprayed or swabbed with a solution containing 200 mg/l of chlorine. Diving equipment shall be cleaned and disinfected prior to entering the reservoir. Cleaning and washing shall be performed before such equipment enters the watershed, and shall be verified by the Contracting Officer and the ENVIRONMENTAL MONITOR.

B. The disinfection and cleaning site shall be sized, designed, constructed, and maintained by the Contractor in accordance with those minimum requirements, dimensions, and design elements as indicated in these specifications and project Drawings. Location shall be determined by the Contracting Officer. The site shall be restored to its original condition at the end of the contract period. The Contractor shall provide and operate and maintain all pumping and washing equipment as required to clean and disinfect all equipment.

C. The Contractor shall comply with the following activities associated with disinfection and cleaning of equipment and construction materials to be in contact with the reservoir.

1. Use machinery, equipment, and materials that have not previously been used in other aquatic systems whenever possible.
2. Follow the decontamination procedures outlined in this Section before beginning work in the reservoir. The terms "machinery" and "equipment" include, but are not limited to, boats, barges, trailers,

cables on heavy equipment, drilling rigs, silt curtains, hoses, pumps, shovels, waders, nets, scuba equipment, scientific equipment, and any other personal equipment. The term "materials" includes all permanent and temporary construction materials including, but not limited to, concrete, metal, plastics, pipes, hardware, cables, ropes, valves, or other items used for the construction.

3. Provide all of the decontamination equipment and supplies.

4. Document other sites where machinery, equipment, and materials were used or stored during the previous 12 months.

5. Schedule decontamination and inspection of machinery, equipment and materials with the Contracting Officer.

6. Reschedule decontamination and inspection if machinery, equipment, or materials have been temporarily taken offsite.

D. Equipment and Materials Decontamination Procedure:

1. The decontamination requirement covers all aquatic vessels, machinery, equipment, and materials that are new or have been previously used outside the Green River watershed and that will be exposed to the reservoir or River. Any use of vessels or equipment in surface waters during the previous year must be documented with dates and location on an equipment decontamination log. Equipment and materials decontamination on-site must be conducted at the decontamination area designated by the Contracting Officer. The decontamination and cleaning procedure has four steps:

a. Visual inspection and physical removal and disposal of obvious plant fragments and mussel shell.

b. Steam clean and/or pressure wash to remove all oil, grease and debris.

c. Wash with chlorine solution.

d. Final visual inspection by Contracting Officer or ENVIRONMENTAL MONITOR.

2. The detailed procedure shall be:

a. Examine all parts of the equipment, looking for any plant fragments, mussel shells, or any foreign matter.

1) If material is green or looks like a clamshell, remove it. Pay special attention to the following areas where small plant pieces or mussel shells can easily be hidden or lodged:

a) Storage wells and the floors of boats.

b) Motor, propeller, and motor well.

c) Hitch and bumper area.

d) Trailer frame, inside and outside.

e) Vehicle and trailer axles and fender wells.

f) Gears and axles on mechanized equipment (remove metal grating to inspect these areas).

2) Properly dispose of removed materials in a refuse facility (e.g., garbage can). Complete the remaining steps in the decontamination process, even if no biological material is visible.

b. Pressure wash surfaces with hot water.

1) Slowly direct the pressure washer stream at all surface, especially the areas listed in Step a.1 above. The pressure washer shall provide a minimum temperature of 180 degrees F (82 degrees C) and a minimum pressure of 2,000 pounds per square inch. Pressure washing technique may vary for materials having different sensitivity to pressure and temperature. The nozzle type, spray distance and application rate shall be adjusted to thoroughly remove all foreign substances without damaging the equipment being decontaminated. Boat motors and other equipment with internal surfaces that contact water shall be flushed with at least three

volumes of hot water.

2) For new equipment or fragile materials that could be damaged by the pressure washer stream (e.g., fabrics and scientific instruments), surfaces may be washed with a brush during the next step instead of a pressure washer. Temperature-sensitive equipment may be stored completely dry for at least 10 days at the decontamination site as an alternative to pressure washing with hot water. Machinery and equipment exhibiting petroleum or chemical contamination shall be washed off-site.

c. Wash surfaces with chlorine solution, following safety and environmental precautions outlined below:

1) Follow pressure wash with chlorine solution (see below) applied with a coarse spray using a pressurized tank sprayer or spray bottle. Concentrate spray especially toward tight spaces and crannies where plant pieces or shells might collect. Allow bleach solution to remain on the equipment for a minimum of 10 minutes. Rinse beach solution off with fresh water.

2) For cleaning equipment that can be damaged by bleach, instead scrub with liquid biodegradable soap. For repetitive decontamination of small equipment, a dip tank filled with chlorine solution may be used instead of a coarse spray. For large equipment and vessels, the coarse spray of chlorine solution must be collected on a wash pad that drains to a wastewater holding tank. Spent chlorine solution in dip tanks or holding tanks must be neutralized before disposal onsite (see environmental precautions below).

3) Chlorine solution is not stable and must be made fresh daily. It readily decomposes to salt and water when exposed to sunlight. An effective chlorine solution must contain approximately 200 milligrams per liter (mg/L) free available chlorine. This concentration can be obtained by diluting fresh household bleach (off-the-shelf Clorox contains approximately 5 percent chlorine), according to the following table:

Household Bleach	Water
4 milliliters	1 liter
40 milliliters	10 liters
1 tablespoon	1 gallon
1 cup	16 gallons
3-1/4 cups	50 gallons

4) Personal safety precautions shall be taken at all times when handling and applying chlorine solution.

5) Environmental Precautions for Use of Chlorine Solution:

a) To protect the environment, take care to prevent the chlorine solution from entering or being washed directly into surface waters. The Contractor shall use a coarse spray for chlorine applications, and rinse the equipment where the rinse water will puddle to allow time for the photo-decomposition process. Spent chlorine solution in dip tanks or wastewater holding tanks shall not be discharged onsite.

b) Sodium ascorbate will neutralize chlorine at ratios between 1.6 and 3 by weight, depending on pH of the solution. Based on a ratio of 2.5 for a pH of 7.8, 500 mg per Liter of sodium ascorbate is needed to neutralize 200 mg per liter of free available chlorine. Therefore, 0.21 pounds (95 grams) of sodium thiosulfate is needed to neutralize 50 gallons (189 liters) of chlorine solution wastewater. Adjust the amount of sodium

ascorbate in proportion to the amount of chlorine solution. Test the neutralized chlorine solution for total residual chlorine using a field test kit.

c) Inspect all surfaces again for plant fragments or mussel shells. A final inspection and approval of vessels, machinery, and equipment must be conducted by the Contracting Officer or authorized representative and documented in an equipment decontamination log.

3. This decontamination procedure must be repeated if the machinery or equipment is removed from the work site.

3.13 PETROLEUM/CHEMICAL STORAGE

3.13.1 GENERAL

1. Petroleum or chemical products shall be stored at the designated refueling/storage area shown on the Drawings. Petroleum and chemical products shall be contained in OSHA-approved containers and secured against spillage.
2. The Contractor shall track the type, location and amount of petroleum/chemicals on site including that in storage, in use, and used. Tracking methods and forms shall be approved by the Contracting Officer. Completed forms shall be submitted by the Contractor to the Contracting Officer twice each month.
3. Handling and storage of oil and chemicals shall not take place adjacent to waterways. Shut off and lock valves shall be provided on tanks. Shutoff nozzles shall be provided on hoses. Locks shall be provided on valves, pumps, and tanks. The fuel storage tanks shall meet the requirements of Section 13202A - FUEL STORAGE SYSTEMS.

3.13.2 BULK STORAGE

Bulk storage shall be defined as storage of 55 gallons or more of petroleum/chemical product in one location. The petroleum/chemical storage area shall be provided with an adequate containment dike surrounding the area as shown on the Drawings to ensure minimum soil contamination in the event of a spill. The volume of the impoundment above the finished grade and below the freeboard level, as shown on the Drawings, shall be equal to the volume of all fluids stored in the area plus 10 percent minimum. The calculated impoundment volume shall not include the catch basin, storm drainage culvert or the void space within the aggregate base. The bulk storage area may be constructed entirely above existing grade by construction berms, below existing grade by excavating the impoundment or some combination depending on topography. Subgrade shall be smoothed to the normally accepted limits of a smooth bladed dozer. Debris larger than 1/2 inch shall be removed prior to placing the impermeable liner. Vehicle traffic shall be minimized within the storage facility. The integrity of the impermeable liner shall be maintained throughout the life of the facility. Penetrations of the liner shall be limited to those required for drainage piping. All penetrations shall be sealed watertight. All fuel and other piping and hoses shall be above the containment basin and shall be continuously visible and shall be properly protected to prevent damage. The impermeable liner shall be as specified in this Section. The liner shall extend beyond the limits of the impoundment and be anchored as shown. Two layers of non-woven geotextile (minimum thickness 30 mils for each layer) shall be placed under the impermeable liner.

3.13.3 NONBULK STORAGE

1. Storage of small volumes, defined as less than 55 gallons of petroleum or chemicals is allowed outside of the bulk storage areas if those materials are being actively used in the construction process. Petroleum and chemical materials not being actively used in the construction process shall be stored in the bulk storage area.

2. All non-bulk petroleum/chemical containers shall be kept within a watertight basin sized to hold 110% of the total stored contents. Storage in non-bulk storage areas will not be allowed during non-work hours.

3. All non-bulk storage areas shall be covered to prevent the collection of stormwater. The collection of stormwater shall be monitored daily or more often as needed.

3.13.4 SPILL PREVENTION AND CLEANUP

1. Adequate petroleum and chemical product containment, recovery, cleanup, restoration, and disposal supplies and equipment shall be maintained at the project site at all times in the event of an accidental spill emergency. The name and location of the spill cleanup firm as specified shall be posted in a conspicuous location on-site, at all times. State-of-the-art methods and procedures of using such spill emergency control supplies and equipment shall be implemented in an expeditious and effective manner, to minimize the adverse impacts of any such spill emergency.

2. Electrically operated petroleum or chemical pumping or transfer devices shall be manned by knowledgeable personnel at all times of operation.

3.13.5 CONTAINMENT AREA USE AND MAINTENANCE:

1. All containment areas shall be inspected by the Contractor daily, and in the event of rain, inspection frequency shall be twice a day. Inspection will ensure that stormwater facilities are appropriately functioning. In event of significant petroleum or chemical leakage or spillage, all contaminated water shall be diverted to a temporary tank for transport and disposal off-site. Fluids in any containment area that contain significant amounts of oil or any spilled chemicals shall be cleaned up immediately by the Contractor or the Contractor's spill response firm and disposed of at a legal disposal facility. The source of leakage or spillage shall be identified and repaired immediately or the equipment or containers shall be immediately removed by the Contractor from the watershed area in a way that prevents further leakage. Cleanup work shall be performed at no additional cost to the Contracting Officer. Contractor shall follow all applicable federal, state, and local laws in clean-up and disposal efforts.

2. The oil/water separators shall be inspected daily or in event of a spill. Trapped oil shall not exceed one-half of the designed oil containment volume.

3. All containment areas not specifically designated by the Contracting Officer to remain as a permanent structure shall be removed by the Contractor immediately upon completion of use. Facilities designated to remain by the Contracting Officer shall be thoroughly cleaned of any accumulated oil or chemicals by the Contractor upon completion of use. Facilities to be removed shall first be cleaned of any accumulated oil or

chemicals by the Contractor. Debris from the removal shall be hauled off-site for disposal. Disturbed areas shall be restored and provided ground cover in accordance with Section 02272, EROSION AND SEDIMENT CONTROL, and Section 02935, HYDROSEEDING.

3.14 STATIONARY EQUIPMENT CONTAINMENT

All stationary equipment, operating or idle, in a location for more than one hour shall have oil absorbent pads placed beneath it. This includes, but is not limited to, backhoes, cranes, loaders, dozers, engine driven pumps, compressors, generators, and trucks. Soiled pads shall be replaced as often as necessary to preclude runoff of water containing petroleum sheens. Pads need to be picked up immediately when equipment is moved. Each piece of heavy equipment shall carry one empty 5-gallon bucket with lid, 5 absorbent pads, and a shovel for use in a petroleum spill. Stationary equipment which is not self-propelled such as compressors, and generators, which contain or use petroleum products or chemicals, shall be placed inside a containment basin as shown on the Drawings. Self-contained mechanisms are preferred.

3.15 PETROLEUM/CHEMICAL STORAGE ON VESSELS

A. Fuel storage on boats, barges, and other vessels shall be limited to the smallest quantities needed for daily operation. Bulk fuel storage will not be permitted on vessels. Chemicals shall be permitted on vessels only with the specific approval of the Contracting Officer, and shall be limited to approved quantities. Stormwater from on-board watercraft shall not be discharged to the reservoir or any other surface water. Bilge water must be held on-board vessels and collected and disposed of off-site. Bilge water shall not be discharged to the sedimentation ponds. All vessels shall be maintained in a clean condition to prevent discharge of deleterious materials during storm events.

B. Each vessel shall be equipped with a minimum of 100 oil absorbent pads and one empty five-gallon bucket with lid. Sheens and rainbows shall be mopped up immediately. Rubbish, litter, or garbage shall not be stored or left on deck. An inspection at the end of each shift will be conducted to pick up and dispose of rubbish.

C. Empty or extraneous containers of petroleum or chemical products shall be removed from watercraft containment areas and transported ashore for removal or disposal daily.

D. All petroleum and chemicals on water vessels shall be stored in watertight containment pans designed to hold 110% for the stored volume.

E. In the event of any spillage, the Contractor shall cease all work that contributed to the spillage or that may interfere directly or indirectly with speedy containment. All suitable personnel shall be devoted to containing and cleaning up the spillage in accordance with the Emergency Response Submittal. Normal work involving the vessel shall not be resumed until all the conditions that resulted in the spill have been fully corrected and the spill has been fully cleaned up.

3.16 EQUIPMENT REFUELING

The approximate location for the refueling and chemical/petroleum storage area is shown on the Drawings. Refueling of all mobile equipment shall be conducted at that location. Fueling of water vessels shall be performed at the moorage location and within containment booms. A mobile fueling truck

may be employed to fuel construction equipment that can not be transported to the refueling site.

3.17 TRANSFER OF PETROLEUM PRODUCTS

During transfer of fluid from one container to another, a competent operator shall be on-site to oversee the operation. Oil and petroleum products shall be dispensed during daylight hours unless the dispensing area is lighted. Dispensing devices shall automatically shutoff when the container is full. Overflows or spillage will not be allowed. Condensation siphoned from fuel tanks shall not be discharged onto the ground or to surface waters. Storage tanks and fuel trucks shall be structurally capable of holding the full contents without leakage. Excessive rust, perforations, holes, splits, etc. on tanks will not be permitted. Fuel trucks shall be labeled or marked as such, and shall carry a minimum of one 20-gallon bucket with lid, one shovel, and 5 oil absorbent pads for use at a spill. Reference Section 13202A - FUEL STORAGE SYSTEMS.

3.18 SANITARY AND RUBBISH WASTES

The Contractor shall provide and maintain any accommodations for the Contractor and Contracting Officer employees that are necessary to comply with the requirements and regulations of the State Department of Health and other agencies. Sanitary facilities and rubbish containers shall be located at all work sites and all locations where workers gather prior to start of work or shift changes. Sanitary facilities shall be maintained in a clean and sanitary condition, and shall be serviced regularly to prevent spillage and undue odors. Rubbish containers will not be allowed to overflow or spill liquids or solids onto the ground or into the reservoir, or other surface waters. Sanitary facilities shall not be located on footbridges, work platforms, barges, or below the high water mark or river. The Contractor shall not discharge waste or litter of any type to the reservoir. This includes fecal material, urine, chewing tobacco, sputum, cigarettes, cigars, food material, and garbage. Gray and black water from sinks and drinking fountains and black water (sanitary wastes) shall not be discharged to surface or ground waters. Gray and black water shall be collected in holding tanks and shall be trucked out of the watershed for legal disposal.

3.19 DIVERS AND DIVING APPARATUS

Divers shall not discharge any waste products to the water during diving operations. Diving gear including breathing apparatus, wet suits, dry suits, masks and fins shall be thoroughly washed and disinfected before entering the reservoir. Gear previously used in sewage lagoons, outfall inspections, or other potentially polluted areas shall not be used on this project.

3.20 PROCESS WATER

3.20.1 SOURCE

The Contractor will be allowed to withdraw process water from the clean water collection vault. Pumps and other mechanical components shall be designed and maintained so as to not impart grease or oils to the source or to the process water during withdrawal.

3.20.2 RECYCLING

Wherever construction operations require the continuing use of water for performing repetitive functions such as washing and rewashing aggregates, construction joint cleanup, curing concrete, washing of concrete batching and mixing equipment, recycling of the water will be required, unless this requirement is specifically waived. Appropriate holding tanks, storage facilities, pumping and treatment equipment shall be provided as required for the recycling process.

3.20.3 DISCHARGE OF PROCESS WATER

All process water released from recycling operations shall be stored and transported off-site for disposal unless conveyance to the sedimentation pond is approved by the Contracting Officer.

3.21 TREMIE PLACEMENT

Control placement of tremie concrete such that minimal loss of material occurs and enters the reservoir waters. This can be accomplished by minimizing the openings at joints and separations to preclude loss to the water.

3.22 LAYOUT OF FACILITIES

General concepts for the pollution control facilities are shown on the Drawings. These general concepts shall be adhered to in the execution of this contract and prosecution of the work.

3.23 CHLORINE RESIDUAL

Water containing chlorine residual shall not be discharged directly into, streams or state waters. Chlorinated water may be treated to remove chlorine residual and disposed on land for percolation if approved by the Contracting Officer. Chlorine residual may be reduced chemically with a reducing agent such as sodium thiosulfate, sodium ascorbate or other suitable chemical. Water shall be tested for chlorine residual prior to discharge.

3.24 NOTIFICATION

In the event of a sanitary sewage spill, notification shall also be made to the following: Tacoma Public Utilities, King County Health Department, Department of Health, and Department of Ecology. The Contractor shall immediately notify the Contracting Officer and the Department of Ecology of all incidents of chemical, oil, or other contaminated spills or discharges in excess of 1 gallon into State waters which become known to the Contractor.

3.25 NONCOMPLIANCE WITH WATER AND AIR POLLUTION CONTROL

The Contractor will be notified of noncompliance with the provisions specified herein and of necessary corrective action to be taken. Ambient water quality levels will be determined by results of samples collected from those areas unaffected by Contractor operations. Dilution zones will be as defined by DOE regulations. The Contractor shall take immediate corrective action when such notice is given. If the Contractor fails to comply or if water quality of potable water is threatened, the Contracting Officer may issue a stop work order until effective remedial measures have been taken by the Contractor. Time lost due to any such stop work order shall not entitle the Contractor to an extension of time or costs or

damages, unless it is later determined by the Contracting Officer that the Contractor was in compliance.

-- End of Section --

SECTION 01565

CONSTRUCTION SPOILS HANDLING

PART 1 GENERAL

1.1 SCOPE

A. This section addresses requirements for collecting, handling and disposal of construction waste and excavation spoils.

B. For the duration of this project the only anticipated waste materials will be overburden soils, excavated rock, reservoir sediments, clearing and grubbing debris, and construction waste.

C. All construction spoils disposed of in the watershed shall be free of petroleum, chemical or other hazardous waste. Spoils resulting from petroleum or chemical spill clean-up activities shall be transported out of the watershed and legally disposed of.

1.2 DEFINITIONS

A. Overburden Soils - Soils removed from the construction site resulting from excavation, site preparation, clearing, etc.

B. Excavated Rock - Clean rock resulting from excavation activity associated with the fish passage facility, approach channel sedimentation pond and access road construction.

C. Reservoir Sediments - Sediments removed from the reservoir bed during clamshelling, cofferdam construction, and rock excavation.

D. Clearing and Grubbing Debris - Vegetative debris with no commercial value generated as a result of site clearing activity.

E. Construction Waste - All materials associated with construction or demolition of structures, forms, retaining walls, erosion control, sedimentation pond, etc. these materials include, but are not limited to lumber, concrete, bricks, shingles, steel, iron, plastics, and paper products.

1.3 REFERENCE SPECIFICATIONS

A. Section 01100, ENVIRONMENTAL MANAGEMENT

B. Section 01563, POLLUTION CONTROL

1.4 REQUIREMENTS FOR WASTE DISPOSAL SITES

A. Waste site locations for excavation spoils, overburden, vegetation debris, and sediments are provided (Site1 and Site 2 as shown on the drawings). The Contractor shall be responsible for preparing waste sites to meet the grading, erosion control, safety and health requirements of the State, county and local political subdivision where located. Contractor shall obtain required permits for waste sites not run by another legally licensed, permitted party. Sites, operations, or results of operations,

which create a definite nuisance problem, or which result in damage to public or private properties will not be permitted.

B. Waste site operation shall be at all times subject to the Contracting Officer's approval. Site utilization without the Contracting Officer's approval will be considered unauthorized work.

C. Waste sites located within unincorporated King County, are subject to the rules and regulations of King County Grading Ordinance (Ord. No. 1488). At other locations sites are subject to rules and regulations of local governmental authority where located.

D. Final cleanup shall be in accordance with the requirements specified in the permits, property agreements and other Contract Documents.

E. When operations are complete, a release from all damages, duly executed by the waste site property Contracting Officer and stating that the restoration of the property is satisfactory, is required.

PART 2 PRODUCTS Not used

PART 3 EXECUTION

3.1 GENERAL

A. Use only approved waste sites.

B. Only excavation spoils, sediments, vegetation and overburden soils will be allowed in watershed waste sites (Site1 and Site 2 as shown on the drawings). All other construction waste shall be transported and disposed of outside of the watershed unless otherwise directed by the Contracting Officer.

C. Any unanticipated wastes will be disposed of outside of the watershed unless approved by the Contracting Officer.

D. Contractor shall implement appropriate erosion, sediment, and restoration controls for Site1 and Site 2 as disposal sites shown on the drawings, and any other site proposed by the Contractor. The waste site control and restoration measures shall be included in the Contractor's Erosion and Sediment Control Submittal as described in Section 01100 - ENVIRONMENTAL MANAGEMENT.

E. Take the protective measures required for the type of waste being handled.

F. After disposal, perform all operations necessary to put the waste sites in a neat, clean, and orderly condition.

G. Final cleanup shall be in accordance with the requirements of the permits, property agreements, and the contract documents.

H. Following use of the waste site the Contractor shall restore the site according to the approved Erosion and Sediment Control Submittal. Restoration shall include, but is not limited to covering and hydroseeding, and removal of erosion control measures.

-- End of Section --

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SECTION 01702

AS BUILT RECORDS AND DRAWINGS

PART 1 GENERAL

1.1 SUBMITTALS

Data listed in PART 3 of this section shall be submitted in accordance with section 01330 SUBMITTAL PROCEDURES. Due dates shall be as indicated in applicable paragraphs and all submittals shall be completed before final payment will be made.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 AS-BUILT FIELD DATA

3.1.1 General

The Contractor shall keep at the construction site two complete sets of full size prints of the contract drawings, reproduced at Contractor expense, one for the Contractor's use, one for the Government. During construction, both sets of prints shall be marked to show all deviations in actual construction from the contract drawings. The color red shall be used to indicate all additions and green to indicate all deletions. The drawings shall show the following information but not be limited thereto:

a. The locations and description of any utility lines and other installations of any kind or description known to exist within the construction area. The location includes dimensions and/or survey coordinates to permanent features.

b. The locations and dimension of any changes within the building or structure, and the accurate location and dimension of all underground utilities and facilities.

c. Correct grade or alignment of roads, structures, and utilities if any changes were made from contract plans.

d. Correct elevations if changes were made in site grading from the contract plans.

e. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor including, but not limited to, fabrication erection, installation, and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.

f. The topography and grades of all drainage installed or affected as part of the project construction.

g. All changes or modifications from the original design and from the final inspection.

h. Where contract drawings or specifications allow options, only the option actually used in the construction shall be shown on the as-built drawings. The option not used shall be deleted.

These deviations shall be shown in the same general detail utilized in the contract drawings. Marking of the prints shall be pursued continuously

during construction to keep them up to date. In addition, the Contractor shall maintain full size marked-up drawings, survey notes, sketches, nameplate data, pricing information, description, and serial numbers of all installed equipment. This information shall be maintained in a current condition at all times until the completion of the work. The resulting field-marked prints and data shall be referred to and marked as "As-Built Field Data," and shall be used for no other purpose. They shall be made available for inspection by the Contracting Officer's representative whenever requested during construction and shall be jointly inspected for accuracy and completeness by the Contracting Officer's representative and a responsible representative of the Contractor prior to submission of each monthly pay estimate. Failure to keep the As-Built Field Data (including Equipment-in-Place lists) current shall be sufficient justification to withhold a retained percentage from the monthly pay estimate.

3.1.2 Submittal of the As-Built Field Data

Two sets of the full size As-Built Field Data shall be submitted to the Contracting Officer for review and approval a minimum of 20 calendar days prior to the date of final inspection. If review of the preliminary as-built drawings reveals errors and/or omissions, the drawings will be returned to the Contractor for corrections. The Contractor shall make all corrections and return the drawings for backcheck to the Contracting Officer within 10 calendar days of receipt. When submitted drawings are accepted, one set of marked drawings will be returned to the Contractor for the completion of the as-built drawings.

3.2 AS-BUILT ELECTRONIC FILE DRAWINGS

3.2.1 The Government will submit to the Contractor one set of the contract drawings original record tracings. These drawings are part of the permanent records of this project and the Contractor will be held responsible for their protection and safety until they are returned to the Contracting Officer. Any drawings damaged or lost by the Contractor shall be satisfactorily replaced in like medium, quality, and size as the originals at the Contractor's expense. The Contractor shall return the contract drawings original record tracings to the Government within 30 calendar days.

3.2.1.1 The Contractor shall digitize the drawings in AutoCAD *) electronic file format, to be used for as-built drawings. The electronic file format, layering standards and submittal requirements are specified in paragraphs below. The Contractor shall incorporate onto the drawings all deviations from the original contract drawings as recorded in the approved "As-built Field Data" (see paragraph 3.1.2). The Contractor shall also incorporate all the written modifications to the contract drawings which were issued by amendment or contract modification. All revisions and changes shall be fully incorporated, i.e. items marked "deleted" shall be deleted, clouds around new items shall be removed, etc..

3.2.2 No earlier than 30 days after award the Government will have available for the Contractor one set of AutoCAD *) electronic file format contract drawings, to be used for preparation of as-built drawings. The electronic file drawings will be available on either 89 mm (3-1/2 inch) 1.44 MB floppy disks or ISO-9660 CD-ROM, as directed by the Contracting Officer. The Contractor has 30 days after the receipt of the electronic file to verify the usability of the AutoCAD files, and bring any discrepancies to the attention of the Contracting Officer. Any discrepancies will be corrected within 15 days and files returned to the Contractor. The Contractor shall incorporate all deviations from the original contract drawings as recorded in the

approved 'As-built Field Data' (see paragraph 3.1.2). The Contractor shall also incorporate all the written modifications to the contract drawings which were issued by amendment or contract modification. All revisions and changes shall be incorporated, i.e. items marked "deleted" shall be deleted, clouds around new items shall be removed, etc.

3.2.3 No later than 30 days after final acceptance a complete set of as-built drawings shall be submitted in AutoCAD electronic file format. The electronic file format, layering standards and submittal requirements are specified in paragraphs below. The as-built drawings shall be done in a quality equal to that of the originals. Line work, line weights, lettering, and use of symbols shall be the same as the original line work, line weights, and lettering, and symbols. If additional drawings are required they shall be prepared in electronic file format under the same guidance. When final revisions have been completed, each drawings shall be identified with the words "AS-BUILT" in block letters at least 3/8-inch high placed above the title block if space permits, or if not, below the title block between the border and the trim line. The date of completion and the words "REVISED AS-BUILT" shall be placed in the revision block above the latest revision notation.

3.2.4 Electronic File Submittal Requirements

3.2.4.1 The AutoCAD electronic file(s) deliverable shall be in AutoCAD release 14'DWG' binary format. All support files required to display or plot the file(s) in the same manner as they were developed shall be delivered along with the files. These files include but are not limited to Font files, Menu files, Plotter Setup, and Referenced files. The AutoCad files shall be "bound" (merged). It is the Contractor's responsibility to translate the design Microstation files to AutoCad files for as-built drawings.

3.2.4.1 The MicroStation electronic file(s) deliverable shall be in MicroStation 'DGN' binary format. All support files required to display or plot the file(s) in the same manner as they were developed shall be delivered along with the files. These files include but are not limited to Font Libraries, Pen Tables, and Referenced files.

3.2.4.2 Leveling shall remain as provided in the electronic files. An explanatory list of which levels are used in each drawing, including any additional levels needed to complete incorporation of the As-Built data, shall be provided with each submittal.

3.2.4.3 Electronic File Deliverable Media:

All electronic files shall be submitted in ISO 9660 format CD-ROM (CD). Zip drive disks shall not be provided. Two complete sets of CD(s) shall be submitted along with one complete set of ½ size prints taken from the CD(s). See paragraph 3.2.5 below. Each CD shall have a clearly marked label stating the Contractor's firm name, project name and location, submittal type (AS-BUILT), and date the CD was made. Each submittal shall be accompanied by a hard copy transmittal sheet that contains the above information along with tabulated information about all files submitted, as shown below:

Electronic File Name	Plate Number	Drawing Title

Electronic version of the table shall be included with each submittal set of disks.

3.2.5 Submittal of the Final As-Built Drawings

The final as-built record drawings shall be completed and returned together with the approved preliminary as-built drawings to the COE, Seattle District Office, Technical Services Branch, Records and Information Section, within 30 calendar days of final acceptance. All drawings from the original contract drawings set shall be included, including the drawings where no changes were made. The Government will review all final as-built record drawings for accuracy and conformance to the drafting standards and other requirements contained in DIVISION 1 GENERAL REQUIREMENTS. The drawings will be returned to the Contractor if corrections are necessary. The Contractor shall make all corrections and shall return the drawings to the same office within 7 calendar days of receipt.

3.3 All costs incurred by the Contractor in the preparation and furnishing of as-built drawings in electronic file format shall be included in the contract price and no separate payment will be made for this work. Approval and acceptance of the final as-built record drawings shall be accomplished before final payment is made to the Contractor.

3.4 One set of marked-up as-built prints shall be furnished at the time of system acceptance testing. These as-built prints shall be in addition to the submittals of marked-up as-built prints specified elsewhere in the contract.

-- End of Section --

SECTION 01703

WARRANTY OF CONSTRUCTION

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

Warranty Management Plan

One set of the warranty management plan containing information relevant to the warranty of materials and equipment incorporated into the construction project, including the starting date of warranty of construction. The Contractor shall furnish with each warranty the name, address, e-mail address and telephone number of each of the guarantor's representatives nearest to the project location.

Warranty Tags

Two record copies of the warranty tags showing the layout and design.

1.2 WARRANTY MANAGEMENT

1.2.1 Warranty Management Plan

The Contractor shall develop a warranty management plan which shall contain information relevant to the clause Warranty of Construction in SECTION 00700, CONTRACT CLAUSES. At least 30 days before the planned pre-warranty conference, the Contractor shall submit the warranty management plan for Government approval. The warranty management plan shall include all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan shall be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below shall include due date and whether item has been submitted or was accomplished. Warranty information made available during the construction phase shall be submitted to the Contracting Officer for approval prior to each monthly pay estimate. Approved information shall be assembled in a binder and shall be turned over to the Government upon acceptance of the work. Information to be turned over to a privatized Utility Contractor shall be separately bound. A joint 4 month and 9 month warranty inspection shall be conducted, measured from time of acceptance, by the Contractor, Contracting Officer and the Customer Representative. Information contained in the warranty management plan shall include, but shall not be limited to, the following:

a. Roles and responsibilities of all personnel associated with

the warranty process, including points of contact, telephone numbers and e-mail addresses within the organizations of the Contractors, subcontractors, manufacturers or suppliers involved.

b. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and for all commissioned systems such as fire protection and alarm systems, sprinkler systems, lightning protection systems, etc.

c. A list for each warranted equipment, item, feature of construction or system indicating:

1. Name of item.
2. Model and serial numbers.
3. Location where installed.
4. Name and phone numbers of manufacturers or suppliers.
5. Names, addresses, e-mail addresses and telephone numbers of sources of spare parts.
6. Warranties and terms of warranty. This shall include one-year overall warranty of construction. Items which have extended warranties shall be indicated with separate warranty expiration dates.
7. Cross-reference to warranty certificates as applicable.
8. Starting point and duration of warranty period.
9. Summary of maintenance procedures required to continue the warranty in force.
10. Cross-reference to specific pertinent Operation and Maintenance manuals.
11. Organization, names, 24-hour emergency phone numbers and e-mail addresses of persons to call for warranty service.
12. Typical response time and repair time expected for various warranted equipment.

d. The Contractor's plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.

e. Procedure and status of tagging of all equipment covered by extended warranties.

f. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

1.2.2 Performance Bond

The Contractor's Performance Bond shall remain effective throughout the construction period.

a. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Contracting Officer will have the work performed by others, and after completion of the work, will charge the expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.

b. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the Contractor's expense, the Contracting Officer will have the right to

recoup expenses from the bonding company.

c. Following oral or written notification by the Contracting Officer or his representative of required construction warranty repair work, the Contractor shall respond in a timely manner. Written verification will follow oral instructions. Failure of the Contractor to respond will be cause for the Contracting Officer to proceed against the Contractor.

1.2.3 Pre-Warranty Conference

Prior to contract completion, and at a time designated by the Contracting Officer, the Contractor shall meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this section. Communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty shall be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor shall furnish the name, telephone number, e-mail address and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact shall be located within the local service area of the warranted construction, shall be continuously available, and shall be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in connection with other portions of this contract.

NOTE: Local service area is defined as the area in which the Contractor or his representative can meet the response times as described in paragraph 1.2.4 below and in any event shall not exceed 200 miles radius of the construction site.

1.2.4 Contractor's Response to Construction Warranty Service Requirements

Following oral or written notification by the Government or utility owner, the Contractor shall respond to construction warranty service requirements in accordance with the "Construction Warranty Service Priority List" and the three categories of priorities listed below. The Contractor shall submit a report on any warranty item that has been repaired during the warranty period within two working days of repair completion. The report shall include the cause of the problem, date reported, corrective action taken, and when the repair was completed. Interim status reports shall be submitted weekly on repairs that have not yet been completed. If the Contractor does not perform the construction warranty work within the timeframes specified, the Government will perform the work and backcharge the Contractor.

a. First Priority Code 1 - Safety/Life & Health/Emergency: Perform onsite inspection to evaluate situation and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.

b. Second Priority Code 2 - Property Damage/Severe Inconvenience/Urgent: Perform onsite inspection to evaluate situation and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.

c. Third Priority Code 3. All other work to be initiated within 3 work days and work continuously to completion or relief.

d. The "Construction Warranty Service Priority List" is as follows (the applicable priority will be determined by the Government in its sole discretion):

Code 1-Air Conditioning Systems
(1) Recreational support.
(2) Air conditioning leak in part of building, if causing damage.
(3) Air conditioning system not cooling properly.

Code 1-Doors
(1) Overhead doors not operational, causing a security, fire, or safety problem.
(2) Interior, exterior personnel doors or hardware, not functioning properly, causing a security, fire, or safety problem.

Code 3-Doors
(1) Overhead doors not operational.
(2) Interior/exterior personnel doors or hardware not functioning properly.

Code 1-Electrical
(1) Power failure (entire area or any building operational after 1600 hours).
(2) Security lights
(3) Smoke detectors
(4) Traffic signal blackout

Code 2-Electrical
(1) Power failure (no power to a room or part of building).
(2) Receptacle and lights, exit lights or emergency lights (in a room or part of building).
(3) Traffic signal inoperable (flashing)

Code 3-Electrical
Street lights.

Code 1-Gas
(1) Leaks and breaks.
(2) No gas to family housing unit or cantonment area.

Code 1-Heat
(1) Area power failure affecting heat.
(2) Heater in unit not working.

Code 2-Kitchen Equipment
(1) Dishwasher not operating properly.
(2) Any other equipment hampering preparation of a meal.

Code 1-Plumbing
(1) Hot water heater failure.
(2) Leaking water supply pipes.
(3) Fire sprinkler systems

Code 2-Plumbing
(1) Flush valves not operating properly.

(2) Fixture drain, supply line to commode, or any water pipe leaking.
(3) Commode leaking at base.

Code 3 -Plumbing
Leaky faucets.

Code 3-Interior
(1) Floors damaged.
(2) Paint chipping or peeling.
(3) Casework.

Code 1-Roof Leaks
Temporary repairs shall be made where major damage to property is occurring.

Code 2-Roof Leaks
Where major damage to property is not occurring, check for location of leak during rain and complete repairs on a Code 2 basis.

Code 1-Water (Exterior)
(1) No water to a building with sanitary facilities.
(2) Broken water main.

Code 2-Water (Exterior)
No water to facility.

Code 2-Water (Hot)
No hot water in portion of building listed.

Code 1 - Sewerage
(1) Sewage line backup.
(2) Broken sanitary or storm sewer main

Code 3-All other work not listed above.

1.2.5 Warranty Tags

At the time of installation, each warranted item shall be tagged with a durable, oil and water resistant tag approved by the Contracting Officer. Each tag shall be attached with a copper wire and shall be sprayed with a silicone waterproof coating. The date of acceptance and the QC signature shall remain blank until project is accepted for beneficial occupancy. The tag shall show the following information.

a. Type of product/material _____.

b. Model number _____.

c. Serial number_____.

d. Contract number_____.

e. Warranty period _____from _____to _____.

f. Contractor Inspector's (QC) signature _____.

g. Construction Contractor _____.

Address_____.

Telephone number_____.

E-mail address _____.

h. Warranty contact_____.

Address_____.

Telephone number_____.

E-mail address _____.

i. Warranty response time priority code_____.

PART 2 (NOT APPLICABLE)

PART 3 (NOT APPLICABLE)

-- End of Section --

SECTION 02212

CONTROLLED BLASTING

PART 1 GENERAL

1.1 APPLICATION

This section covers the use of explosives in drill-and-blast operations for all work involving the excavation of rock for the construction of the Juvenile Fish Passage Facility and Cofferdam at the Howard Hanson Dam operated by United States Army Corps of Engineers - Seattle District.

The work covered in this section includes pre-blast inspections, blast design which includes evaluating the existing nearby structures, blast limitations, materials, equipment, labor and supervision for the transportation and storage of explosives, drilling and loading of blast holes, protection of existing facilities, test blasts, blast-effects monitoring, post-blast inspections and damage repairs.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

BUREAU OF ALCOHOL TOBACCO AND FIREARMS (BATF)

BATF 27 CFR Part 555	Title XI, Regulation of Explosives (18 U.S.C. Chapter 40; 84 Statute 952), of the Organized Crime Control Act of 1970 (84 Statute 922) and the Safe Explosives Act, Title XI, Subtitle C of Public Law 107-296, the Homeland Security Act of 2002

U.S. DEPARTMENT OF TRANSPORTATION (DOT)

DOT 49 CFR	Title 49, Parts 106, 107, 171-179, 383 and 390-399

WASHINGTON DEPARTMENT OF LABOR AND INDUSTRY (WAC)

WAC296-52	Safety Standards for the Possession and Handling of Explosives

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(1996) Safety and Health Requirements Manual (Section 29)

1.3 DEFINITIONS

Air Overpressure: Fluctuating changes in ambient air pressure caused by blasting. Airblast is expressed in units of psi or decibels (dBL).

Buffer Holes: Holes with reduced energy charges drilled adjacent to

smoothwall, trim or open line-drilled holes at the perimeter of the excavation. The explosive charge in buffer holes is generally between 50 and 75% of the charge used in normal production blast holes. Buffer holes are usually drilled parallel to adjacent holes at the excavation perimeter.

Channel Drilling: A method of preventing overbreak by using special drilling equipment to create a series of drilled holes that are connected to create a continuous open slot within the plane of the desired excavation limits. This method is often used in conjunction with lightly loaded buffer charges that are placed within the rock mass at a set distance that will break it back to the channel slot but not beyond it. Mechanical excavation methods such as hoe-rams, rock saws, or narrow cutter trenching machines can also be used to break rock within the boundaries of drilled channel slots.

Close-in Blasting: Refers to drilling and rock excavation activities to existing structures within a distance that is equal to or less than the final excavation depth.

Line Drilling: A method of controlling overbreak, in which a series of very closely spaced holes are drilled at the perimeter of the excavation. Line holes are generally not loaded with explosives; however, in some applications alternating holes may be loaded with light charges using detonating cord.

Lookout - A term used to define the practice of aligning perimeter blast holes such that the toe of the hole arrives 6 to 12 inches outside the ideal envelope limits of the cut. The planned overbreak in the toe area, created by lookout-holes angles several degrees outward, creates adequate space so drills can establish perimeter holes for the next bench or round at desired collar locations just outside the planned minimum cut or round break limits.

Maximum Charge Weight per Delay-For purposes of vibration control, any charges firing within any 8-millisecond time period are considered to have a cumulative effect on vibration and airblast effects. Therefore, the maximum charge per delay equals the sum of the weight of all charges firing within any 8-millisecond time period. For instance, if two 10-lb charges fire at 100 ms and one 15-lb charge fires at 105 ms, the maximum charge per delay would be 35 lbs.

Occupied Building: Structure on or off construction limits that are occupied by humans or livestock.

Peak Particle Velocity (PPV): The maximum of the three ground vibration velocities measured in the vertical, longitudinal and transverse directions. Velocity units are expressed in inches per second (ips).

Pre-splitting: A blasting technique in which the perimeter charges are detonated first in the firing sequence or as a separate blast ahead of production blasting. This technique is designed to generate a fracture in the plane of the pre-split holes drilled along the perimeter of the excavation.

Primary Initiation: The method whereby the blaster initiates the blast(s) from a remote and safe location. Primary initiation systems use pneumatic tubing or shock-tubes to convey firing energy from blasters to blast locations.

Production Holes: Blast holes in the main body of the rock mass being removed by drilling and blasting.

Residential Building: Includes single and multi-family dwellings, hotels, motels, and any other structure containing sleeping quarters.

Scaled Distance: The distance from a blast measured in feet, divided by the square root of the charge per delay period measured in pounds. These "square root" scaled distance values are used in calculations regarding ground vibration prediction and control. For airblast calculations, cube root scaling is used whereby distance is divided by the cube root of the maximum charge per delay.

Smoothwall Blasting (trim blasting): A form of controlled blasting used in tunnel, shaft, trench and other surface blasting excavations. With this method, lightly loaded charges are placed in relatively close-spaced holes and timed to fire such that a well-formed open face provides excellent relief when removing the final burden of rock in front of trim holes drilled at the excavation limits. Smoothwall trim blasts can be fired as separate blasts after mass rock has been blasted and removed or the trim blast can be integrated with adjacent mass blasts if delay timing and other blast design factors ensure that adequate free-face relief is provided for the final rock burden against perimeter charges.

Stemming: Crushed stone, tamped clay or some other inert earth material placed in the unloaded collar area of blast holes for the purpose of confining explosive charges and limiting rock movement and airblast.

Sub-drilling: The portion of a blast hole that is drilled below or beyond the desired excavation depth or limit. Subdrilling is generally required to prevent the occurrence of high or tight areas of unfractured rock between blast holes.

USBM RI 8507 PPV Frequency Plot: A plot of measured peak particle velocity vs. measured frequency on a logarithmic horizontal and vertical scales, examples of which are shown in Appendix A of "Structure Response and Damage Produced from Surface Mine Blasting", U.S. Bureau of Mines, Report of Investigation 8507, by D. E., Suskind, et. al, dated 1980.

1.4 SYSTEM DESIGN

Unless approved by the Contracting Officer, test and full-scale production blasts shall conform to the requirements for Excavation Bench Blasting provided in paragraph EXCAVATION BENCH BLASTING of these specifications. The Contractor, with the assistance of the Contractor's blasting consultant, shall evaluate the results of the Test Blasts (paragraph TEST BLASTS) and shall evaluate the impacts of the test blasts on nearby existing structures. With supporting documentation, the Contractor shall then propose in a revised blasting plan that includes additional blast design requirements, including maximum charge-weight-per-delay based on scaled distance, to accomplish the work in a satisfactory manner and to protect nearby existing structures, and to limit peak particle velocities at nearby structures to the values presented in paragraph PERFORMANCE REQUIREMENTS of these specifications. The Contracting Officer may approve the Contractor's proposed revisions to the blasting plan, which shall be used to design subsequent blasts. As an alternative, the Contracting Officer may require that all subsequent blasting shall conform to the requirements listed in paragraph DESIGN CRITERIA through PERFORMANCE REQUIREMENTS. The contracting Officer reserves the right to not allow any

blasting method, product, or practice proposed by the Contractor that does not conform to the requirements listed in paragraph DESIGN CRITERIA through PERFORMANCE REQUIREMENTS for any reason.

Additional requirements and limitations on blasting methods may be necessary to accomplish the work in a satisfactory manner, and protect existing and newly constructed facilities. Adoption of the requirements in this section, including the maximum charge weight-per-delay provided in paragraph EXCAVATION BENCH BLASTING, of these specifications does not relieve the Contractor, with the assistance of the Contractor's Blasting Consultant, of developing a plan for preventing damage to nearby facilities as required in the General Blasting Plan (paragraph PREPARATION AND PROTECTION (B)) of these specifications.

1.4.1 Design Criteria

The firing systems for the general blast holes shall be controlled by the use of delay detonators. Explosives used for a single period of delay shall be the minimum required.

Blast designs shall include measures that prevent all forms of misfires and ensure complete detonation of all explosives. If any products or methods are causing excessive cutoffs or other forms of misfires, the Contracting Officer can require the Contractor to suspend the use of problematic products or methods. All associated costs of redesigned blasts or delays caused by this action will be at the Contractor's expense.

1.4.2 Excavation Bench Blasting

Excavation to final rock surfaces shall be carried out using, channel drilling, line drilling or approved smoothwall blasting methods. Pre-split blasting will not be allowed.

The diameter of all holes charged with explosives shall not exceed 2.5 inches.

Only fixed-cartridge or packaged explosives with diameters not exceeding 1.5 inches shall be used. Flowable explosives like ANFO or pumped slurries will not be allowed.

In excavation area 1B, the north perimeter walls adjacent to the existing outlet works tower shall be channel drilled to control overbreak and limit blast impacts to remaining rock and the nearby structures beyond it. The depth of the channel drilling shall not be less than the depth of the excavation drill benches.

The depth of excavation drill benches, not including subdrilling, shall not exceed 10 feet, except in those areas specified in Section 02300, EARTHWORK, paragraph EXCAVATION BENCH HEIGHT RESTRICTIONS where a bench height of 8 feet is specified.

Subdrilling shall not exceed 2 feet and the total depth of blast holes shall not exceed 12 feet.

Perimeter holes along the final excavation limits may be drilled to a maximum depth of 42 feet, backfilled with a sand and partially reopened with blow pipes to allow their integrated use with adjacent 10-foot production bench blasts.

All explosive charges shall be stemmed with clean washed crushed stone sized between 3/8 and ½ inches. The minimum height of stemming shall be at least 20 charge diameters; i.e. if a 1.5-inch diameter charge is used, minimum stemming shall be at least 30 inches or 2.5 feet.

Maximum charge weights per delay shall meet the following criteria:

In Areas 1B and 1C, minimum scaled distance of 5 ft/lb^0.5 (feet per square root of the charge weight in pounds) shall be used to determine maximum charge-weight-per-delay, based on the distance of charges to the nearest point of the existing outlet works tower, tunnel, and bridge piers; i.e. if the distance is 10 feet, the maximum-charge-weight-per-delay shall not exceed 4 pounds (10/5)^2. To conform to this limit, contractors are encouraged to use 200 or 400-grain detonating cord in charges used very close to the existing outlet works tower and tunnel.

When smoothwall blasting methods are used, the design and implementation shall conform to the following requirements:

(1) Hole spacing shall not exceed 18 inches unless the Contracting Officer approves a variance. Justification to increase hole spacing shall be based on the Contracting Officer's opinion that test blasts have produced satisfactory results.

(2) The main explosive charge, not including the primer stick, shall be distributed evenly and de-coupled from wall of the hole. The maximum charge weight per unit length of hole (loading factor) shall not exceed 0.34 lb/ft. The weight of the primer stick or cast booster shall not exceed 0.5 pounds.

(3) Burden/spacing ratio for perimeter holes shall be between 1.2 and 1.4. The burden is the distance between the borehole and the nearest free-face, and spacing is the distance between boreholes and approximately perpendicular to the burden.

(4) Lookout of perimeter holes: Lookout shall be limited to the minimum necessary to collar holes for the the next bench.

1.4.3 Performance Requirements

A. Blasting shall be performed only within the period of time occurring 30 minutes after dawn and 30 minutes before sunset. No nighttime blasting will be allowed, unless it is authorized under special circumstances with the express approval of the Contracting Officer.

B. In no case shall blasting noise (air-overpressure), measured near the nearest on-site building, exceed 133 dBL.

C. Peak particle velocity measured at reinforced concrete structures, including but not limited to the spillway, outlet works tower, outlet works tunnel lining, bridge piers, shall not exceed a Limiting Value equal to 20 inches per second (ips). The Threshold Value at these structures shall be equal to 16 ips. If either the Limiting or the Threshold Values of peak particle velocity as measured by instrumentation, installed by either the Contracting Officer or the Contractor, is exceeded the Contractor shall take the actions specified in Section 02214, GEOTECHNICAL INSTRUMENTATION, paragraph INTERPRETATION OF DATA AND IMPLEMENTATION OF ACTION PLANS.

Peak particle velocity measured at the trunnions of the existing spillway

and outlet works regulating gates shall not exceed a Limiting Value equal to 8 ips. The Threshold Value at these structures shall be equal to 6 ips. If either the Limiting or the Threshold Values of peak particle velocity as measured by instrumentation, installed by either the Contracting Officer or the Contractor, is exceeded the Contractor shall take the actions specified in Section 02214, GEOTECHNICAL INSTRUMENTATION, paragraph INTERPRETATION OF DATA AND IMPLEMENTATION OF ACTION PLANS.

1.4.4 Alternative Excavation Bench Blasting Criteria

The Contractor may propose and submit in a revised blast plan an Alternative Excavation Bench Blasting Criteria for the Contracting Officer's approval. If approved by the Contracting Officer, the Contractor's proposed criteria shall only apply to the following areas:

1. Area 1C above an elevation of 1120 feet and not included in those areas where the height of excavation benches are limited to 8 feet as specified in Section 02300, EARTHWORK, paragraph EXCAVATION BENCH HEIGHT RESTRICTIONS.

2. Those portions of Area 1B that are located at a distance greater than 40 feet from the existing outlet works tower, tunnel, and regulating gates.

In all other areas, the requirements of paragraph EXCAVATION BENCH BLASTING of this Section shall apply.

Prior to implementation of Alternative Excavation Bench Blasting Criteria in any production blast, the Contractor shall demonstrate by the means of Test Blasts (paragraph TEST BLASTS) that the proposed revisions will neither damage existing structures nor exceed the Limiting Values of peak particle velocities listed in paragraph PERFORMANCE REQUIREMENTS of this Section. The Contractors proposed Alternative Excavation Bench Blasting Criteria shall be implemented only with the approval of the Contracting Officer, and the Contracting Officer may require that the Contractor use the Excavation Bench Blasting Criteria provided in paragraph EXCAVATION BENCH BLASTING if the Contractor's proposed methods are resulting in damage to existing structures.

The Contractor's proposed Alternative Bench Blasting Requirements shall conform to the following requirements:

(1) The depth of excavation benches shall not be greater than 20 feet.

(2) The diameter of holes charged with explosive shall not exceed 3.5 inches.

(3) Only fixed cartridge explosives with diameters not exceeding 2.5-inches shall be used, and flowable explosives like ANFO or pumped slurries shall not be allowed.

4) Subdrilling shall not exceed 4 feet, and the total depth of blast holes shall not exceed 24 feet.

(5) Excavation to final rock surfaces shall be carried out using channel drilling, line drilling, or approved smoothwall blasting methods, Pre-split blasting shall not be allowed.

(6) Stemming, approved stemming materials, smoothwall blasting

methods, and maximum charge weight per delay shall meet the requirements listed in paragraph EXCAVATION BENCH BLASTING of this Section.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

General Blasting Plan: G
Individual Blast Plans: G
Blasting Safety Plan: G

The Contractor shall prepare a blasting safety plan. Unless otherwise indicated, make required submittals at least 30 days prior to conducting any blasting operations, and before any explosives, blasting agents, primers, or initiators are delivered to the job site.

Emergency Response Plan: G

An Emergency Response Plan indicating types of explosive materials, storage locations and quantities shall be submitted to and approved by the local emergency response agency. The approved emergency response plan will be submitted to the Contracting Officer before explosives are allowed on site. The emergency Response Plan shall contain points of contact and telephone numbers for local emergency response agency(ies).

Pre-Blast Inspection Survey

Prepare and deliver to the Contracting Officer, prior to the start of test blasting, two bound copies of the pre-blast inspection reports containing field notes, sketches, diagrams, photos and videos. Reports must be signed and witnessed by all involved parties. The blasting consultant shall be included in the pre-blast survey and inspection, as well as the post-blast survey, if the post-blast survey is required as directed by the Contracting Officer.

Data obtained from pre-inspections shall be delivered to the Contracting Officer within 7 days of the date of inspection.

Submit copies of all after-blast inspection reports to the Contracting Officer within 30 calendar days of the receipt of a complaint.

SD-03 Product Data

Material Safety Data Sheets; G

Manufacturer's product information sheets and Material Safety Data Sheets (MSDS) for all explosives, blasting agents, primers and

initiator products, blasting devices, lightning detectors, blasting mats, and all other blasting equipment.

Vibration Monitoring Software; G

Submit original installation-disks, manuals and other documentation for IBM-PC-based software used to report and interpret blast-induced motion.

SD-07 Certificates

Quality Control Submittals; G

A detailed description of the education, training, and experience of all proposed persons that will be immediately in charge of drilling and blasting operations. Separate qualifications shall be submitted for each supervising blaster-in-charge. The qualifications of each blaster-in-charge shall meet or exceed the requirements given in paragraph QUALIFICATIONS of the specifications. The Contractor's' submittal shall include names, addresses and telephone numbers of at least three persons who can verify such prior successful experience for each supervising blaster-in-charge. Copies of valid Washington State blasting licenses shall also be submitted for all blasting supervisors. Blasting licenses shall indicate that the blasters are certified for blasting using non-electric initiation systems.

The name and qualifications of a recognized blasting consultant(s) whom the Contractor plans to retain to facilitate the development or review of all blasting designs and blast-effect control measures. The qualifications of the blasting consultant(s) shall meet or exceed the requirements given in paragraph QUALIFICATIONS. of these specifications. The blasting consultant shall be retained for the duration of the project. Contractor shall anticipate a minimum of 60 hours of blasting consultant effort to prepare the General Blasting Plan and Individual Blast Plans for test and full-scale production blasts. The retained blasting consultant shall also be on site during test blasting. Also, if requested by the Contracting Officer, the Contractor shall provide two additional one-week duration on-site visits for the blasting consultant.

The name and qualifications of a qualified specialist who will perform the pre-blast condition inspection of all structures, utilities and facilities located within 500 feet of the blast areas. The qualifications of the specialist shall meet or exceed the requirements given in paragraph QUALIFICATIONS of these specifications.

After each blast, a post-blast report including printed seismograph monitoring reports, including all data specified in paragraph BLAST MONITORING EQUIPMENT, shall be submitted to the Contracting Officer prior to loading any subsequent blast holes. After each blast, a copy of the video tape recording, specified in paragraph MONITORING shall be submitted to the Contracting Officer prior to the loading of any subsequent blast holes.

Copies of required Washington State Explosive Purchase and Storage licenses.

Copies of any required regulatory variances.

1.6 SCHEDULING AND SEQUENCING

A. Schedule blasting operations, including the initial test blasts, to minimize disturbance of the public ongoing dam operations, Burlington Northern Santa Fe (BNSF) railroad traffic, and users of the access road through the project.

B. Perform pre-blast inspections of adjacent private and public property as specified herein, including but not limited to the BNSF Railway before conducting test blasts.

1.7 QUALITY ASSURANCE

1.7.1 Qualifications

All blasters and supervising shift foremen shall be properly qualified and licensed in accordance with applicable federal, state, and local government regulations. The Contractor shall not allow prohibited persons as defined (BATF 27 CFR Part 555) by the BATF to transport, handle, possess or use explosive materials.

The blasting supervisors (blasters-in-charge) shall have a minimum of 10 years of experience, directly related to controlled blasting, in-water blasting, and close-in blasting near critical above and below ground structures or other demonstrated experience of satisfactory performance on previous jobs, as demonstrated to the Contracting Officer. All blasting supervisors shall be able to document the completion of at least three projects with satisfactory results of similar scope and complexity.

The Contractor shall retain the services of an experienced blasting consultant with at least 10 years experience in monitoring blasting operations and interpreting blast-induced effects including vibration in complex structures and air overpressure impacts for similar construction projects.

The Contractor shall retain the services of an experienced blasting consultant(s) with at least 10 years experience in preparing controlled blasting designs. This experience shall include specific experience with close-in blasting near critical above and below ground structures. Blasting plans, test-blasting-plans and revisions to any of these plans will be reviewed by and covered with a signed review letter by the blasting consultant(s). The blasting consultant shall not be required to sign the individual blast plans provided they are signed by an on-site licensed blaster.

The Contractor shall retain the services of an experienced specialist who will conduct a detailed pre-blast inspection of the condition of the BNSF Railway line and critical structures and openings within the Howard Hanson Dam including but not limited to the existing spillway outlet works tower, access bridge, outlet tunnel, and associated mechanical works of the facilities. The specialist shall have performed similar pre-construction survey services on at least three projects of similar scope and complexity and have at least five years of experience in conducting pre-blast inspections. The experienced specialist shall have a college degree in science or engineering from a 4-year college or university.

1.7.2 Monitoring

Monitor each blast using approved personnel and equipment conforming to the requirements outlined in paragraph BLAST MONITORING EQUIPMENT as follows:

1. Seismographs to measure ground motion and air overpressure:

a. At two on-site structures as designated by the Contracting Officer.

2. One instrument using either tri-axial accelerometers or high-range velocity geophones with 1,000 Hz frequency range and PPV range up to 100 ips to measure blast-induced vibration at identified locations where frequency of motion exceeds 250-Hz:

a. At locations identified by the Contractor's blasting consultant or the Contracting Officer.

The Contractor shall make a video tape recording on VHS format of each blast. The video shall include coverage before, during, and after initiation of the shot that clearly depicts the layout of the shot, the behavior of the shot, and the resulting muck pile. Each shot record shall be cued in tape to identify the project, date, and shot number.

1.8 DELIVERY, STORAGE AND HANDLING

A. Comply with federal, state, and local regulations, applying to the purchase, transportation, storage, handling, and use of explosives, blasting agents, primers, initiators, and ancillary equipment and materials.

B. Transportation

1. Where explosives are transported on public roads, the carriage shall be in accordance with DOT 49 CFR.

2. If explosives are to be transported in interstate or foreign commerce, a license or users permit shall be secured from the (BATF) Bureau of Alcohol, Tobacco, and Firearms (BATF 27 CFR Part 555).

C. On Site Storage

1. The location, access, and construction of explosive storage magazines and day-use magazines shall meet all requirements outlined in WAC296-52 and be in accordance with BATF 27 CFR Part 555 and all other applicable regulations.

2. The location of the on site storage facility shall be no less than 100 feet away from the shoreline of the high water level.

3. All second class magazines used for day storage shall be located at least 150 feet from active work areas.

4. Maintain inventory control of all blasting equipment and supplies. Copies of inventory logs shall be kept as required by BATF rules and be made available for review at the request of the Contracting Officer.

5.Storage places shall be identified with signs stating clearly and boldly, DANGEROUS EXPLOSIVES. Signs shall be attached to poles in plain sight from all approaches to the magazine sites. Signs must not

be attached directly to magazines. Signs shall also include the warning "Never Fight Explosive Fires."

6. No more than 30,000 pounds of explosives may be stored on-site at any time.

7. A berm/barrier, in accordance with WAC96-52 must be installed around the explosives storage area. The location of the explosives storage area will be designated by the Government prior to contractor mobilization. The area will be located within ½ mile of the blasting & excavation work site.

8. The bermed explosives storage area shall be surrounded with an 8 foot fence with double outriggered barbed wire on top, and access and egress through a lockable gate. The gate is to remain padlocked at all times when a contractor/subcontractor employee is not present within the bermed explosives storage area.

D. The aforementioned review of specific regulations shall not relieve the Contractor from his/her responsibility of knowing about and complying with all applicable regulations.

E. Explosive Losses to Ground or Water

Contractor shall use great care to ensure that all possible measures are used to prevent explosive losses to ground by spillage, misfires or any other cause. If poor handling practices or blasting malfunctions cause excessive losses of explosives -based on the Contracting Officer's judgment-all blasting in affected excavations shall cease until the Contractor submits a revised explosive loss prevention plan that is approved by the Contracting Officer.

1.9 WORKSITE CONDITIONS

This Statement of Concern is expressly written to alert the Contractor (or prospective bidders) to the fact that ordinary practices that are customarily considered as standard for the blasting industry will not be acceptable on this project. Extra caution and skill will be required to accomplish this work in a satisfactory manner. Blasting must be safely accomplished in close proximity to the existing outlet works tower, outlet works tunnel, access bridge, regulating gates, foundations and other critical facilities. Because of these concerns, the Contracting Officer will exercise his prerogative to examine carefully the qualifications of any persons whose knowledge and skills may impact the outcome of the work. In addition, the Contracting Officer will reject any persons who are deemed unqualified for any tasks that may be required.

The Contractor shall anticipate that ground containing existing rock bolts will be encountered in the excavation, including the excavation next to the existing outlet works tower and tunnel. The Contractor shall be prepared to perform both channel drilling and production hole drilling through existing rock bolts.

PART 2 PRODUCTS

2.1 EXPLOSIVE MATERIALS

Only fully non-electric blasting systems shall be used. Cap and fuse method shall not be allowed.

Only explosives designed and manufactured for smoothwall (trim) blasting shall be used in perimeter holes for blasting in the bench excavations. Such products include detonating cord as well as cartridge configurations. Loading density of charges in perimeter holes shall not exceed 0.34 pounds per lineal foot unless approved by the Contracting Officer.

Explosives, blasting agents, primers, initiators, and ancillary blasting materials shall be kept in original packaging with clearly marked date codes. All explosives and initiating devices used shall be less than one year old.

If the Contracting Officer determines that a blasting product appears to be in a damaged or deteriorated condition, the suspect product shall not be used until its condition can be determined. Products found to be damaged or in a deteriorated condition shall be immediately returned to the supplier for safe disposal.

2.2 BLAST MONITORING EQUIPMENT

Equipment for on-site and off-site particle velocity and air overpressure monitoring shall be 4-channel (1 overpressure and 3 seismic channels) units capable of digitally storing collected data. Equipment must be capable of printing ground motion time histories and summaries of peak motion intensities, frequencies and USBM RI8507 PPV--frequency plots. Printed report records must also include date, time of recording, operator name, instrument-number and date of last calibration.

1. Instruments shall have a flat frequency response between 2 and 250 Hz for particle velocity and from 2 to 200 Hz for air overpressure.

2. The digitizing sampling rate for peak particle velocity and air overpressure measurements shall be least 1,024 samples per second.

3. Seismographs shall be capable of performing a self-test of velocity transducers and printed event records shall indicate whether or not the sensor test was successful.

4. Seismographs used for off-site compliance monitoring shall be capable of recording overpressure from 88 to 148 decibels (dB-L), and particle velocity from 0.005 to 5.0 in/sec.

5. At locations where the intensity of expected ground motion (PPV) exceeds the accurate-recording range of standard velocity transducers (5 to 10 in/s), either high-range velocity transducers or accelerometers shall be used to record motion. The minimum flat-response frequency range of velocity transducers shall be 20 to 1,000 Hz, and the upper range of measurable PPV shall be at least 50 in/s. when high-range sensors are used, the minimum digitizing rate of recording equipment shall be at least 10,000 samples per second. Acceleration data shall be integrated to determine peak particle velocities.

6. Systems shall be capable of providing printed event reports that include all peak measurements, frequencies and complete waveform plots.

7. Seismographs shall have adequate memory to record events, on all measurement channels for a time period equal to maximum planned blast duration plus one second.

8. All seismograph/software systems shall be capable of saving back-up copies of all event files on floppy or Zip disks in file formats supported by software that the Contractor has submitted to the Contracting Officer as specified in paragraph SUBMITTALS SD-03.

PART 3 EXECUTION

3.1 GENERAL

Monitoring and recording of all blast effects, as required by these specifications, shall be performed by the Contractor. The Contractor shall monitor each blast at specified locations and other locations determined by the Contracting Officer. Printed reports of all monitoring results-including motion and air-overpressure time-histories shall be submitted to the Contracting Officer before subsequent blasting occurs. The Contractor shall save all digital monitoring record files to at least two separate disk locations-of which one location is either an IBM-compatible 3-1/2 inch floppy disk or a Zip disk. Upon request, the Contractor shall submit copies of digitally recorded blast monitoring files to the Contracting Officer. The Contracting Officer may or may not perform independent blast monitoring. When both the Contracting Officer and the Contractor perform blast monitoring, the monitoring performed by the Contracting Officer shall be used to evaluate and determine the Contractor's compliance with the peak particle velocity (PPV) limitations specified in paragraph PERFORMANCE REQUIREMENTS of these specifications.

3.2 PREPARATION AND PROTECTION

A. The following warning systems, procedures and protection devices shall be established prior to blasting.

1. A system of audible signals to warn of impending blasts. The signal shall correspond to those described in EM 385-1-1, Section 29.

2. Signboards and flags indicating areas where blasting operations are occurring. These signs shall be clearly visible and legible from all points of access to the area. The signs shall clearly describe the audible signal system for warning of impending blasts. Blast area signs shall clearly indicate the length and nature of audible blast warning and all clear signals. All warning systems shall comply with the most stringent requirements of regulating local, state, and federal agencies.

3. The blaster-in-charge shall determine when to sound the five-minute warning signal. Blasting will be performed only after ensuring that all people and equipment have been removed to a safe location.

4. Blasting shall occur only when a representative of the Contracting Officer is present to witness each blast.

5. A "tag out" procedure will be utilized to ensure that all persons are out of the blasting area prior to a blast.

B. Blasting Plans

The Contractor shall prepare a Blasting Safety Plan. Generic plans simply stating that "all regulations will be followed" shall not be acceptable. Plans shall include:

1. A complete description of the warning, clearing and guarding procedures that will be employed to ensure personnel, staff, visitors, and all other persons are at safe locations during blasting. This information will include details regarding visible warning signs or flags, audible warning signals, method of determining blast areas (all areas affected by any potentially harmful blast effects), access blocking methods, guard placement and guard release procedures, primary initiation method, and the system by which the blaster-in-charge will communicate with site security guards.

2. Detailed description of how explosives will be safely stored, transported and used at the various project work sites. Plans will explain how storage magazines and explosive transport vehicles will satisfy all applicable BATF, OSHA, DOT, Federal, and State of Washington regulations. This plan will also indicate how explosives will be inventoried secured and guarded to prevent theft or unauthorized use of explosives. This plan shall include a detailed description of how the Contractor shall provide 24-hour security for any explosive magazines located on site.

3. Include Material Safety Data Sheets (MSDS) and specific details about hazard communication programs for employees.

4. Equipment that will be used to monitor the approach of lightning storms and in the event of such, evacuation and site security plans.

5. Detailed contingency plans for handling of misfires caused by cutoffs or other causes.

6. Fire prevention plan details, including, smoking policies, procedures and limitations for work involving any open flames or sparks, description and location of all fire fighting equipment, and fire fighting and evacuation plans.

7. Initial and ongoing blasting and fire safety training programs.

8. Description of the personal protective equipment that will be used by the Contractor's personnel, including but not limited to safety glasses, hard-toe footwear, hard hats, and gloves.

9. Description of blast monitoring equipment and listing of individuals that will operate such equipment. Submittal shall indicate that all equipment meets the standards defined in paragraph BLAST MONITORING EQUIPMENT of these specifications.

Obtain copies of all applicable codes, regulations, and ordinances, keep a copy in project files at all times, and shall provide the Contracting Officer with a copy. The Contractor's Safety Manager shall ensure that ongoing blasting work complies with all applicable regulations.

Submit a General Blasting Plan to the Contracting Officer not less than 30 days prior to commencing the test blasting, or at any time the Contractor proposes to change the drilling and blasting methods. The Contractor's blasting consultant shall spend at least 20 hours of time on the development and review of this plan-submitted under a signed letter from the blasting consultant. Review of the blasting plan by the Contracting Officer shall not relieve the Contractor of his responsibility for the accuracy and adequacy of the plan when implemented in the field. The

blasting plan shall include:

1. Details of controlled blasting techniques. Include plan and vertical section drawings showing hole locations, spacing, diameter and loading details for typical blast holes, buffer holes and smoothwall or perimeter trim holes.

2. All blast plan drawings shall indicate explosive types, amounts, priming method, initiator types, delay periods, and locations, charge firing times, stemming type and quantities, and typical charge weights.

3. Plans for preventing damage to nearby facilities, including but not limited to the existing outlet works tower, tunnel, access bridge, and regulating gate structures. The Contractor's blasting consultant shall establish limits for each structure, based on estimated intensities of PPV, strain, acceleration or other appropriate measures, and frequency of motion.

4. Methods of drilling, including equipment descriptions, hole alignment techniques and measures that will be used to prevent excessive blast hole deviation.

5. Method of Channel Drilling including equipment descriptions of the method to create a continuous open slot to a depth not less than the excavation drill benches: This method should include a description of the method used to cut or break existing rock bolts encountered in the slot excavation prior to blasting.

6. Hole Charging Methods: Primer make-up, placement of charges and inert stemming and method of securing detonators until tie-in.

7. Initiation system hook-up methods and primary initiation.

8. Methods for preventing spills or losses of explosives, drilling fluids, oil, or any other pollutants to ground or water of the Green River and/or Howard Hanson Reservoir during all handling and hole charging operations. Include details of all containment and contingency plans for quickly and effectively cleaning up any spilled materials.

9. Methods of safe and approved disposal of all explosive packaging materials.

10. Method of informing the BNSF Railroad and users of the access road(s) of the Contractor blasting schedule and frequency and duration of road(s) closure.

Individual Blast Plans shall be submitted for each blast at least 24 hours prior to drilling any blast holes. No loading of explosives will be permitted until the Contracting Officer has approved the Individual Blast Plan. Individual Blast Plans shall include the following information:

1. Scaled plan-view and cross-section drawings showing the location, orientation, number, diameter, and length of blast holes relative to specified stations, slopes and elevations.

2. The amount, type, diameter, weight and linear loading density of explosives in all blast holes.

3. Maximum weight of explosive per hole or decked charge, total weight of explosives used, maximum charge weight per delay and powder factor.

4. Drawings or plan text shall clearly show detonator types, delays, quantities and charge firing times.

5. The proposed date and time of the blast.

6. Proposed location(s) of seismograph transducers and/or water-pressure measurement equipment for monitored blast effects.

7. The Contractor shall also submit other information deemed pertinent by the Contracting Officer such as measures to control flyrock, vibration, air-overpressure or other blast effects.

If the Contractor intends to blast within 100 feet of concrete aged less than 28 days, a plan indicating details of controlled blasting techniques that will be used to prevent damage to the concrete shall be submitted to the Contracting Officer. These plans shall indicate the age of the concrete-at the time of blasting, and include calculations indicating levels of expected strain in the concrete. Plans shall also indicate how concrete strain levels for such blasting will be monitored and reported to the Contracting Officer.

An emergency response plan indicating types of explosive materials, storage locations and quantities shall be submitted to and approved by the local emergency response agency. The approved emergency response plan will be submitted to the Contracting Officer before explosives are allowed on site.

Prior to any blasting on site, the Contractor shall meet with representatives of the BNSF Railroad and users of the existing access road to coordinate the Contractor's blasting operations and answer any questions they may have dealing with vibration, air-blast overpressure, flyrock, and access road closures expected to impact their operations.

C. Flyrock Control

Commercially manufactured steel wire rope and/or rubber tire blasting mats shall be placed over faces or breakouts to be blasted as required to protect instrumentation, utilities, personnel, and equipment from flyrock.

3.3 TEST BLASTS

Before any full-scale blasting occurs a series of test blasts designed to collect data concerning blast effects on critical facilities will be performed. The Contractor's Blasting Consultant(s) shall be on site to facilitate test-blasting activities. Test blasts shall accomplish the following:

1. Initially, maximum charge weights per 8-millisecond delay shall be significantly smaller than those expected for full-scale production work and shall require the approval of the Contracting Officer. Subsequent charges will be gradually increased such that blast effect data can be measured at a variety of scaled distances. For each new excavation in area 1B and 1C, the Contractor shall execute a minimum of three test blasts using gradually increased charge weights to enable the Contractor's Blasting Consultant and the Contracting Officer to establish criteria for limiting charge weights.

2. The Contracting Officer will install instrumentation, including instrumentation to measure blast vibrations, on critical structures adjacent to the project site. A description of this instrumentation is provided in Section 02214, GEOTECHNICAL INSTRUMENTATION, paragraph EXISTING STRUCTURES INSTRUMENTATION. If there is a discrepancy between the Contractor's measurements of ground vibration (PPV) and the Contracting Officer's measurement of vibration, the measurements made by the Contracting Officer shall be used to establish limiting charge weights.

3. Whenever practical, test blasts shall also be designed to evaluate the results of smoothwall blasting measures intended to minimize overbreak. The effectiveness of tested control measures should be reported in test blast reports. Measures proposed for controlling the adverse effects of full-scale production blasts should also be included in the test blast reports.

4. The Contractor shall allow adequate time for executing test blasts. The Contractor shall coordinate the test blasting firing times to accommodate structural response monitoring that might be performed by the Contracting Officer. The Contracting Officer's review of the test blasting plans does not relieve the Contractor's responsibility for any damages that might result from blasting.

5. The Contracting Officer will review the test blast results and monitoring data and evaluate proposed blasting controls provided by the Contractor's Blasting Consultant before allowing full-scale blasting.

3.4 BLASTING

Perform blasting operations in a manner to minimize air-overpressure and ground motion near critical on-site structures and private structures. If blast-induced air overpressure or particle velocity exceeds the performance requirements specified herein, blasting shall be suspended in the affected excavation(s) until a re-designed blasting plan is submitted to and approved by the Contracting Officer.

The Contractor may need to employ special measures to meet the specified air-overpressure limit. These measures might include, but are not limited to, the use of: blasting mats or other practical measures deemed necessary by the Contracting Officer.

The Contractor shall use extreme care to prevent spillage or loss of any explosives, oils or other pollutants to the ground or lake water. If any explosives or other pollutants are spilled, immediately clean up the spilled explosives and dispose of them by approved means. Spills of any amount shall be immediately reported to the Contracting Officer.

Limitations:

1. Blasting shall not be permitted when in the opinion of the Contracting Officer it may be detrimental to existing installations. The Contracting Officer's decision will be final.

2. Controlled blasting techniques shall be used to prevent overbreak and minimize rock damage in all excavations. Blast patterns shall be designed so that the explosive energy is not directed into the back and sidewalls of the excavation but, instead, towards the developed free

face.

3. Whenever, in the opinion of the Contracting Officer, proposed blasting may cause harm to persons, cause damage to structures, or create unacceptable rock instability, cease blasting immediately and review the blast design. The Contractor can resume excavation of the rock with an approved re-designed blast plan or by mechanical means.

Misfires and Dangerous Conditions:

After a blast has been fired, the blaster-in-charge and one assistant under his or her direct supervision shall make a careful inspection of the blast area. The Contracting Officer's representative may be present for this inspection. Inspections shall determine whether there are any indications that misfires might have occurred or whether the blast created any other imminent dangers like unstable ground conditions. If misfires or other dangerous conditions are found, the blaster-in-charge will secure the area and properly correct all hazards before any other work is allowed in the affected area. The all clear signal, allowing other work to resume in the area, shall not be given until affected blast sites are clear of all hazards.

Post Blast Report:

After each blast, submit a Post Blast Report, including printed seismograph reports, to the Contracting officer prior to the loading of any subsequent blast holes. The Post Blast Report will include a written description of any deviations between the information contained in the corresponding Individual Blast Plan and the blast as it was drilled, loaded, initiated delayed and fired.

Video Tape Recording:

After each blast, submit a copy of the video tape recording of the blast to the Contracting Officer prior to the loading of any subsequent blast holes.

Rock Reinforcement:

Rock reinforcement consisting of rock bolts and rock and soil anchors, welded wire fabric, and shotcrete shall be installed commensurate with excavation, drilling, blasting and excavation of subsequent lifts shall not be allowed until rock reinforcement is installed in the slope above the preceeding lift.

3.5 SUSPENSION OF BLASTING

Blasting operations may be suspended by the Contracting Officer for any of the following reasons:

1. The Contractor's safety precautions are inadequate.

2. Air overpressure at occupied building exceed 133 decibels.

3. The peak particle velocity measured at the reinforced concrete structures, including the spillway, intake tower, outlet works tower, tunnel lining, and bridge piers exceed 20 ips.

4. The peak particle velocity measured at the trunnions of the existing spillway and outlet regulating gates exceed 8 ips.

5. Existing structural conditions are aggravated or adjacent improvements are damaged by blasting and result in instrumentation measurements that exceed the Limiting Values specified in Section 02214, GEOTECHNICAL INSTRUMENTATION, paragraph INTERPRETATION OF DATA AND IMPLEMENTATION OF ACTION PLANS.

6. Blasting endangers the stability of or causes damage to facilities outside the prescribed limits of excavation.

7. The results of the blasting, in the opinion of the Contracting Officer, are not satisfactory.

8. Contractor or Subcontractor Personnel are acting unsafely around the blast area immediately, before, during or after blasting operations.

Blasting operations shall not resume until the Contracting Officer has approved the Contractor's revised blasting plan with modifications correcting the conditions causing the suspension.

Delays or suspensions of blasting operations, as a result of improper Contractor actions or inactions, shall not be compensated, or the basis of a claim.

3.6 PRE-BLAST/POST-BLAST INSPECTIONS

Prior to blasting, a thorough inspection shall be made of accessible portions of BNSF rail line and of all structures and openings within the Howard Hanson Dam, including but not limited to the existing outlet works tower, tunnel, access bridge and spillway, located within 500 feet of blast areas. Qualified specialists, approved by the Contracting Officer and the Contractor's insurance carrier, shall perform all inspections. The Contractor shall notify the Contracting Officer at least 7 days prior to the inspections so a representative of the Contracting Officer may be present. Inspections shall meet the following conditions:

1. Existing crack damage, other structural problems or defects occurring inside and outside of structures or internal openings within Howard Hanson Dam shall be thoroughly documented.

2. The condition of all portions of structures shall be documented by diagrams, transcribed notes and photographs to show the extent and location of any existing damage, deterioration and cracks.

3. Close-up detailed 35-mm photographs (with print film and negatives) will be taken of all cracks, deterioration or cracks observed in the exterior portions of structures and other property improvements.

4. Minimum size of all color photographic prints shall be 5" x 7" and based on standard 35-mm negative film format. The Contractor may also provide a HI-8 or equivalent quality video of the structures and features noted above.

5. Photographs and HI-8 or digital videos shall include imprints of the survey date.

As construction progresses, re-inspect, as often as necessary or at the intervals prescribed by the Contracting Officer, to verify that controlled blasting methods are not causing any new damage.

After-blasting, inspections shall be required for any and all property at the Contracting Officer's request. All inspections shall be done at the Contractor's expense.

3.7 DAMAGE REPAIR

When blasting operations damage existing facilities, offsite properties, or a portion of the work, or material surrounding or supporting the work, promptly repair or replace damaged items to the condition that existed prior to the damage, to the satisfaction of the Contracting Officer.

Nothing contained herein shall relieve the Contractor of his responsibility for claims arising from his construction operations. Failure to inspect any structure required by these contract documents, or inadequacy of the inspections shall not relieve the Contractor of his responsibility. The Contractor shall indemnify the Contracting Officer from such claims.

-- End of Section --

SECTION 02214

GEOTECHNICAL INSTRUMENTATION

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

The work of this section includes furnishing, installing and maintaining the geotechnical instrumentation; and protecting the instrumentation (both that installed by the Contractor and the Contracting Officer) from damage. It also includes additional instrumentation that the Contractor deems necessary to ensure the safety of personnel and the Work. The Contractor shall implement required remedial and precautionary measures based on the instrumentation data.

1.2 PURPOSE OF GEOTECHNICAL INSTRUMENTATION PROGRAM

The purposes of the geotechnical instrumentation program include, but are not limited to providing:

a. Pre-construction baseline data for comparison with construction and post-construction data.

b. Monitoring of ground movement, groundwater conditions and existing structure's integrity during and after construction, to determine whether they have been adversely affected by construction activities.

c. A forewarning of unforeseen conditions that may require remedial or precautionary measures.

The Contracting Officer is not responsible for the safety of the work based on geotechnical instrumentation data.

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 778 (2000) Standard Sand

1.4 DEFINITIONS

Work Station - Computer established to receive/download data from Measurement Control Units on site.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section

01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Installation Plan; G
Instrumentation Site Plan; G

At least 30 calendar days prior to commencing installation of the first of each type of instrument, submit to the Contracting Officer for review the following items pertaining to that instrument type:

a. Detailed step-by-step procedure for installation, together with a sample installation record sheet. The procedures shall be bound and indexed. The installation procedures shall include:

1. The method to be used for cleaning the inside of the casing or borehole.

2. Specifications for proposed grout mixes, including commercial names, proportions of admixtures and water, mixing sequence, mixing methods and durations, pumping methods and tremie pipe type, size and quantity.

3. Drill casing, type and size, if used.

4. Depth increments for backfilling boreholes with sand and bentonite grout.

5. Method for overcoming buoyancy of instrumentation casings and components during grouting.

6. Method of sealing joints in pipes and inclinometer casings to prevent ingress of grout.

7. Method for assembly of instrumentation components.

8. Method for conducting post-installation acceptance test.

9. Routing plan for instrument leads to Automatic Data Acquisition System (ADAS).

10. Method for protecting instruments and cable leads from damage.

b. Proposed layout of site ADAS, including locations of data logger(s), multiplexers, telephone and power connections, and instrument cable/conduit routing.

c. A bar chart indicating the proposed time sequence of instrument installation in relation to the proposed excavation activities.

d. A review and acceptance of proposed instrument locations and quantities by the Contractor's Geotechnical Instrumentation Engineer relative to the Contractor's proposed construction method, schedule, and safety considerations.

Implementation of Action Plans; G

Prior to implementation of instrumentation program, the Contractor shall submit to the Contracting Officer for review, generalized plans of action to be implemented in the event any response value, as specified in paragraph:INTERPRETATION OF DATA AND IMPLEMENTATION OF ACTION PLANS, is reached. The generalized plans of action shall be positive measures by the Contractor to do any or all of the following, as applicable:

a. Limit further excavation-induced structure and ground movement.

b. Limit vibrations to adjacent structures.

c. Maintain the structural integrity of adjacent structures in accordance with response values (see Table 1).

SD-02 Shop Drawings

As-Built Location Plan; G

On every Monday, during instrument installation, submit to the Contracting Officer updated as-built location plans, including location of instruments, terminal units, conduits, and ADAS components, for work completed the previous week. Also included shall be updated instrument wiring schematics and schedule of instrument leads.

SD-03 Product Data

Manufacturer's Product Data; G

Within 21 work days of the Notice to Proceed, submit manufacturers' product data describing all specified instruments to the Contracting Officer for review, including requests for consideration of substitutions, if any, together with product data and instruction manuals for requested substitutions.

SD-06 Test Reports

Pre-Installation Test Record Report

Within 2 weeks of receipt of each instrument at the site, submit to the Contracting Officer completed pre-installation acceptance test record for that instrument in accordance with manufacturer recommendations.

Instrument Test Report

Within 5 workdays of receipt of each instrument at the site, submit to the Contracting Officer a copy of factory calibration, manufacturer's test equipment certification, completed copy of quality assurance checklist, and warranty for each instrument and portable readout unit.

Installation Record Sheet

Within 5 days of installation of each instrument, submit to the Contracting Officer the installation record sheet for that

instrument, including as-built location as specified.

Instrument Reading Report

Within 2 days of performing initial readings, as specified in paragraph:SCHEDULE OF WORK, submit to the Contracting Officer an initial reading agreement form for each instrument that has been signed by both the Contracting Officer and the Contractor.

The Contractor shall submit to the Contracting Officer a description of the work performed during that week for the following items. See DATA REDUCTION, PROCESSING, PLOTTING AND REPORTING for more details.

Groundwater Control
Summary of Support System Construction Activities
Summary of Excavation and Filling Activities
Summary of Construction Activities other than Excavation
Summary Report of Unusual Events
Inclinometer/Multi-point borehole Extensometer Cross Section

SD-07 Certificates

Personnel Qualifications; G

Within 3 weeks after the Notice to Proceed, submit to the Contracting Officer for review:

a. Resume of Contractor's Geotechnical Instrumentation Engineer, sufficient to define details of relevant site experience.

b. Resumes of other field and office geotechnical instrumentation personnel to be assigned to the project, other than clerical staff.

1.6 RESPONSIBILITIES OF CONTRACTOR

Contractor's responsibilities shall include, but not be limited to the following:

a. Furnish components of instrumentation that are to be installed during construction by the Contractor. Instruments installed by the Contracting Officer will be supplied by the Government.

b. Provide routing and protection of cables from instruments to terminal boxes and/or multiplexers of Automatic Data Acquisition System (ADAS).

c. Furnish portable readout units for the Contracting Officer's use.

d. Install instruments and ADAS hardware.

e. Protect from damage and maintain instruments installed by the Contractor, and existing and future instruments installed by the Contracting Officer for the Project. Repair or replace damaged or inoperative instruments at no additional cost to the Government.

f. Install additional instrumentation that the Contractor deems necessary to ensure the safety of personnel and the work.

g. Provide safe access to the Contracting Officer for instrument installation and data collection.

h. Implement response actions.

1.7 QUALIFICATIONS OF CONTRACTOR'S INSTRUMENTATION PERSONNEL

1.7.1 General

Geotechnical instrumentation work involves highly specialized tasks. The Contractor's instrumentation personnel who are responsible for furnishing, installing, and maintaining all geotechnical instrumentation shall have the qualifications specified herein. These personnel may be on the staff of the Contractor or may be on the staff of a specialist instrumentation subcontractor.

The Contractor's instrumentation personnel including the Geotechnical Instrumentation Engineer, and all other field and office personnel shall be subject to the review of the Contracting Officer.

1.7.2 Geotechnical Instrumentation Engineer

The Contractor's instrumentation personnel shall include a qualified Geotechnical Instrumentation Engineer who is a registered Professional Engineer or Licensed Geologist, and who has at least 8 years of experience in installation and monitoring of the types of instruments specified herein, including installation and management of ADAS. The Geotechnical Instrumentation Engineer shall:

a. Review all proposed instrument locations and quantities and confirm that they are appropriate relative to the Contractor's proposed construction method, schedule, and safety considerations.

b. Prepare detailed step-by-step procedures and bar chart specified for submittal SD-01, "Installation Plan", for all instruments specified herein.

c. Be on site and supervise all installations of each type of instrument.

d. Conduct the pre-installation and post-installation acceptance tests for all types of instruments specified herein.

e. Be on site until the completion and acceptance by the Contracting Officer of the tasks identified in paragraphs 1.7.2.a through c, and subsequently be available for consultation at all times for the duration of the Contract.

f. Supervise data collection, reduction, plotting, interpreting, and reporting of instrumentation data.

1.8 QUALITY ASSURANCE

Factory calibrations of the input/output signals and temperature corrections shall be conducted on all instruments prior to shipment. Certification shall be provided to indicate that the test equipment used for this purpose is calibrated and maintained in accordance with the test equipment manufacturer's calibration requirements and that, where applicable, calibrations are traceable to the National Institute of

Standards and Technology. Factory calibration shall have at least 5 points within the range of instruments and shall have three loading and three unloading cycles. This data shall be provided by the manufacturer.

A final quality assurance inspection shall be made by the manufacturer of the instrument prior to shipment. During the inspection, a checklist shall be completed to indicate all materials were included and inspected. A completed copy of the checklist shall be supplied with each instrument, and furnished to the Contracting Officer prior to installation.

Contractor shall provide the manufacturer's warranty for each portable readout unit and for the electrical components of the ADAS.

1.9 SCHEDULE OF WORK

Install instruments and agree on formal initial readings in accordance with paragraph: DATA COLLECTION, and the following schedule:

a. ADAS shall be installed 15 days prior to any dewatering or pumping tests, and/or start of foundation grouting, or excavation activities, with exception of the road cut along the south side of the project site.

b. Vibrating wire piezometers shall be installed and formal initial readings agreed on at least 15 days prior to start of any dewatering or pumping tests, start of foundation grouting, or excavation activities, with exception of the road cut along the south side of the project site.

c. Inclinometer casings shall be installed and formal initial readings agreed on at least 7 days prior to start of foundation grouting, or excavation activities, with exception of the road cut along the south side of the project site.

d. Horizontal MPBX shall be installed as excavation for facility continues. The excavation shall not proceed to depths greater than 5 feet below a proposed MPBX location. Initial readings shall be agreed on at least 3 days after installation of instrument.

e. Load cells shall be installed on test anchors as excavation for structure progresses. Initial readings shall be agreed upon at least 3 days after installation of the instrument.

Variations in the schedule require the review and acceptance of the Contracting Officer.

1.10 STORAGE OF INSTRUMENTS

All instrumentation materials, after receipt at the site and prior to installation, shall be handled and stored in an indoor space, as per manufacturer's requirements. Instruments shall not be exposed to temperatures exceeding the manufacturer's stated working temperature range.

1.11 SITE CONDITIONS

Contractor shall provide access necessary for installation of instrumentation and ADAS. The Howard Hanson Dam project has existing instrumentation for Dam Safety that is monitored with Geomation 2380 series ADAS. Numerous Measurement Control Units (MCU) are located around the site, and are linked to a main control unit on the right abutment via radio transmitters that are operating in the 400 to 500 Mhz range. Power is

provided to existing MCUs by solar panels.

1.12 EXISTING STRUCTURES INSTRUMENTS

Instrumentation is, or will be, installed, on, within, and around the existing adjacent structures, under separate contract by the Contracting Officer. These instruments include, and are not limited to, vibrating wire crackmeters, strain gages, sister bars, multipoint borehole extensometers, in-place inclinometers, liquid level system, and blast monitoring geophones.

The instrument leads from these instruments, excluding the blast monitoring devices, will be connected to an ADAS provided and installed at the existing Gate Tower by the Contracting Officer. Conduits will be used to route instrument leads from the designated instrument locations to the ADAS. These conduits will be located along the existing ground surface. The Contractor shall be responsible for maintaining and protecting these instruments, conduits, and cable from damage at all times.

1.13 INSTRUMENT MONITORING

The instruments specified herein shall be monitored by an Automated Data Acquisition System (ADAS). The Contractor shall procure and install the necessary components of the ADAS. The Contractor shall connect the instrument leads to the ADAS, program the ADAS to monitor the instruments, and develop database for collection and presentation of data. The Contractor shall share recorded data with the Contracting Officer.

PART 2 PRODUCTS

2.1 GENERAL

All materials shall be new.

Whenever any product is specified by brand name and model number, such specifications shall be deemed to be used for the purpose of establishing a standard of quality and facilitating the description of the product desired. The term "acceptable equivalent" shall be understood to indicate that the "acceptable equivalent" product is the same or better than the product named in the specifications in function, performance, reliability, quality, and general configuration. This procedure is not to be construed as eliminating from competition other suitable products of equal quality by other manufacturers. The Contractor may, in such cases, submit complete comparative data to the Contracting Officer for consideration of another product. Substitute products shall not be ordered, delivered to the site, or used for this project unless accepted by the Contracting Officer in writing. The Contracting Officer will be the sole judge of the suitability and equivalency of the proposed substitution.

Any request from the Contractor for consideration of a substitution shall clearly state the nature of the deviation from the product specified.

The Contractor shall furnish all installation tools, materials, and miscellaneous instrumentation components necessary for installation.

Specified readout units, together with associated calibration devices and software, shall be furnished to the Contracting Officer no later than one week before commencing installation of the first of each type of instrument. In addition to specified readout units for the Contracting

Officer's use when collecting data, the Contractor shall provide Contractor's own readout units as needed for making pre-installation and post-installation acceptance tests, and for taking any required readings during installation. Such readout units shall be identical to the specified readout units.

Surface protection shall be provided for instruments specified herein, including protection from damage from blasting, lightning, and construction activities. Surface protection, flush with the ground surface, shall be required for instruments installed in Contractor's staging areas. Instrument leads and cabling shall also be protected from blasting and construction activities, by installation in conduits and/or burial in ground.

For each instrument type, provide an instruction manual which shall include the following:

a. A description of the purpose of the instrument.

b. Theory of operation.

c. Step-by-step procedures for:
   1. Pre-installation acceptance test when instruments are received on site, to ensure the instruments are functioning correctly prior to installation.
   2. Calibration of readout units.

d. A list of calibration equipment required and recommended frequency of calibration for the readout units.

e. Step-by-step installation procedure including any borehole requirements, materials, tools, spare parts, and post-installation acceptance tests.

f. Maintenance procedures.

g. Step-by-step data collection procedure.

h. Data reduction, processing, and plotting procedures.

All graduations shall be in U.S. Customary Units; for example, feet, inches, pounds, temperature °F.

2.2 INCLINOMETERS

Provide 2.75-inch O.D. ABS inclinometer casing with machine-broached internal grooves, precision-alignment couplings, and twist tolerance better than one degree per 10-foot length, as manufactured by Slope Indicator Co, Mukilteo, WA, or acceptable equivalent. Couplings shall be of the non-telescoping type.

Provide installation accessories including end caps and coupling connection tools necessary for installation and grouting of inclinometer casing.

Cement grout backfill shall be a cement/bentonite mixture having a weight ratio of 1 / 2.5 / 0.3 (cement/water/bentonite).

Provide 1/4- to 3/8-inch diameter, stranded copper wire for use as grounding system for ADAS. The wire shall be installed on at least one

inclinometer casing, secured vertically along the exterior full length of the casing.

Surface protection shall have a diameter adequate to allow attachment of cable support assembly, or shall allow for an inclinometer casing extension while readings are being taken. The length of the casing extension shall be 12 inches, with a tolerance of 0.05-inches.

Provide inclinometer probe, cable, readout unit, attachment accessories, and data reduction software, manufactured by Slope Indicator Co., Mukilteo, WA. These portable units will be used to complete pre-construction surveys of inclinometer casings, and subsequent surveys, as needed.

Inclinometer equipment shall be as follows:

a. Probe shall be model 50302500, manufactured by Slope Indicator Co. Probe shall be biaxial, consisting of two force balance accelerometers mounted at 90 degrees to each other, with a 2-foot wheelbase. Probe shall be supplied in a carrying case.

b. Cable shall be model 50601000, with necessary connectors, manufactured by Slope Indicator Co. The cable shall be supplied in a continuous 200-foot length with vulcanized depth marks at 1-foot intervals, with an internal steel core wire, and a neoprene cable jacket.

c. The readout unit shall be Digitilt Datamate, model 50310900, manufactured by Slope Indicator Co. Readout unit shall include a battery charger, and Datamate Manager (DMM) Software.

d. Pulley assembly shall be model 51104606, manufactured by Slope Indicator Co.

e. Inclinometer data reduction software shall be Digipro for Windows, model 50310001, manufactured by Slope Indicator Co.

2.3 MULTIPOINT BOREHOLE EXTENSOMETERS (MPBX)

Provide borehole rod extensometer system manufactured by Geokon Inc, Lebanon, NH, conforming to the requirements specified herein.

Anchors for MPBX shall be groutable anchors, made from lengths of steel reinforcing bars, capable of being installed within a 3-inch diameter borehole.

Extensometer rods shall be 0.25-inch diameter stainless steel rods, in lengths of 10-foot and shorter, with ends threaded and tapped for assembly encased in PVC pipes, or continuous fiberglass rods encased in plastic tubing.

Rod completion kits shall be necessary to complete connections at bottom and top of extensometer rods.

Rod displacement monitoring shall be performed using a reference head with vibrating wire displacement sensors at the top of the installation. The reference head shall be a flangeless type of head that can be recessed into the borehole.

Displacement sensors shall be as follows:

a. Displacement sensors in the reference head shall be Model 4450 VW Displacement Transducer, manufactured by Geokon Inc., Lebanon, NH.

b. Displacement sensors shall have a 1-inch range, with a stated laboratory accuracy of ± 0.1% of full scale and a sensitivity of 0.02% of full scale.

c. Displacement sensor and attached instrument cable shall be pressure tested to 100 psi at manufacturer's prior to delivery.

d. Reference head shall be complete with seals capable of long-term submersion up to 100 psi.

Provide 12-conductor cable (six shielded twisted pairs), 22 gage, with a common drain wire, and a sheath of 0.11- inch thick pressure-extruded vinyl with an outside diameter of 0.5-inch. Cable shall be from the same commercial source as the displacement transducers. Cable shall be impermeable to long-term submersion of up to 100 psi. Lengths of cable shall be sufficient for routing from each reference head to the ADAS, or terminal unit located at top of excavation, with a minimum of 5 percent additional length. Additional length of similar cable routing from terminal units to ADAS will be necessary if terminal boxes are used.

Provide portable vibrating wire readout box (Geokon model GK-403) and terminal units. Terminal units shall be clearly marked with each MPBX and gage number. Readout and terminal units shall be as follows:

a. Provide portable readout unit, jumper cable and interface so that each gage can be read separately by automatic switching, and readings stored in memory in the portable readout unit. The portable readout unit shall have a minimum of 64K RAM memory, and shall be programmed to display each sensor reading in engineering units.

b. If a terminal box is used, it shall be a fiberglass or stainless steel watertight terminal box.

c. Cable leads shall be routed from terminal unit into ADAS.

Cement grout backfill shall be in accordance with paragraph: INCLINOMETERS.

Surface protection shall be provided such that the recessed reference head of the instrument is protected from blasting and construction activities, and is accessible for maintenance, as necessary.

2.4 VIBRATING WIRE PIEZOMETERS (VWP)

Provide vibrating wire piezometers, model 4500S or 4500MLP, manufactured by Geokon Inc., Lebanon, NH. Piezometers shall have a range of 50 psi, an over-range rating of twice the rated pressure, ± 0.2 percent full scale laboratory accuracy, and 0.025 percent full scale resolution, and shall be fitted with a low air entry filter.

Provide cable. Cable shall be attached to the piezometers through an integral bulkhead seal, consisting of an interior waterstop seal and a cable entry seal. Cable shall be 4-conductor, 22 gage, with two shielded twisted pairs, a common drain wire, and a sheath of 0.065 inch thick pressure-extruded vinyl with an outside diameter of 0.25 inch. Seals shall be either O-rings or hermetic seals. The piezometer and attached cable

shall have been tested and certified for water-tightness up to 100 psi. The cable shall be of sufficient length so that it can be extended from the top of the borehole to the ADAS.

Backfill grout shall consist of uniform sized fine ground or powdered non-drilling mud grade bentonite, for use in sealing and grouting well casings. A polymer-based thixotropic additive may also be added to the mix if recommended by the manufacturer. Special grout Type A shall have a mixed specific gravity, prior to placement within the instrument borehole, of between 1.03 and 1.10.

Filter sand shall conform to ASTM C 778, for No. 20-40 sand.

Granular bentonite shall be Enviroplug Medium, manufactured by Wyo-Ben, Inc., Billings, MT, or Holeplug, manufactured by Baroid Division, Petroleum Services, Inc., Houston, TX, or acceptable equivalent.

2.5 VIBRATING WIRE LOAD CELLS

Provide vibrating wire load cells , model 4900 manufactured by Geokon Inc., Lebanon, NH, for installation on selected rock bolts. Each load cell shall consist of a cylinder of high-strength heat-treated steel with three vibrating wire strain gages located at 120 degrees around the circumference of the cylinder, and at the mid-point of the cylinder height and wall thickness. Load cell capacity shall be 300 kips as indicated on the schedule included in the plans with an over-range capacity of not less than three times the rated capacity. The height of the load cell shall exceed four times the cylinder wall thickness. All load cells shall be equipped with thermistors for measuring ambient temperatures. The housing and cable connector shall be permanently sealed for field conditions and shall be plated for corrosion protection. The cell and attached cable shall be proof tested by submersion in water for 72 hours at 100 psi.

Provide cable of sufficient length, attached to the load cells through an integral bulkhead seal, consisting of an interior waterstop seal and a cable entry seal. Cable shall be eight-conductor, 22 gage, with four shielded twisted pairs, a common drain wire, and a sheath of 0.1-inch thick pressure extruded vinyl with an outside diameter of 0.375 inch. Seals shall be either O-rings or hermetic seals.

Installation locations will be determined by the Geotechnical Instrumentation Engineer and reviewed by the Contracting Officer as the excavation for the Facility progresses. The Contractor shall supply 8 gages of the type specified above, with attached cable lengths sufficient to reach the ADAS, or terminal units.

Provide terminal units from Geokon, necessary to accommodate the number and location of load cells. Terminal units shall be clearly marked with each load cell and gage number. Cable leads shall be routed from terminal unit into ADAS . Terminal units shall be as follows:

A fiberglass or stainless steel watertight terminal box with 4 deck switch shall be provided at each load cell station.

Provide protective enclosure or device sufficient in size to protect load cell, bearing plates, and anchor head assemblies from potential damage from blasting activities.

Each load cell shall be provided with top and bottom bearing plates with a

minimum thickness of 1 inch, or as recommended by the manufacturer. Bearing plates shall be ground flat, smooth and parallel.

2.6 AUTOMATIC DATA ACQUISITION SYSTEMS (ADAS)

Provide components of ADAS necessary to monitor VW Piezometers, VW load cells, and VW displacement sensors in MPBX. ADAS consists of, but is not limited to, data logger, multiplexers, protective enclosures, transient protection devices, rechargeable external battery, battery charger, modem, flash memory card, software, and system documentation. All ADAS components shall be manufactured and/or provided by Geomation Inc., Golden CO.as follows:

a. ADAS shall have the same excitation signal configuration as instrument manufacturer readouts to assure that VW gages will be read in accordance with manufacturer's specifications.

b. Data logger(s) shall consist of Model 2380/80 and/or 2380/20 Measurement Control Units (MCU) manufactured by Geomation Inc.

c. Multiplexers shall be 10-channel Analog Signal Multiplexers (Geomation Model ASM), pre-installed by manufacturer.

d. Protective enclosures shall consist of lockable NEMA-4 cross-connect termination enclosures for the 2380 MCUs, with DIN rails, external battery brackets, and blank gland panels (Geomation Model EN80-XC or EN20-XC. The DIN rails, external battery brackets, and MCU shall be pre-mounted into the enclosure by the manufacturer. The blank gland panels, supplied by the manufacturer, shall be drilled or punched by the Contractor to accommodate the Contractor selected conduit configuration.

e. Transient Protection Modules shall consist of a 20-pole multi-stage transient protection modules for each multiplexer, and shall be mounted and pre-wired to each multiplexer within the protective enclosure, by the manufacturer.

f. Rechargeable battery shall be Geomation Model ERB-EN external rechargeable battery kit for the XC type enclosure, which includes 7.2 Amp Hour external rechargeable battery and wiring harness with a DIN-rail mounted battery-disconnect switch and fuse assembly. The external battery and wiring harness shall be installed and pre-wired in the enclosure by the manufacturer.

g. External battery charger shall be Geomation model XBC.

h. PCMCIA Modem card shall be Geomation model TNM. The main MCU on site shall have a modem card.

i. Memory card shall consist of one 8 MB Industrial Flashdisk Mass Storage Card (Geomation model FMS-8).

j. Three copies of Geonet Suite software and supporting documentation.

Power for the ADAS shall conform to the manufacturer's recommendation for the external battery charger. Contractor shall provide power to each data logger. Alternative charging power can be provided by use of solar panels.

The Contractor shall provide telephone connection to the main MCU on site.

Grounding shall consist of connecting ADAS ground leads to ground wire installed in inclinometer borehole as described in paragraph: INSTALLATION OF INCLINOMETER CASING.

Provide protection of ADAS components from damage from blast debris and construction activities.

For multiple MCU locations, Contractor shall establish communication between MCUs by either hard wire or radio-link connections. Hard wire connections shall be placed in conduit protected from damage. Radio-link connections shall not be in the 400 - 500 Mhz range.

The Contractor's Work Station for accessing and downloading data from the ADAS shall consist of the following computer hardware and software:

a. 1.3 GHz (minimum) personal computer, with 40 GB of hard drive disk space, 128 MB RAM, 3.5-inch floppy disk drive, CD-RW disk drive, and a 56.6 kbps modem.

b. The latest version of the following software for each desktop computer: MS Windows, MS Excel, MS Access, Grapher, and Slope Indicator's Digipro.

c. In addition, the Contractor shall provide to Contracting Officer two (2) sets of the software Grapher and Slope Indicator's Digipro.

2.7 EXISTING STRUCTURES INSTRUMENTATION

The Contracting Officer will install instrumentation on critical structures adjacent to the project site. Most instrumentation will be installed prior to the Contractor's mobilization to the site; however, certain instruments, due to construction sequence will be installed during construction, as outlined in paragraph: CONTRACTING OFFICER INSTRUMENT INSTALLATION. These instruments will be utilized to monitor performance of existing adjacent structures during the construction of the Fish Passage Facility. Structures to be monitored include the Intake Entrance Structure, the Gate Tower, the Outlet Works Tunnel, the Gate Tower Bridge, the Spillway, the rock pillar between excavation and the Outlet Tunnel, and the rock formation above the Outlet Tunnel. Instrumentation includes liquid level systems, in-place inclinometers, multi-point borehole extensometers, piezometers, strain gages, sister bars, crackmeters, and blast monitoring instruments. Locations and designations of instruments installed by the Contracting Officer are presented in the As-built Reference Drawings (Plate Nos. GT-1 through GT-6).

During blasting events, the Contracting Officer will monitor some of the piezometers, crackmeters, sister bars, and strain gages dynamically. Double coil vibrating wire assemblies are installed in these gages to provide continuous output signal at a frequency of approximately 100 times per second. The output from these gages will provide a full waveform response to each of the blast events.

Response values for these instruments are provided in paragraph: INTERPRETATION OF DATA AND IMPLEMENTATION OF ACTION PLANS. The Contractor shall interpret the data collected by these instruments and shall implement plans of action as outlined in paragraph: INTERPRETATION OF DATA AND IMPLEMENTATION OF ACTION PLANS, in the event these response values are exceeded.

Formal initial readings for these instruments shall be provided to the Contractor prior to major construction activities.

2.7.1 Liquid Level Systems

Liquid level systems are installed around the perimeter of the first bridge pier footing near the Gate Tower, and around the perimeter of the Gate Tower. Liquid level systems consist of the following components:

2.7.1.1 Liquid Level Gage

The liquid level gage consists of a Model 4675-LLG vibrating wire liquid level gage manufactured by Geokon, Inc., Lebanon, NH. Gage includes vibrating wire transducer, weight, chamber, locking mechanism, thermistor, air and liquid fittings, and tubing. The liquid level gage is sealed for long-term immersion of up to 100 psi.

2.7.1.2 Carrier Pipe

The carrier pipe consists of a 3-inch nominal schedule 40 stainless steel pipe, installed between the liquid level gages. The carrier pipe is joined to the liquid level gage or subsequent sections of pipe by rubber slip couplings, and supported along the structure at approximate 4-foot intervals.

2.7.1.3 Cable

The cable is 4-conductor, 22 gage, with two shielded twisted pairs, a common drain wire, and a sheath of 0.065-inch thick pressure-extruded vinyl with an outside diameter of 0.25 inch. The cable is routed through rigid metal conduit that runs adjacent to the carrier pipe, and then is routed to the ADAS in the Gate Tower.

2.7.1.4 Protective Enclosure

A 1/8-inch thick sheet metal cover is used to provide additional protection of the gages against damage from blasting and construction activities. The covers enclose the gage and are secured to the structure being monitored.

2.7.2 Inclinometers

Two inclinometer casings are installed in the rock pillar between the Juvenile Fish Passage Facility excavation and the Outlet Tunnel, and one is installed between the Outlet Tunnel and the bridge pier footing. In-place inclinometer sensors are installed at selected depths in these casings. Each system is designed to be removed from the casing, when necessary, to allow manual inclinometer surveys of the casing. The in-place inclinometer system consists of the following components:

2.7.2.1 Casing

ABS plastic casing as described in paragraph: INCLINOMETERS.

2.7.2.2 Sensors

Uniaxial in-place inclinometer sensors manufactured by Slope Indicator Co., Mukilteo, WA. The gage is composed of 3-foot long tube, with upper and lower wheel assemblies, individual signal cables for each gage, and a cable

suspension device secured at the top of the casing.

2.7.2.3 Cables

The cable is 7-conductor, 22-gauge, with common drain wire, and a sheath of 0.1-inch thick pressure extruded vinyl with an outside diameter of 0.385 inches. A watertight connector is attached to the cable at the top of the casing, for quick disconnect when making manual casing surveys.

2.7.2.4 Protective Covers

A flush-mount monument is attached to the top of each casing. Centered and secured to the monument is a 16-inch square, 8-inch deep metal junction box. The cable suspension device and cable connections are located within this box. The cables are routed from this box and through conduit to the ADAS in the Gate Tower.

2.7.3 MPBX

Three vertical MPBXs are installed over the Outlet Tunnel alignment, with the lowest anchor embedded into the top liner of the tunnel. Each MPBX has three anchors at various depths. These instruments are manufactured by Geokon, Inc., Lebanon, NH. Details of the instruments are presented in paragraph: MULTI-POINT BOREHOLE EXTENSOMETER. The instruments are installed flush to the ground surface, with instrument leads being routed through conduits located along the ground surface to the ADAS in the Gate Tower.

2.7.4 Vibrating Wire Piezometers

Two boreholes were completed within the rock pillar between the Juvenile Fish Passage Facility excavation and the Outlet Tunnel in which vibrating wire piezometers were installed. Each borehole has three piezometers at various depths. These instruments are manufactured by Geokon, Inc., Lebanon, NH. Details of the instruments are presented in paragraph: VIBRATING WIRE PIEZOMETERS. The instrument monuments are installed flush to the ground surface, with instrument leads being routed through conduits located along the ground surface to the ADAS in the Gate Tower. One vibrating wire piezometer will be installed in the north cast-in-place wall of the cofferdam during construction.

2.7.5 Vibrating Wire Strain Gages

Vibrating wire strain gages are affixed to steel components of the trunnion gate support, and the concrete surface of the Intake Tower Structure. The strain gage installations include a strain gage sensor with plucking coil, anchors, cable, and protective housing, as described below:

2.7.5.1 Strain Gage Sensor

Model VSM 4000-6" vibrating wire strain gage sensor with double plucking coils manufactured by Geokon, Inc., Lebanon, NH. All gages are equipped with thermistors for measuring ambient temperatures.

2.7.5.2 Anchors

Weldable type anchors were used for bonding the gages to concrete or steel surface on the trunnion gate support. Groutable anchors were used on the Intake Entrance Structure. Groutable anchors are 3-inch long, 3/8-inch

diameter reinforcement steel bars with a threaded hole to fit the ball coupling of the strain gage.

2.7.5.3 Cable

Same type as Liquid Level System for the trunnion gages. Cables for the Intake Structure are 8-conductor, 22 gage, with four shielded pairs, a common drain and a sheath of 0.1-inch thick pressure-extruded vinyl with an outside diameter of 0.385 inches. The cables are routed through rigid conduit that is routed to the ADAS in the Gate Tower.

2.7.5.4 Protective Covers

The strain gages are protected with stainless steel covers, formed to fit over the gages and protect from floating debris in the water.

2.7.6 Vibrating Wire Sister Bars

Vibrating wire sister bars will be installed along anchors in the Intake Entrance seismic retrofit and on reinforcing steel in the cast-in-place north wall of the cofferdam. The gages will be permanently encased in grout or concrete. The sister bar installations include the gage and cable.

2.7.6.1 Sister Bar Gage

Model 4911AR vibrating wire sister bar sensor with double plucking coils, manufactured by Geokon, Inc., Lebanon, NH. The coil assembly is secured to the middle of a 54-inch long, 1/2-inch diameter rebar. All gages are equipped with thermistors for measuring ambient temperature.

2.7.6.2 Cable

Same type as strain gage cable used on the Intake Structure. The cables will be routed through conduit that is routed to the ADAS in the Gate Tower.

2.7.7 Vibrating Wire Crackmeters

Vibrating wire crackmeters are installed across existing cracks and joints in concrete surfaces of the Outlet Tunnel liner, on the bridge pier footing, and bridge deck. The crackmeter installations include a crackmeter sensor, anchors, cable, and protective housing, as described below:

2.7.7.1 Crackmeter Sensor

Model 4420-0.5" vibrating wire crackmeter sensor with double plucking coils manufactured by Geokon, Inc., Lebanon, NH. Some gages are equipped with thermistors for measuring ambient temperatures.

2.7.7.2 Anchors

Groutable anchors are 3-inch long, 3/8-inch diameter reinforcement steel bars with a threaded hole to fit the ball coupling of the crackmeter.

2.7.7.3 Cable

Same type as Liquid Level System for the Tunnel Crackmeters. Cables for the other crackmeters are the same as the strain gage cables for the Intake Structure. The cables are routed through rigid conduit that is routed to

the ADAS in the Gate Tower.

2.7.7.4 Protective Covers

Some of the crackmeters in the tunnel are recessed into the concrete liner and then patched to result in a flush surface. The remaining crackmeters are protected with stainless steel covers, formed to fit over the gages and protect from floating debris in the water.

2.7.8 Seismographs and Geophones

Seismographs and geophones will be installed at selected locations on the Intake Entrance Structure, Gate Tower, Outlet Tunnel, bridge pier, and the Spillway. The installations will include seismographs, geophones, cables, and accessories as described below:

2.7.8.1 Seismograph

MiniMate Plus manufactured by Instantel, Ogdensburg, NY. Each seismograph (4 channel and 8 channel) includes an internal triaxial sensor, external microphone, AC power charger, and PC connecting cable.

2.7.8.2 Geophone

High frequency uniaxial and triaxial geophones, manufactured by Instantel, Ogdensburg, NY, will be used for close proximity monitoring. These geophones have measurement ranges of up to 100 in/s in the frequency range of 28 Hz to 2000 Hz. Standard geophones with ranges of up to 10 in/s will generally be utilized on structures 50 feet or more from blast.

2.7.8.3 Cable

Extension signal cables of up to 250 feet will be used to transmit signal from geophones to seismograph. Splitter cables will be used to connect multiple geophones into the seismographs. Cables are manufactured by Instantel, Ogdensburg, NY.

2.7.8.4 Mounting Plate

Fastening plate for securing seismograph to floor, ceiling, and walls. Uniaxial geophones are recessed into concrete liner, attached to mounting bolt. Triaxial geophones are mounted directly to surface using mounting bolt, or attached to fastening plate and secured to surface. Fastening plates are manufactured by Instantel, Ogdensburg, NY.

2.7.8.5 Software

Advanced Module software provided by Instantel, Ogdensburg, NY., is necessary for analysis of high frequency geophones.

2.7.9 ADAS

ADAS components will be installed at the Gate Tower (El. 1230)to monitor the existing structures' instrumentation. This ADAS will be capable of dynamic and static monitoring of the strain gages, VWP's, and crackmeters. In addition, static monitoring of MPBX displacement transducers, liquid level gages, and thermistors, will be performed through ADAS. Data received through this ADAS will herein be known as Contracting Officer's Data.

2.7.10 Access Platforms

Four of the instrument locations within the rock pillar, along the north side of the FPF, may require periodic access by the Contracting Officer. Permanent platforms were constructed and secured to the steep slope surface to provide this access from the staging area above. The Contractor shall be responsible for repair or replacement should damage occur as a result of blasting and/or construction activities.

2.8 FACTORY CALIBRATION

A factory calibration shall be conducted on all instruments at the place of manufacture prior to shipment. Each factory calibration shall include a calibration curve with data points clearly indicated, and a tabulation of the data. Each instrument shall be marked with a unique identification number. Quality assurance procedures during factory calibration shall be as specified in paragraph: QUALITY ASSURANCE.

Factory calibrations of vibrating wire piezometers shall be made against a pressure gage traceable to the National Institute of Standards and Technology. The accuracy of the pressure gage shall not be less than twice the specified accuracy of the piezometers. Calibrations shall be made to full scale in three complete cycles, recording the reading in 5 equal increments during three loading and three unloading cycles. The thermal factor of each piezometer shall be determined in a precision test chamber, at 0, 10, and 20 degrees C. The calibration record shall include gage factor, thermal factor, and zero reading with corresponding temperature and barometric pressure.

Factory calibrations of the inclinometer probe shall include comprehensive calibrations of the force balance accelerometers prior to assembly in the gage. A final calibration shall include measurements made at 2.5 degrees intervals from -10 degrees to +10 degrees with respect to vertical, and a comprehensive repeatability check over a smaller zone near vertical.

Factory calibrations of vibrating wire displacement transducers shall be made against a dial gage traceable to the National Institute of Standards and Technology. The accuracy of the dial gage shall not be less than twice the specified accuracy of the displacement transducers. Calibrations shall be made to full scale in three complete cycles, recording the reading in 5 equal increments during three loading cycles. The thermal factor of each transducer shall be determined in a precision test chamber, at 0, 10, and 20 degrees C. The calibration record shall include gage factor, thermal factor, and zero reading with corresponding temperature and barometric pressure.

Factory calibrations of load cells shall be made in a testing machine with an accuracy traceable to the National Institute of Standards and Technology. Calibrations shall be made to full scale in three complete cycles, recording the reading in 5 equal increments during three loading and three unloading cycles.

PART 3 EXECUTION

3.1 PRE-INSTALLATION ACCEPTANCE TESTS

When the Contractor's instruments are received at the site, the Contractor's instrumentation personnel shall perform pre-installation

acceptance tests to ensure that the instruments and readout units are functioning correctly prior to installation. Pre-installation acceptance tests shall include relevant items from the following list:

a. Examine factory documentation: suggested installation methods and calibration data to verify completeness.

b. Examine manufacturer's final quality assurance inspection check list, to verify completeness.

c. Check cable length and cable label.

d. Check tag numbers on instrument and cable.

e. Check, by comparing with procurement document that model, dimensions, and materials are correct.

f. Perform resistance and insulation testing, in accordance with criteria provided by the instrument manufacturer, using a gage insulation or circuit tester that applies 2 volts or less for resistance testing and 15 volts or less for insulation testing.

g. Verify that all components fit together in the correct configuration.

h. Check all components for signs of damage in transit.

i. Check that quantities received correspond to quantities ordered.

j. For vibrating wire piezometers, check that the pre-installation reading agrees with the manufacturer's zero reading, as specified in paragraph:FACTORY CALIBRATION. During the pre-installation reading, barometric pressure and piezometer temperature shall be measured, and corrections applied in accordance with factory calibration data. Prior to making the pre-installation reading, the piezometer shall be maintained in a constant temperature environment for sufficient time, as stated by the manufacturer, to achieve thermal equilibrium. The pre-installation reading shall be made with the piezometer filter dry, and the piezometer shall not be placed in a sand-filled bag.

During pre-installation acceptance testing of each instrument the Contractor's instrumentation personnel shall complete a pre-installation acceptance test record form.

An instrument that fails the specified pre-installation acceptance test shall be repaired by manufacturer such that it passes a subsequent pre-installation acceptance test, or shall be replaced by an identical instrument at no additional cost to the Government.

3.2 INSTALLATION - GENERAL

The Contractor's instrumentation personnel shall install instruments in accordance with the Contractor's detailed step-by-step procedures that were submitted as specified in the Installation Plan, and reviewed by the Contracting Officer.

Installation procedures for instruments in boreholes shall be such that all steps in the procedure can be quality assured.

Drilling, core retrieval, core logging, and core storage shall be in accordance with Section 02251, FOUNDATION DRILLING AND GROUTING.

The Contractor may elect to use drill casings in the upper 20 feet (soil/weathered rock) of the vertical instrumentation boreholes. Prior to installing any instrument through drill casing, all material adhering to the inside of the casing, and all cuttings, shall be removed thoroughly.

Whenever withdrawing drill casing, during instrument installation in a borehole, care shall be taken to minimize disturbance to the borehole. Backfill material shall not be allowed to build up inside the casing such that the instrument is lifted as the casing is withdrawn. The casing shall be withdrawn without rotation. The casing may be omitted, if allowed by the Geotechnical Instrumentation Engineer, only where it can be shown that instrument installation without the casing will not cause collapse of the borehole or in any way adversely affect instrument installation.

Grout shall be placed using a tremie method with side discharge ports on the tremie pipe.

The Contractor shall notify the Contracting Officer at least 24 hours prior to installing each instrument.

As excavation of the Facility progresses, the Contractor shall use the profile information from the installed inclinometer casings to mark the sidewalls of the excavation. The vertical marks will assist the Contractor in placement of the rock bolts, seep holes, and multi-point borehole extensometers, in an effort to reduce possible damage to inclinometer casing.

For instruments which do not have factory-connected cable leads that can be routed directly to the ADAS or terminal units, the Contractor shall perform connections of instrument leads to multiconductor cables. These connections shall have a water-tight seal impermeable to submersion of up to 100 psi.

The Contractor shall provide and facilitate safe access to the Work at all times for the Geotechnical Instrumentation Engineer to complete instrument lead connections, perform manual readings, perform cable lead checks, and inspect instrument boreholes. Safe access shall include, but not be limited to, cessation of work activities, temporary relocation of obstructing materials and equipment, provision of ladders, provision of crane-operated man-baskets, and any other needs that, in the opinion of the Engineer, are necessary to ensure safety.

The Contractor shall install instrumentation, in addition to that specified herein, that the Contractor deems necessary to ensure the safety of personnel and the Work. The Contractor shall notify the Contracting Officer at least 24 hours prior to installing any such additional instrumentation. Data resulting from such instrumentation are referred to herein as Contractor's data, together with data specified in paragraph: DATA COLLECTION. Such Contractor's data will be accepted by the Contracting Officer only if the data are obtained from instrumentation furnished, calibrated, tested, installed, and maintained as specified herein, if the data are collected and plotted as specified herein, and if submitted/provided to the Contracting Officer as specified herein.

The Contractor shall extend installed instrumentation and reinstall protective covers as necessary as grade changes occur, and revise

instrument reference elevations as necessary.

As each instrument is installed, an installation record sheet shall be prepared, including appropriate items from the following list:

a. Project name.

b. Contract name and number.

c. Instrument type and number, including readout unit.

d. Planned location in horizontal position and elevation.

e. Planned orientation.

f. Planned lengths and volumes of backfill.

g. Personnel responsible for installation.

h. Drill equipment used, including diameter and depth of any drill casing used.

i. Date and time of start and completion.

j. Spaces on record sheet for necessary measurements or readings required at hold points during installation to ensure that all previous steps have been followed correctly, including instrument readings made during installation.

k. A log of subsurface data indicating the elevations of strata changes encountered in the borehole. Strata nomenclature shall be based on profiles and boring logs contained in the Geotechnical Data Report.

l. Type, length, and volume of backfill used.

m. As-built location in horizontal position and elevation including:

1. Elevation referenced to the vertical datum N.G.V.D. (1929) to an accuracy of ± 0.01 foot, together with the location of the point used for the elevation measurement.

2. Horizontal position referenced to the North American Datum of 1983 (NAD 83) to an accuracy of ± 0.1 foot, together with the location of the point used for horizontal position measurement.

3. A location sketch showing the instrument number, taped horizontal distances to the instrument, measured to an accuracy of ± 1 foot from permanent physical features in the field. A sufficient number of taped measurements shall be included on the sketch to establish a unique horizontal position for the instrument. If such features are removed, the Contractor shall provide a new sketch, prior to removal, with taped measurements to other features.

n. As-built orientation.

o. Result of post-installation acceptance test.

p. Weather conditions at the time of installation.

q. A space on record sheet for notes, including problems encountered, delays, unusual features of the installation, and details of any events that may have a bearing on instrument behavior.

r. Instrument lead colors and each lead's function or code.

An instrument that fails the specified post-installation acceptance test shall be replaced by an identical instrument at no additional cost to the Government.

After installation, protective covers shall be free-draining. Protective covers that are not free draining shall be repaired or replaced at no additional cost to the Government.

The Contractor shall ensure that surface components of instrumentation, including, but not limited to, terminal units, cables, and conduits, will be protected and secured from possible inundation from flood events.

The Contractor shall submit updated as-built instrument location plans to the Contracting Officer. The location plans shall be reproducible composite plans of all installed instruments plotted on 11 inch x 17 inch or 24 inch x 36 inch sheets at a scale of 1 inch = 20 feet. The first plans shall be submitted within one week after completion of the first instrument installation, regardless of instrument type. Updated plans shall be submitted every subsequent week. Updated plans need not be submitted for periods during which no instruments have been installed.

3.3 INSTALLATION OF INCLINOMETER CASINGS

Inclinometer casings shall be installed at the locations and depths shown on the Instrument Schedules within the Plans, or as directed by the Geotechnical Instrumentation Engineer.

At least one inclinometer casing shall have a ground wire attached and installed to the full depth of the borehole, as described in paragraph: INCLINOMETERS.

Prior to drilling, the drill rig shall be plumbed to the designated plunge listed in the Instrument Schedule.

The Contractor shall retrieve continuous core samples throughout depth of borehole.

The inclinometer casings shall be oriented such that one axis of the internal grooves are within 5 degrees of being perpendicular to the excavation. Casing groove orientation shall be maintained throughout installation. During and after installation, the casing groove spiral shall not exceed one degree per 10 feet of length.

No part of the inclinometer casing shall deviate from designed inclination by more than 2 percent of the depth to that part.

After completion of installation, a post-installation acceptance test shall be performed to verify that there is no grout in the inclinometer casing, that groove orientation and verticality satisfy the specifications, and that the inclinometer probe tracks correctly in all four orientations. A vertical survey of the installed inclinometer casing shall be performed at

2-foot depth intervals using the standard probe, to determine the vertical profile of the casing, and develop an initial data set. The Contractor shall use the vertical profile of the casing to mark the location of the casing along the sidewalls of the excavation to prevent damage from installation of rock bolts, weep holes, and other instrumentation.

3.4 INSTALLATION OF MULTI-POINT BOREHOLE EXTENSOMETERS

Multi-point borehole extensometers (MPBX) shall be installed at the locations and depths shown on the Instrument Schedules within the Plans, or as directed by the Geotechnical Instrumentation Engineer. Contractor shall locate MPBXs such that they do not intersect or damage existing instruments or pumping well location.

Horizontal MPBX shall be installed at the bench designated by the Geotechnical Instrumentation Engineer and reviewed by the Contracting Officer as the excavation progresses. Excavation greater than 5 feet below the designated MPBX location shall not occur until the instrument is installed and initial readings have been completed.

Assemble reference head, anchor rods, anchors, and grout tube as recommended by manufacturer of instruments. Upper tips of anchor rods shall be assembled such that they are less that 1/2-inch below the fixed readout head surface.

Tremie place grout at the bottom of the borehole and ensure that grout has been placed up to the bottom of the reference head. A seal shall be created at the bottom of the reference head with the grout tube and a short section of tubing passing through the top portion of the seal. Grout shall be placed until return is observed through the short section of tubing.

After completion of installation, but before grout has set, wash the reference head clean of debris and grout so that there are no obstructions to the smooth movement of the anchor rods within their protective sleeves.

Prior to installation of the displacement transducers, a pre-installation acceptance test shall be performed with a gage block.

Install and firmly secure the protective cover to reference head. Install surface protection over instrument assembly.

Route the multiconductor cable, for each MPBX borehole, through conduit up to top of excavation and into ADAS or terminal units. The Geotechnical Instrumentation Engineer will complete connections of the multiconductor cable to the respective displacement transducers.

3.5 INSTALLATION OF VIBRATING WIRE PIEZOMETERS

Vibrating wire piezometers shall be installed at the locations and depths shown on the Instrument Schedules within the Plans, or as directed by the Geotechnical Instrumentation Engineer. Piezometers shall be located around the perimeter of excavation, approximately midway between the pumping well locations. At locations where piezometers are to be installed in closely spaced groups or in the vicinity of other instruments installed in boreholes, piezometers shall be installed no closer than 10 feet from the adjacent borehole instruments.

At least one piezometer borehole shall be located immediately downstream of the cofferdam excavation (PZ-7300). The piezometer(s) will monitor ground

water levels on the west side of the Phase 1B excavation, and will likely be destroyed during Phase 1C excavation.

Contractor shall retrieve continuous core samples from instrument borehole.

The vibrating wire piezometer shall be inverted and secured to the instrument cable, resulting in a looped end of cable less than 1 foot in length.

Prior to insertion of the piezometer in the borehole, a reading shall be taken of the vibrating wire transducer and thermistor, at ground surface.

After insertion of the piezometer a check shall be made to ensure that the piezometer reading agrees with the water head, and the elevation of the diaphragm shall be recorded.

Depth to the top of each increment of sand and granular bentonite shall be checked using a cylindrical sounding hammer. The granular bentonite shall not be tamped.

After completion of installation, a post-installation acceptance test shall be performed to verify that the piezometer functions correctly.

3.6 INSTALLATION OF LOAD CELLS

Rock bolt load cells shall be installed at locations within the excavation as directed by the Geotechnical Instrumentation Engineer and reviewed by the Contracting Officer.

Load cells shall be installed on test bolts, located in the middle of the design bolt pattern. The test bolts shall be similar in dimensions and installed in similar manner as production bolts, however only the bottom four (4) feet of the bolt shall be anchored to the rock formation. Anchorage can be completed with a grout plug, or epoxy capsules. The remaining ungrouted length of drill hole shall be cased with PVC pipe.

A 1-inch thick cement-grout pad shall be placed on the rock surface around the head of the test bolt, for placement of the lower bearing plate of the load cell assembly. The bolt shall be tensioned and locked off at 10 kips after the load cell is installed.

During installation of load cells, bearing plates and cell shall be in alignment within 0.125 inch, using centralizer bushings as necessary.

After load cell installation, perform post-installation acceptance test, by reading the gages, to ensure correct functioning.

Extend cables, within protective conduit to top of excavation and route into terminal boxes or ADAS.

3.7 INSTALLATION OF ADAS

Based on the quantity of instruments to be measured, multiple MCUs may be utilized throughout the site. A main MCU shall be established to link with the designated Work Station for downloading data.

Multiconductor cables, capable of accommodating the quantity of leads necessary, may be used to reduce overall cabling routed from terminal units to MCUs. The Contractor shall be responsible for routing and protecting

cables, and for performing connections of instrument leads to multiconductor leads within the terminal units. The Geotechnical Instrumentation Engineer shall perform the connection of cable leads within the ADAS. Individual instrument leads shall be labeled and easily identifiable at either end of the cable.

Installation of the ADAS equipment shall be in accordance with the manufacturer's recommendations for installation. Install the protective enclosure containing main MCU at the location shown on the Instrumentation Site Plan, or at Contractor's field trailer. Placement of additional MCUs shall be based on Contractor's submittal. Installation of all MCU enclosures shall be as follows:

a. The enclosures shall be permanently mounted at elevations above 1,170 feet.

b. MCUs shall be mounted by existing structures, or within constructed enclosures, such that MCUs will be protected from blasting debris.

c. Each MCU shall be grounded in accordance with the manufacturer's recommendations, and as described in paragraph: AUTOMATIC DATA ACQUISITION SYSTEMS.

d. The bottom blank gland panel, supplied by the manufacturer, shall be drilled or punched by the Contractor to accommodate the Contractor's selected conduit configuration.

Contractor shall route cable leads from instrumentation, or terminal units, into MCU enclosure allowing a minimum of 5 feet of cable for connection to the ADAS. Each instrument cable shall be clearly labeled with the instrument designation.

The Geotechnical Instrumentation Engineer shall perform the final connection of the instrument cables to the ADAS and programming of ADAS. The Contractor shall provide and facilitate safe access to the location(s) of the ADAS at all times for the Geotechnical Instrumentation Engineer, and Contracting Officer.

Power shall be provided to location of each MCU as indicated in paragraph: AUTOMATIC DATA ACQUISITION SYSTEMS.

3.8 CONTRACTING OFFICER INSTRUMENT INSTALLATION

The contracting Officer will install instrumentation, including vibrating wire sister bars, vibrating wire piezometers, and seismographs/geophones, during construction. Instrument installations will be performed at the intake entrance structure during the seismic retrofit work, and at the north cast-in-place wall of the cofferdam. Contractor shall provide assistance to the Contracting Officer to facilitate the instrument installations.

3.8.1 Intake Entrance Structure Seismic Retrofit

In conjunction with the Contractor, the Contracting Officer shall install up to 16 vibrating wire sister bars on four vertical anchor rods and one downhole seismic geophone, as shown on Plate S8.2 of the plans. The Contracting Officer will attach instrumentation and associated instrument cables to rods prior to insertion in drilled holes. The Contractor shall provide a staging area for the anchor rods to be placed horizontally and

prepared for instruments.

The Contractor will remove existing rigid metal instrument conduits from the Intake Entrance Structure deck (El. 1140). The Contractor shall provide replacement conduits, with similar cable capacity, from the top of the instrumented anchor holes to the existing rigid metal instrumentation conduits located at the south exterior corner of the Gate Tower. The Contracting Officer, with assistance of Contractor, will route instrument cables form the top of the instrumented anchor holes to the Contracting Officer's ADAS.

3.8.2 Cofferdam North Cast-In-Place Wall

In conjunction with the Contractor, the Contracting Officer shall install up to 5 vibrating wire sister bars and one vibrating wire piezometer on the reinforcement steel as shown on Plate S3.3 of the plans. The Contracting Officer, with the Contractor's assistance, will attach instrumentation and associated instrument cables to reinforcement steel prior to placement, if reinforcement is assembled in sections and lowered into position. If the Contractor assembles reinforcement steel in place, then the Contractor shall install instruments with the assistance of the Contracting Officer. The Contracting Officer, with assistance of the Contractor, will route instrument cables from the top of the drilled hole to the Contracting Officer's ADAS.

3.9 FIELD MAINTENANCE AND CALIBRATION

The Contractor's instrumentation personnel shall conduct regular maintenance of field terminals and accessible instrument components during construction. Maintenance shall include instruments installed by the Contractor.

The Contractor shall have the survey level peg-tested and adjusted, if necessary, once a week to check for collimation error.

3.10 DATA COLLECTION

3.10.1 Initial Readings

The Geotechnical Instrumentation Engineer shall perform the manual initial readings of each instrument, and both the Geotechnical Instrumentation Engineer and the Contracting Officer shall check the validity of formal initial readings, and shall sign agreement to such readings as specified in the Instrument Reading Report, SD-05 Test Reports of paragraph:SUBMITTALS. No instrument will be accepted or paid for until formal initial readings are agreed upon as specified herein.

Data for initial readings shall be recorded on field data records, which shall include at least the following:

a. project name
b. contract name and number
c. instrument type
d. date and time
e. observer
f. readout unit number
g. instrument number
h. readings
i. remarks

j. visual observations
k. other causal data including weather, temperature, and construction activities

Instrumentation data shall be recorded in U.S. Customary Units, such as feet, inches, pounds.

The Contractor shall provide and facilitate safe access to the Work at all times for the Geotechnical Instrumentation Engineer to collect data from specified instruments, and also from any additional instruments installed by the Contractor as specified in paragraph:INSTALLATION-GENERAL. Safe access shall include, but not be limited to, cessation of work activities, temporary relocation of obstructing materials and equipment, provision of ladders, working platforms and hoisting services, and any other needs that, in the opinion of the Geotechnical Instrumentation Engineer, are necessary to ensure the safety of data collection personnel. The Contractor shall furnish two sets of safety equipment for use by the Geotechnical Instrumentation Engineer when collecting data or accessing instrument locations, which shall include, but not be limited to respirators and harnesses.

For the Contractor's information, the following subparagraphs define formal initial readings, which will be collected by the Geotechnical Instrumentation Engineer and shall be agreed on by the Contracting Officer. The following definitions of readings other than formal initial readings shall apply to Contractor's data only.

A. A set of formal initial inclinometer readings for each inclinometer casing shall be performed. An inclinometer reading is defined as a set of readings at 2 foot intervals throughout the casing, and a second set at 180 degrees to the first set. The formal initial inclinometer reading will be selected from three reading sets as defined above, involving six complete traverses along the casing. Each reading other than the formal initial reading shall be a single reading. Check-sums (sum of two readings at the same depth but 180 degrees apart) shall be examined in the field. Except where obvious imperfections in the casing have affected the check-sums, the standard deviation of A- and B-axis check-sums over a 2 foot interval shall not exceed 0.0005 foot and 0.0010 foot, respectively.

B. A formal initial set of multi-point borehole extensometer readings will consist of the average of three readings with repeatability ± 0.0005 inches per 1 inch range gage, with the electronic readout, for each displacement transducer located at the reference head of the MPBX borehole. Each reading other than the formal initial reading shall consist of a single reading taken with the electronic readout unit or ADAS.

C. A formal initial vibrating wire piezometer reading will consist of the average of three readings with repeatability of ± 0.25 psi per 50 psi gage range. Each reading other than the formal initial reading shall be a single reading.

D. A formal initial load cell reading will be made with approximately 10 kips load on the load cell, and will consist of a set of readings of all strain gages, determining the average of the set, followed by repeating the set of readings two more times and averaging all three sets with repeatability ± 150lb for 300 kips gage range. Each reading other than the formal initial reading shall be the average of a single

set.

E. It is the Contractor's responsibility to maintain and periodically calibrate all portable readout boxes and probes in accordance with the schedule of such maintenance provided by the manufacturers of this equipment.

3.10.2 Reading Schedule

Instrumentation data shall be collected by the ADAS at least twice per day during active construction, and at higher frequencies during blasting events, with a minimum of once before and after the blast event. The reading schedule shall continue 24 hours per day, 7 days per week through the end of construction, and/or the end of the contract. Instrumentation collected through the ADAS will not include inclinometer casing surveys.

Manual inclinometer casing surveys shall be performed 1 to 2 hours after each blast event, for casings located within 75 feet of the nearest drilled blast hole.

Data recorded by the ADAS will be available to the Contractor and the Contracting Officer as specified in paragraph:DATA REDUCTION, PROCESSING, PLOTTING, AND REPORTING. This data will herein be known as the Contractor's Data.

The Contractor shall collect data from instrumentation specified herein, in addition to the data regularly collected by the ADAS, which the Contractor believes are required to ensure the safety of personnel and the Work.

3.11 DATA REDUCTION, PROCESSING, PLOTTING, AND REPORTING

3.11.1 Data Reduction and Processing

The Contractor's Geotechnical Instrumentation Engineer shall program the ADAS to perform the functions specified below.

The ADAS will record measurements on a predetermined schedule, as specified in paragraph:DATA COLLECTION, and at an accelerated schedule during blasting events. The data will be stored within the main multiplexer until an ADAS Work Station downloads it. The multiplexer will automatically download data to the Work Station when a communication line is established between the two units. This shall be performed after each blasting event, or once per day (whichever is greater), with the main multiplexer automatically calling the Work Station, or by calling the multiplexer directly from the Work Station.

The ADAS shall be programmed to convert the raw data into engineering units. Both the raw data and the engineering units shall be downloaded from the multiplexer to the Work Station. The Contractor's Data shall be sent from the ADAS to both the Contractor's Work Station and the Contracting Officer's Work Station. A database, integral with the ADAS, will automatically be updated, after additional data is downloaded, on both the Contractor's and Contracting Officer's Work Stations. Plots of data will be available within this database.

The ADAS shall be programmed to trigger an alarm when measurements occur that meet or exceed the threshold values, as established in paragraph: INTERPRETATION OF DATA AND IMPLEMENTATION OF ACTION PLANS. The triggered alarms shall alert the Contractor either by audible means and/or pager.

3.11.2 Plotting

Plots of the Contractor's Data shall be available through the database, updated every time measurements are downloaded from the ADAS. The ADAS shall be programmed by the Geotechnical Instrumentation Engineer to develop the following types of plots for each instrument type:

a. Plots of vibrating wire piezometer data shall show piezometric elevation versus time.

b. Plots of multi-point borehole extensometers shall show deformation of each anchor in borehole versus time.

c. Plots of load cell data shall show load versus time. A plot of temperature versus time shall be on the same axis.

Additional plots of instrumentation, not recorded by the ADAS shall include:

a. Plots of inclinometer casing vertical surveys. Plots of inclinometer data shall be "cumulative change" data, showing absolute horizontal deformation versus depth, and "change" data showing incremental deflection versus depth, and shall be prepared on 8-1/2 inch x 11-inch sheets using Digitilt software. The top of the inclinometer casing (excluding any extension length added during data collection) shall be used as a datum for depth measurement. Multiple plots shall be on the same sheet to provide a time history, each labeled with the date. Each plot shall include the instrument numbers, station, and offset. Electronic copies of the raw data shall also be provided in Digitilt (PCSlin) format.

3.11.3 Reporting

Each week the Contractor shall submit to the Contracting Officer an updated set of instrumentation data plots as described in the subparagraphs above for both the Contractor's Data and the Contracting Officer's Data.

a. A description of groundwater control and temporary pressure relief operations. This description shall include the pump locations (plan location and depth), times and duration of operation, and estimated quantity of flow from dewatering operations as well as metered quantity of flow from each well.

b. A summary of the support system construction activities. This installation shall include a location plan and narrative indicating rock bolt installation, in addition to other excavation support systems.

c. A summary of excavation activities. This summary shall include a location plan and a description of where excavation has occurred during the week, together with plots of the elevation of the bottom of the excavation or top versus station, showing a plot for the current date and one each for the three previous weeks.

d. A description and location of any construction activities other than excavation support system, excavation, including any surcharge caused by temporary construction loads.

e. A report of any unusual events that may have affected the instrumentation readings. This report shall include a description of

any remedial or precautionary measures that were implemented during the week in response to geotechnical instrumentation or other data, including when they were implemented and for what reason. The report shall also include a description of any future remedial or precautionary measures that are planned in response to existing geotechnical instrumentation or other data.

f. An evaluation of Contractor's instrumentation data, and recommendations to ensure safety for work site and personnel.

g. A list and proposed layout of additional recommended instrumentation.

Each week the Contractor shall also submit to the Contracting Officer a cross section, at each inclinometer / multi-point borehole extensometer location, using a vertical scale of 1 inch = 20 feet, showing the key construction activities and other events that could influence changes in the data. These key construction activities and other events shall include at a minimum: current elevation of the bottom of the excavation at the same station as the inclinometer / multi-point borehole extensometer; support system construction including current depth of walls; elevation, installation angle, and number for each bolt; stratigraphy to final bottom of excavation; profile and number of each inclinometer / multi-point borehole extensometer; and contract stationing.

3.12 ELECTRONIC ACCESS TO DATA

The Contracting Officer shall have access to the Contractor's Data during the construction contract. Similarly, the Contractor will have access to the Contracting Officer's Data during the construction contract. Some of the new data in the database may be unchecked. The Contractor can retrieve and use the unchecked data at their own risk.

The Contractor access to the Contracting Officer's data will be accomplished by two data transmission methods. The first data transmission method will provide the Contractor with real-time data views and alarms which are based on thresholds and limits set for data measurements. The Contracting Officer's data will be directly transmitted from the data logging facilities to a contractor supplied computer at the construction site. To accomplish this method of data transmission, the Contractor will be required to obtain hardware and software compatible with the Contracting Officer's instrumentation monitoring systems. The second data transmission method will provide comprehensive instrumentation data via a common web site that will be accessible to the Contractor, the Contracting Officer, and other team members. It is anticipated that data on the Contracting Officer web site will be available 5 to 10 minutes after the actual measurement time. It is also anticipated that access to the web site will only require a typical personal computer with Internet access.

3.13 DAMAGE TO INSTRUMENTATION

The Contractor shall protect all instruments and appurtenant fixtures, leads, connections, and other components of instrumentation systems from damage due to construction operations, weather, lightning, traffic, and vandalism.

If an instrument, including an existing instrument installed by others, is damaged or inoperative, the Contractor's instrumentation personnel shall repair or replace the damaged or inoperative instrument within 72 hours at

no additional cost to the Government. The Contractor shall notify the Contracting Officer at least 24 hours prior to repairing or replacing a damaged or inoperative instrument. The Contracting Officer will be the sole judge of whether repair or replacement is required.

3.14 DISCLOSURE OF DATA

The Contractor shall not disclose any instrumentation data to third parties and shall not publish data without prior written consent from the Contracting Officer.

3.15 INTERPRETATION OF DATA AND IMPLEMENTATION OF ACTION PLANS

The Contractor shall interpret the Contractor's Data and the Contracting Officer's Data. Interpretation shall include making correlations between instrumentation data and specific construction activities. Instrumentation data shall be evaluated to determine whether the response to construction activities is reasonable.

Table 1 indicates Threshold and Limiting Values for selected instruments. These values shall be defined collectively as Response Values. The actions associated with these Response Values are defined below. Plans for such actions are referred to herein as plans of action, and actual actions to be implemented are referred to herein as response actions. Response Values are subject to adjustment by the Contracting Officer as indicated by prevailing conditions or circumstances.

TABLE 1. RESPONSE VALUES

Instrument	Threshold Value	Limiting Value
A. Vibrating Wire Piezometers		
During Excavation	Groundwater elevation less than 5 ft below adjacent subgrade elevation	Groundwater elevation equal to adjacent subgrade elevation
During Dewatering of the Excavation Following a Flood Event	Groundwater elevation more than 3 ft above water elevation in the adjacent flooded excavation	Groundwater elevation more than 5 ft above water elevation in the adjacent flooded excavation
B. Inclinometer Casings (See Notes 1 & 2)		
1. In-Place Sensors (See Note 5)	Change in Slope = 30 seconds	Change in Slope = 45 seconds
2. Inclinometer Casing Surveys	0.0005H	0.001H
C. Multi-Point Borehole Extensometers		
1. Above Existing Tunnel - Vertical (See Notes 3 & 5)	0.01 ft	0.04 ft
2. Excavation Sidewalls - Horizontal (See Note 2)	0.01 ft	0.04 ft
D. Liquid Level Gages (See Notes 3 & 5)		
1. On Structures	0.01 in	0.02 in
E. Outlet Works Tunnel Liner (see Note 5)		
1. Crack Meters	0.05 in.	0.1 in.
2. Static Strain Gages	100 microstrain	250 microstrain
F. Load Cells	5 kip increase in load	10 kip increase in load
G. Seismographs (see Note 5 & 6)		

TABLE 1. RESPONSE VALUES

1. Reinforced Concrete Spillway, Outlet Works Tower, Outlet Works Tunnel Lining, and Bridge Piers	16 in/s	20 in/s
2. Trunnions of Existing Spillway and Outlet Works Regulating Gate	6 in/s	8 in/s

NOTES:

1. H is equal to the current excavation depth.
2. Instrument Response Values refer to horizontal displacement.
3. Instrument Response Values refer to vertical displacement.
4. Contractor monitored instruments, not in ADAS.
5. Data for existing structures supplied by Contracting Officer.
6. Instrument response values given are peak particle velocities.

If a Threshold Value is reached the Contractor shall:

a. Meet with the Geotechnical Instrumentation Engineer and Contracting Officer to discuss the need for response action(s).

b. If directed by the Geotechnical Instrumentation Engineer or the Contracting Officer, during the above meeting, that a response action is needed, within 24 hours of receiving instrumentation data from the ADAS or Contractor, indicating that a Threshold Value has been reached, submit a detailed specific plan of action, based as appropriate on the generalized plan of action submitted previously in accordance with the Sections 02212, CONTROLLED BLASTING, 02521, WATER WELLS, and 02525, RELIEF WELLS.

c. If directed by the Geotechnical Instrumentation Engineer or Contracting Officer, implement response action(s) within 24 hours of submitting a detailed specific plan of action, so that the Threshold Value is not exceeded.

d. Install additional instruments if directed by the Geotechnical Instrumentation Engineer.

The Contractor shall take all necessary steps so that the Limiting Value is not exceeded. Contractor may be directed to suspend activities in the affected area with the exception of those actions necessary to avoid exceeding the Limiting Value.

If a Limiting Value is reached, the Contractor shall:

a. Meet with the Geotechnical Instrumentation Engineer and Contracting Officer to discuss the need for response action(s).

b. If directed by the Geotechnical Instrumentation Engineer or Contracting Officer, during the above meeting, that a response action is needed, within 24 hours of receiving instrumentation data from the ADAS or Contractor indicating that a Limiting Value has been reached, submit a detailed specific plan of action, based as appropriate on the

generalized plan of action submitted previously in accordance with the Sections 02212, CONTROLLED BLASTING, 02521, WATER WELLS, and 02525, RELIEF WELLS.

c. If directed by the Geotechnical Instrumentation Engineer, implement response action(s) within 24 hours of submitting a detailed specific plan of action, so that the Limiting Value is not exceeded.

3.16 DISPOSITION OF INSTRUMENTS

Remove salvageable instruments only when directed by the Contracting Officer. All salvaged instruments shall become the property of the Contracting Officer.

Portable readout units and computers furnished to the Contracting Officer for data collection shall become the property of the Contracting Officer. Portable readout units used by the Contractor during installation, during pre- and post-installation acceptance testing, and for collecting Contractor's data shall remain the property of the Contractor.

It is the responsibility of the Contractor to ensure that all instruments installed by the Contractor shall be operational upon completion of the Work for possible later monitoring by the Contracting Officer. If directed by the Contracting Officer, the Contractor shall remove any or all instruments at no additional cost to the Government. The Contracting Officer will be the sole judge of whether or not removal is required. If directed by the Contracting Officer to remove piezometers, multi-point borehole extensometers, or inclinometers, the upper two feet of the instrument shall be removed, together with the surface protection. The remaining open portions of the instrument and casing shall be backfilled with cement grout up to a level two feet below the ground surface, and with lean concrete in the upper two feet. Disturbed or damaged surfaces shall be restored to the condition existing before installation of the instrument.

-- End of Section --

SECTION 02217

FOUNDATION PREPARATION

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Foundations

The rock foundation is comprised of the rock surfaces upon which concrete structures are placed. Vertical surfaces, where permitted or required by these specifications, are included.

1.1.2 Rock Joints

Rock joints are all planar and/or curvilinear fractures, including cracks, crevices, and seams which separate a rock mass into individual rock blocks of various sizes. They may be open or closed and may be filled with material other than rock material.

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Equipment; G

The Contractor shall submit catalog cuts, brochures, or other descriptive literature describing the equipment to be used for foundation preparation. The Contractor shall submit the equipment data and receive approval prior to the beginning of rock excavation.

Personnel; G

The qualifications and experience records shall be submitted for approval Experience records shall identify all the individuals responsible for foundation preparation (including foundation preparation underwater), and shall include a listing of projects of similar scope along with points of contact. The Contractor shall submit the qualifications and receive approval prior to the beginning of rock excavation.

Foundation Preparation Plan; G

The Contractor shall submit to the Contracting Officer for review and comment a plan for foundation preparation, including foundation preparation under water. The proposal shall describe the sequence of foundation preparation and other restrictions as outlined on the drawings or specified. The Contractor shall

submit the Foundation Preparation Plan and receive approval prior to the beginning of rock excavation.

SD-03 Product Data

Tools; G

Tabular list of power tools to be used in lieu of hand tools shall be submitted for approval prior to their use on the job site.

1.3 Qualifications

Foundation preparation shall be performed by a firm which is regularly engaged in the preparation of foundations, and particularly foundations underwater and have at least 10 years of experience in work of similar scope and size. The superintendent responsible for foundation preparation shall have worked at least 5 projects of similar scope and size.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

3.1 EXAMINATION

The limits of the proposed foundations for the various parts of the work are approximately as indicated. The Contracting Officer reserves the right to change the depth to, or the width of, the foundations if, conditions exposed in the foundation excavations, or as determined by exploratory drilling, warrant such modifications.

3.2 PREPARATION

3.2.1 Equipment

3.2.1.1 Tools

Hand tools, where required or permitted by these specifications include, but are not limited to shovels, bars, picks,and wedges. Power tools may be used in lieu of hand tools only when such use is approved.

3.2.1.2 Air Jet

An air jet shall consist of a 3/4 inch nozzle with a supply hose connected to a suitable source of compressed air. The compressed air shall have a pressure between 90 and 110 psi. The compressed air shall be controllable at the nozzle.

3.2.1.3 Air/Water Jet

An air/water jet shall consist of a 3/4 inch nozzle with associated controls and supply hoses connected to suitable sources of compressed air and water. Compressed air shall have a pressure between 90 and 110 psi. Water shall be introduced into the airstream at the nozzle when needed, at a rate of up to 30 gpm. The air and water shall be separately controllable at the nozzle.

3.2.1.4 Water Jet

A water jet shall consist of a 1 inch nozzle with a supply hose connected to a suitable source of water. The system shall be capable of delivering up to 200 gpm. The flow rate shall be controllable at the nozzle.

3.2.1.5 Air Lift Dredge

An air lift dredge shall be provided to remove all objectionable soil and rock material from the excavation that can not be removed by hand methods.

3.3 CLEANUP IN THE DRY

3.3.1 Preliminary Cleanup

When the excavation has reached the approximate limits shown or when the Contracting Officer determines that a satisfactory foundation may have been reached, the Contracting Officer may direct that a preliminary cleanup be performed on all or any part of the rock foundation surface. This cleanup shall consist of removing all debris, loose rock, sand, silt, and other objectionable material by hand tools or any combination of additional methods approved or directed. The Contracting Officer may require that the excavation be continued and the preliminary cleanup procedure repeated until a satisfactory foundation surface is reached. At the direction of the Contracting Officer, the Contractor shall provide a protective treatment of 3 inches of concrete to cover exposed rock that is susceptible to slaking.

3.3.2 Final Cleanup and Foundation Preparation

Unless otherwise directed, Final Cleanup and Foundation Preparation shall be performed. This work shall consist of removing loose and/or weathered rock and pockets of fines, sand, rock rubble or gravel and other objectionable material from the in place rock surface including areas of depression, large crevices, and open rock joints. The loose material need not be removed where the width of the opening is less than 1/4 inches. Mechanical equipment may be used but such equipment will be rubber tired only. Picking, barring, and hand excavation may be necessary to obtain a foundation surface free from loose, drummy, or shattered materials. The final rock surface shall be thoroughly cleaned by use of air jets, water jets, and/or air/water jets or other approved method and shall be maintained in a clean condition until the placement of concrete thereon. At the direction of the Contracting Officer, the Contractor shall provide a protective treatment of 3 inches of concrete to cover exposed rock that is susceptable to slaking.

3.4 UNDERWATER CLEANUP

3.4.1 Preliminary Cleanup

When the excavation has reached the approximate limits shown or when the Contracting Officer determines that a satisfactory foundation may have been reached, the Contracting Officer may direct that a preliminary cleanup be performed on all or any part of the rock foundation surface. This cleanup shall consist of removing all debris, loose rock, sand silt, and other objectionable material by hand tools followed by air lift dredge or any combination of additional methods approved or directed. The Contracting Officer may require that the excavation be continued and the preliminary cleanup procedure repeated until a satisfactory foundation surface is reached. The Contractor shall provide divers before, during and after each phase of Preliminary Cleanup and as directed by the Contracting Officer to

inspect the foundation conditions. The divers shall videotape the foundation conditions and provide video images real time to a monitor located above water surface. The divers shall also communicate with Contractor personnel and the Contracting Officer during the work so that adjustments to the cleanup work can be completed as the work proceeds. The location of the video monitor shall be as directed by the Contracting Officer.

3.4.2 Final Cleanup and Foundation Preparation

Unless otherwise directed, Final Cleanup and Foundation Preparation shall be performed. This work shall consist of removing loose and/or weathered rock and pockets of fines, sand, rock rubble, or gravel and other objectionable material from the in place rock surface including areas of depression, large crevices, and open rock joints. The loose material need not be removed where the width of the opening is less than 1/4 inches. Picking, barring, and hand excavation may be necessary to obtain a foundation surface free from loose, drummy, or shattered material. The final rock surface shall be thoroughly cleaned by use of air lift dredge or any other method approved or directed and shall be maintained in a clean condition until the placement of the concrete/grout thereon. The Contractor shall provide divers before, during and after each phase of Final Cleanup and Foundation Preparation as directed by the Contracting Officer to inspect the foundation conditions. The divers shall videotape the foundation conditions and provide images real time to a monitor located above the water surface. The diver shall also communicate with the Contractor personnel and the Contracting Officer during the work so that adjustments to the Final Cleanup and Foundation Preparation work can be completed as the work proceeds. The location of the video monitor shall be as directed by the Contracting Officer.

3.5 TESTS

3.5.1 General

The Contractor shall establish and maintain quality control for foundation preparation operations to assure compliance with contract specifications and shall maintain records of his quality control for all operations including but not limited to the following:

3.5.1.1 Equipment

Quantity and type.

3.5.1.2 Foundation Excavation

Strict adherence to foundation excavation limits and depths.

3.5.1.3 Inspection, Mapping, and Cleanup

Orderly prosecution of inspections, mapping, and cleanup of foundation excavation areas.

3.5.1.4 Specialized Operations

Protective treatment shall consist of the placement of 3 inches of concrete during preliminary and final cleanup to cover rock exposed in the excavation that is susceptible to slaking.

3.5.2 Reports

Three copies of these records of inspection as well as corrective action taken shall be submitted daily.

3.6 FOUNDATION INSPECTION AND GEOLOGIC MAPPING

Inspections to determine adequacy of the foundations will be performed by the Contractor and reviewed by Contracting Officer in all foundation areas between completion of excavation and placement of concrete, or protective treatment and as described in paragraph: CLEANUP IN THE DRY and UNDERWATER CLEANUP. The contractor will cooperate to the extent necessary to assist in inspection and mapping activities which may require additional survey control points and access. The contractor will coordinate his schedule for foundation excavation and preliminary cleanup with the Contracting Officer to insure that the cleanup, inspection, and mapping proceed in an orderly manner.

-- End of Section --

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SECTION 02220

DEMOLITION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 (1996) Safety and Health Requirements Manual

1.2 GENERAL REQUIREMENTS

The work includes demolition and removal of resulting rubbish and debris. Rubbish and debris shall be removed from Government property daily, unless otherwise directed, to avoid accumulation at the site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer. In the interest of occupational safety and health, the work shall be performed in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections. In the interest of conservation, salvage shall be pursued to the maximum extent possible; salvaged items and materials shall be disposed of as specified.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Work Plan; G

The procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, including procedures and methods to provide necessary supports, lateral bracing and shoring when required, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, and coordination with other work in progress. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations in accordance with EM 385-1-1.

1.4 DUST CONTROL

The amount of dust resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the construction site and to

avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.

1.5 PROTECTION

1.5.1 Protection of Personnel

During the demolition work the Contractor shall continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site.

1.5.2 Protection of Existing Property

Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The Contractor shall take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Government; any damaged items shall be repaired or replaced as approved by the Contracting Officer. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract.

1.5.3 Environmental Protection

The work shall comply with the requirementsof Section 01061 ENVIRONMENTAL PROTECTION.

1.6 BURNING

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

1.7 USE OF EXPLOSIVES

Use of explosives will be permitted for removal of concrete infill wall. Refer to Section 02212 CONTROLLED BLASTING.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 EXISTING STRUCTURES

Existing structures indicated shall be removed to the lines and grades shown on the drawings.

3.1.1 Infill Wall

Demolition of existing infill wall will require divers. Refer to Section 01005 SITE SPECIFIC SUPPLEMENTARY REQUIREMENTS.

3.2 DISPOSITION OF MATERIAL

Title to material and equipment to be demolished is vested in the

Contractor upon receipt of notice to proceed. The Government will not be responsible for the condition, loss or damage to such property after notice to proceed.

3.2.1 Salvageable Items and Material

Contractor shall salvage items and material to the maximum extent possible.

3.2.1.1 Material Salvaged for the Contractor

Material salvaged for the Contractor shall be stored as approved by the Contracting Officer and shall be removed from Government property before completion of the contract. Material salvaged for the Contractor shall not be sold on the site.

3.2.2 Unsalvageable Material

Concrete, masonry, and other noncombustible material, except concrete permitted to remain in place, shall be disposed of off site, on private land with the proper permits obtained. Disposal on City of Tacoma or Government property is not allowed.

-- End of Section --

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SECTION 02230

CLEARING AND GRUBBING

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Clearing

Clearing shall consist of the felling, trimming, and cutting of trees into sections and the satisfactory disposal of the trees and other vegetation designated for removal, including down timber, snags, brush, and rubbish occurring in the areas to be cleared.

1.1.2 Grubbing

Grubbing shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

3.1 CLEARING

Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except such trees and vegetation as may be indicated or directed to be left standing. Trees designated to be left standing within the cleared areas may be trimmed of branches subject to approval of the Contracting Officer. Limbs and branches to be trimmed shall be neatly cut close to the bole of the tree or main branches. Cuts more than 1-1/2 inches in diameter shall be painted with an approved tree-wound paint. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or by such other means as the circumstances require.

3.2 GRUBBING

Material to be grubbed, together with logs and other organic or metallic debris not suitable for foundation purposes, shall be removed to a depth of not less than 18 inches below the original surface level of the ground in areas indicated to be grubbed and in areas indicated as construction areas under this contract. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

3.3 TREE REMOVAL

Where indicated or directed, trees and stumps that are designated as trees shall be removed from areas designated for clearing and grubbing. This

work shall include the felling of such trees and the removal of their stumps and roots as specified in paragraph GRUBBING. Trees shall be disposed of as specified in paragraph DISPOSAL OF MATERIALS.

3.4 DISPOSAL OF MATERIALS

3.4.1 Salable Timber

All felled timber from which saw logs, pulpwood, posts, poles, ties, mine props, or cordwood can be produced shall be considered as salable timber, and shall be trimmed of limbs and tops, sawed into salable lengths of 20 feet, and stockpiled at locations as directed. The disposal of the stockpiled timber will be by the Government.

3.4.2 Materials Other Than Salable Timber

Logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations, except for salable timber, shall be disposed of in the designated waste disposal area, except when otherwise directed in writing. Such directive will state the conditions covering the disposal of such products and will also state the areas in which they may be placed.

-- End of Section --

SECTION 02251

FOUNDATION DRILLING AND GROUTING

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53/A 53M	(1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM C 70	(1994) Surface Moisture in Fine Aggregate
ASTM C 91	(1998) Masonry Cement
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 150	(1999a) Portland Cement
ASTM C 618	(1999) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 937	(1997) Grout Fluidifier for Preplaced-Aggregate Concrete

ASME INTERNATIONAL (ASME)

ASME B16.3	(1992) Malleable Iron Threaded Fittings

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 100	(1975) Method of Sampling Concrete Aggregate and Aggregate Sources, and Selection of Material for Testing
EM 385-1-1	(1996) Safety and Health Requirements Manual

1.2 GOVERNMENT SAMPLING AND TESTING

1.2.1 Preconstruction Sampling and Testing

1.2.1.1 Sand, Cementitious Materials, and Admixtures

Sampling and testing of these materials shall be in accordance with Section 03301 CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS.

1.2.1.2 Grout Materials

Sampling and testing of grout materials shall be in accordance with Section 03301 CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Drilling Equipment
Grouting Equipment
Grout Material; G

Details and data on the drilling and grouting equipment shall be submitted for conformance with the requirements of paragraph EQUIPMENT.

Grout Plant; G

A detailed plan shall be submitted showing equipment and grout plant layout proposed for mixing and placing grout.

SD-06 Test Reports

Grouting Operations

Contractor shall furnish grouting records to the Government within 24 hours of grouting operations

SD-07 Certificates

Contractor Qualifications

Grouting Contractor shall have and provide evidence to the Government of at least 10 years of successful grouting experience on similar projects with adjacent critical structures.

1.4 MATERIALS DELIVERY, STORAGE, AND HANDLING

Transportation and storage of materials shall be in accordance with Section 03301 CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS.

1.4.1 Cement

A sufficient quantity of cement shall be stored at or near the site of the work to insure that grouting operations will not be delayed by shortage of cement. In the event the cement is found to contain lumps or foreign matter of a nature and in amounts which, in the opinion of the Contracting Officer, may be deleterious to the grouting operations, screening through a standard 100 mesh screen, or rejection of the cement, may be required as determined by the Contracting Officer. No payment will be made for such screening or rejected cement.

1.5 PROJECT/SITE CONDITIONS

The project grouting will consist of installation of a grout curtain in four areas of the upstream side of the project site: 1) left abutment; 2) intake structure foundation; 3) intake structure seismic retrofit backfill and 4) cofferdam foundation; the approximate locations, limits and details which are indicated. The intent of the grout curtain is to reduce seepage into the excavation. To maintain adequate overburden pressures and reduce potential for grout leaks, the left abutment and intake structure grouting will be conducted prior to Phase 1B blasting and excavation. The cofferdam foundation grouting will be conducted at an intermediate period of Phase 1B blasting and excavation when the excavation reaches elevation 1075.

The program shown and described is based on currently available information. Conditions encountered during construction may require additions or deletions. The grouting program shall not be modified or curtailed as a construction expediency. It is a required part of design and shall not become secondary to any time or scheduling restrictions. Final determination of grouting mixes, pressures, injection rate and the sequence in which the holes are drilled and grouted will be made in the field and shall be as directed by the Contracting Officer.

PART 2 PRODUCTS

2.1 GROUT MATERIAL

Grout shall be composed of water and cement, pozzolans, admixtures, and fillers, as needed and approved by the Contracting Officer. The grout mixes will be approved by the Contracting Officer and will be varied to meet the characteristics of each hole as determined by conditions encountered. The various materials to be furnished by the Contractor shall conform to the specifications listed in the paragraphs below.

2.1.1 Water

Water suitable for use in the work can be obtained from a well at the left dam abutment just upstream from the spillway gates. It shall be the responsibility of the Contractor to provide a pump and any necessary supply line connections and extensions.

2.1.2 Cement

Cement used in grout shall conform to the requirements of ASTM C 91 and ASTM C 150. The use of bulk cement will not be allowed Only cement furnished in moisture-resistant cloth or paper bags will be accepted to use in the work. Storage of cement shall be in accordance with paragraph MATERIALS DELIVERY, STORAGE, AND HANDLING.

2.1.3 Pozzolans

Pozzolans, if required, shall be fly ash or other raw or calcined natural pozzolans conforming to ASTM C 618. Sampling will be done by an authorized representative of the Government. All tests will be made by and at the expense of the Government. Pozzolans are to be furnished in moisture resistant paper sacks. It shall be transported, handled, and stored so as to avoid damage, waste, or absorption of moisture. Material which has become caked due to moisture absorption will be rejected.

2.1.4 Microfine Cement

Microfine cement, if required, shall consist of a blend of ultrafine Portland cement and ultrafine blast furnace slag with 95 percent of the particles finer than 10 microns and 50 percent of the particles finer than 3 microns. The ultrafine cement shall include a high range water reducer supplied as a powder preblended into the ultrafine cement or as a liquid to be added by the grouting contractor. Use only liquid superplasticizers supplied by or approved by the ultrafine cement supplier as being compatible with their ultrafine cement. Sampling shall be done by an authorized representative of the Government. all tests shall be made by and at the expense of the Government. Ultrafine cement is to be furnished in moisture resistant sacks. it shall be transported, handled and stored so as to avoid damage, waste, or absorption of moisture. material that has become caked due to moisture absorption will be rejected.

2.1.5 Admixtures

Admixtures, if required, shall be added to the grout immediately before or during its mixing and will consist of accelerators, retarders, water reducers, aluminum powder, and/or fluidifiers.

2.1.6 Fluidifier

Fluidifier shall be a compound possessing characteristics which will increase the flowability of the mixture, assist in dispersal of the cement grains, and neutralize the setting shrinkage of the grout. The quality of the material shall meet the requirements specified in ASTM C 937. Sampling of fluidifier shall be done by an authorized representative of the Government. Trial mixtures should be tested prior to using the materials in field work. All tests will be made by and at the expense of the Government. Fluidifier shall be furnished in moisture-resistant paper sacks shipped in sealed containers and shall be handled and stored so as to avoid absorption of moisture, damage or waste. Material which has become caked due to moisture absorption will be rejected.

2.1.7 Bentonite

Bentonite shall be sodium (Na) cation, powdered montmorillonite. It shall be added to the cement grout 2 percent to 5 percent by weight of cement. The percentage shall be adjusted as directed by the Contracting Officer. A separate colloidal bentonite mixer is required to mix the bentonite and water to ensure fully dispensing and hydrating the bentonite before adding to the grout mixer. The bentonite shall be handled and stored so as to avoid absorption of moisture, damage, or waste. Bentonite which has become caked due to moisture absorption will be rejected. A sufficient quantity of bentonite shall be stored at or near the site of the work to insure that grouting operations will not be delayed by shortage of bentonite.

2.1.8 Sand

a. Sand for grout shall be clean and consist of hard, tough, durable, uncoated particles with no more than 2 percent passing the #200 sieve. The shape of the particles shall be generally rounded or cubical and shall not contain more than 5 percent of flat or elongated pieces having a maximum dimension in excess of five times the minimum dimension. The sand shall be generally well graded from fine to medium in accordance with ASTM C 136 with 100 percent passing the No. 30 sieve.

b. The sand shall be subjected to such tests as are necessary to

determine its acceptability. All sampling of sand shall be in accordance with the applicable sampling provisions contained in COE CRD-C 100 or as directed. Unless otherwise directed, all test samples shall be taken under the supervision of the Contracting Officer and shall be delivered to a designated point, at the expense of the Contractor, at least 10 working days in advance of the time when sand will be required at the site of work. All tests will be made by the Government at its expense. The tests to which the sand will be subjected will include specific gravity, absorption, soundness in magnesium sulfate, petrographic analyses, and any other tests that are necessary to demonstrate that grout of adequate durability can be produced.

c. The percentage of surface moisture in terms of the saturated surface-dried sand will be determined in accordance with ASTM C 70, or other method giving comparable results.

d. Sand shall be stored in such a manner as to avoid the inclusion of any foreign materials in the grout. All sand shall remain in free draining storage for at least 72 hours prior to use.

2.2 METAL PIPE AND FITTINGS

Metal pipe and fittings, if required, for constructing grout and exploratory holes, shall be furnished, cut, threaded, and fabricated by the Contractor.

2.2.1 Pipe

Pipe will be black steel. The pipe shall conform to ASTM A 53/A 53M.

2.2.2 Fittings

The fittings shall be black, malleable iron in accordance with ASME B16.3.

PART 3 EXECUTION

3.1 EQUIPMENT

3.1.1 General

All drilling, including exploratory hole drilling, and grouting equipment used shall be of a type, capacity and mechanical condition suitable for performing the work, as determined by the Contracting Officer. The power and equipment and the layout thereof shall meet all applicable requirements of local, State, and Federal regulations and codes, both safety and otherwise.

3.1.2 Drilling Equipment

Standard drilling equipment of the rotary or percussion type shall be used to perform the drilling as specified in paragraphs GROUT HOLE DRILLING and EXPLORATORY HOLE DRILLING. Water or air shall be used to remove cuttings from the hole during drilling operations. Supplies shall include all bits, drill rods, tools, casing, piping, pumps, water, and power to accomplish the required drilling. All drilling rigs and pumps will be equipped with pressure gages. A borehole deviation survey, using a method proposed by the Contractor and approved by the Contracting Officer, shall be employed at each stage of the first three primary grout holes in the intake

structure grout curtain. The survey is intended to verify angle and location of grout holes, and reduce potential for damage to the intake structure. If location of grout holes are inaccurate, additional grout holes and deviation surveys may be required, as determined by the Contracting Officer and at no cost to the Government. Water suitable for use in the work will be supplied by the Contractor, as described in paragraph: WATER.

3.1.2.1 Core Boxes

Longitudinal partitioned wooden core boxes shall be furnished for rock cores. Core boxes shall be fabricated from dressed lumber. Core boxes shall be completely equipped with all necessary partitions, covers, hinges and hasps for holding down the cover. White painted wooden spacer blocks used to partition the core to provide marking space to identify core runs shall be furnished with the core boxes. Contractor shall furnish three spacer blocks per core box, painted with non-glass red paint for marking voids and core losses. Staples will not be allowed in core box construction. Core boxes shall be identified with stenciled labels on the inside and outside of the cover. Labels shall show: Project, Boring No. Depth, and Box No. Core boxes shall be places on wooden pallests. All cores shall be arranged neatly in the partioned boxes in the same sequence in which they occurred before removal from the boring. Facing the open box with the hinged cover above and the open box below, cores shall be arranged in descending sequence beginning at the left end of the trough nearest the hinges and continuing in the other troughs from left to right. The highest part of the core shall be placed in box no. 1 and the lower portions of the core shall be placed in the other boxes in consecutive order. A waterproof, black, wide-tip felt tip marker shall be used for labeling the core boxes. The individual white blocks shall be placed at the end of a core run and labeled in tenths of feet. White blocks shall contain the following information: Run ID (ie run A); D (length of run, ie 4.8 ft; C (length recovered; ie 4.8 ft); L (loss, ie 0.0); and D (ending depth of run; ie 47.5 ft).

3.1.3 Grouting Equipment

The grout plant shall be capable of supplying, mixing, stirring and pumping the grout and additives, to the satisfaction of the Contracting Officer. The plant shall have a minimum capacity of 30 gpm of grout injected at a combined pressure (static head and pumped pressure) not greater than 150 psi. The grout plant shall be properly maintained at all times and any grout hole that is lost or damaged due to mechanical failure of equipment or inadequacy of grout supply shall be replaced by another hole, drilled by the Contractor at his expense. The amount of grouting equipment shall be as necessary to perform the work specified herein. The type to be furnished shall include the following:

a. A progressive cavity pump capable of passing particles up to a top size of No. 16, generating pressures up to 50 psi and pumping a maximum of 30 gpm. In no case will the pump be separated by more than 200 feet of grout line from the header of a hole being grouted.

b. A colloidal type grout mixer having a minimum drum capacity of approximately 10 to 15 cubic feet with a mix batch of 15 cubic feet. Mixing time shall be as required to mix thoroughly. A No. 30 sieve filter screen shall be placed over the mixer to remove agglomerated grout from the return line.

c. A separate colloidal mixer for mixing and hydrating bentonite.

d. A mechanically agitated sump having a minimum capacity of 20 to 30 cubic feet or as required.

e. A circulating grout header with control valves and a pressure gage with protector. Control valves shall be connected to the return line and header. The header shall be joined directly to the riser pipe at the hole by means of a quick connector union.

f. A water storage tank or suitable source of clean auxiliary water for use in washing, pressure testing and flushing operations.

g. A water meter graduated in cubic feet and tenths having a direct reading totalizer and capable of conveniently being set back to zero.

h. Such valves, packers, pressure gages, pressure hose, supply lines, and small tools as may be necessary to provide a continuous supply of grout at accurately controlled pressures as specified. All valves shall be of the ball type and shall have lever-type handles so that it can be easily determined if the valves are open or closed. The inside diameter of the pressure hose and grout supply line shall be not less than 1 inch. Pressure gages shall be at least 3 inches in diameter and capable of measuring no higher than 50 percent beyond the maximum anticipated grout pressures. An accurately calibrated, high precision pressure gage shall be used to check the accuracy of all gages used in the grouting. Certificates indicating such gage calibration shall be submitted for approval within 10 working days prior to beginning grouting operations. Gages shall be checked at least every 24 hours, or more frequently if the Contracting Officer so determines. When defects are found, grouting operations will be stopped until calibration of gages has been obtained. A sufficient number of additional calibrated gages shall be maintained on site at all times for use as replacements.

i. A computer system to monitor grouting operations, including grout pressures and rates. Grouting data is to be recorded electronically and displayed in real time. Copies of the grouting data are to be supplied to the Contracting Officer within 24 hours of grout operations.

j. Equipment to light the work area so that grouting can be conducted during hours of darkness in a safe manner. Lighting must also be directed into the reservoir area adjacent to the work area so that underwater grout leakage can be observed during hours of darkness.

3.1.4 Safety

Cement, lime and bentonite clay are respiratory and skin irritants. Section No. 6 of EM 385-1-1 shall be strictly adhered to and workers shall be equipped with respirators and skin protection during mixing of the dry cement and bentonite products. The manufacturer's recommended safety equipment and instructions shall be used.

3.2 GROUT AND EXPLORATORY HOLES

All holes for grouting or exploration shall be drilled at the locations, in the direction, angle, and to the depths indicated or as directed by the Contracting Officer. A maximum tolerance for deviation in angle and direction shall be 1/2 degree. The first series of holes to be drilled and

grouted shall be as shown on the plans and hereinafter are referred to as primary holes. The location of secondary and succeeding series (intermediate) holes shall be determined by the split spacing method as defined in paragraph SPLIT SPACING and as shown on the plans. The number of grout holes shall be increased, progressively, by the split spacing method as deemed necessary by the Contracting Officer until the amount of grout take at each hole is less than 0.1 cubic foot grout over a 10 minute period. Each hole drilled shall be protected from becoming clogged or obstructed by means of a cap or other suitable device on the collar and any hole that becomes clogged or obstructed due to fault of the Contractor before completion of operations shall be cleaned out in a manner satisfactory to the Contracting Officer or another hole provided by and at the expense of the Contractor.

3.2.1 Pipe for Foundation Grouting

All metal pipe and fittings required for constructing grout and exploratory holes shall be embedded. The pipe and fittings shall be cleaned thoroughly of all dirt, grease, oil, grout and mortar immediately before embedment. All joints shall be made up snug and the assembly held firmly in position and protected from damage or displacement while the concrete is being placed. The Contractor shall take all necessary precautions to prevent any pipe from becoming clogged or obstructed from any cause and any pipe which becomes clogged shall be cleaned out in a manner satisfactory to the Contracting Officer at the Contractor's expense. The presence of tramp metal such as nails, wire, bolts, nuts and other foreign material in the pipes through which diamond drilled holes are to be drilled shall be considered as obstructions. The Contractor may, if he so elects, substitute percussion or diamond drilled holes through the concrete in lieu of pipe, provided that the method proposed meets with the approval of the Contracting Officer and provided further that such substitution does not result in any increased cost to the Government.

3.2.2 Grout Hole Drilling

a. Grout holes shall be drilled with standard rotary or percussion drilling equipment. No core recovery will be required and the type bit used shall be optional with the Contractor. The hole shall be of sufficient diameter to allow use of an expansion plug or packer with an effective inside diameter of not less than 1/2 inch. The minimum diameter of hole shall be 2 inches at the point of maximum penetration. Drill casing may be needed where grout holes extend through soil. No grout hole will be drilled at an angle less than 60 degrees measured from the horizontal nor to a depth greater than 200 feet measured along the hole from the collar of the hole. If, as the work progresses, it is determined that holes to depths greater than indicated are necessary, drilling to such greater depth will be ordered in writing, and the drilling to depths in excess of 200 feet will be paid for at a negotiated unit price.

b. Drilling will be done in accordance with the applicable grouting method hereinafter described. Upon completion of drilling of any grout hole and prior to pressure testing, all drill cuttings and slurry shall be removed by applying water to the bottom of the hole through open end rods and returning the wash water through the hole to the surface until the return water is clear. No separate payment will be made for this washing.

3.2.3 Completion of Grouting

All grouting operations shall be completed and in proper working condition prior to the time of impounding water. At that time, all work in the area shall be completed and the area shall be free of all construction debris. Nipples, if required for grout hole drilling, will be removed.

3.2.4 Exploratory Hole Drilling

a. The Contractor shall perform such exploratory drilling as may be required to determine the condition of the rock prior to grouting or the effectiveness of the grouting operations during or after grouting. All exploratory drilling shall be performed with rotary drilling equipment using coring type bits. Since the maximum recovery of unpredictable soft or friable materials is of prime importance, the Contractor shall make every effort to recover 100 percent of the core by use of the appropriate equipment and drilling procedures.

b. The holes may be required to be drilled to varying depths, with a maximum depth of 200 feet as measured along the hole from the collar of the hole. No exploratory hole will be drilled at an angle greater than 50 degrees measured from the horizontal.

c. Special care should be exercised to obtain cores in as good condition as possible. The Contractor shall keep, in a manner satisfactory to the Contracting Officer, an accurate Driller's Log of all exploratory holes drilled. The log shall include a nontechnical description of all materials encountered in the drilling, their location in the holes and the location of special features such as seams, open cracks, soft or broken rock, points where abnormal loss or gain of drill water occurred, and any other items of interest in connection with the purpose for which the exploratory drilling is required.

d. Wooden or other approved core boxes will be furnished by the Contractor, and the Contractor shall place the cores in the boxes in the correct sequence and separated accurately by wooden blocks, according to the measured distances in the hole. No box shall contain cores from more than one hole. The covers shall be fastened securely to the core boxes and the secured boxes shall be delivered in the vicinity of the work as directed.

e. Exploratory holes shall be grouted under pressure, if conditions so indicate, by grouting to full depth in one operation and backfilled in accordance with paragraph BACKFILLING OF HOLES.

3.3 DEFINITIONS AND PROCEDURES FOR DRILLING AND GROUTING

3.3.1 General

The drilling and grouting shall be accomplished in single or multiple lines as shown. The drilling and the grouting shall be done using the split spacing, stage grouting method and by the split spacing, stop grouting method as described herein.

3.3.1.1 Zone

A zone is a predetermined partial depth of curtain. Zones are shown on the plans.

3.3.1.2 Section

A section is a reach along the grout curtain, not more than 100 feet in length, in which grouting operations will not be permitted at the same time that drilling is in progress. Insofar as practicable, the grout curtain will be subdivided into sections in a manner which will facilitate the Contractor's operations.

3.3.1.3 Stage

A stage is one complete operational cycle of drilling, cleaning, pressure washing, pressure testing, and pressure grouting within a zone. The actual depth of a stage depends upon geologic conditions encountered in drilling. It may vary from a fraction to the full depth of the zone.

3.3.1.4 Stop

A stop is a predetermined depth at which the expanding plug or packer is positioned.

3.3.1.5 Split Spacing

Split spacing is the procedure of locating an additional grout hole midway between two previously drilled and grouted holes.

3.3.2 Stage Grouting

Stage grouting is the grouting of progressively deeper zones in stages. It involves the placement of a grout curtain by drilling and grouting in successive operations in accordance with the following general procedure.

3.3.2.1 Primary Holes

Primary holes for foundation grouting shall be drilled to their first stage of depth within the first zone. The depths will be governed by the foundation conditions.

a. The holes thus drilled shall be washed and pressure tested, and then grouted, except that when pressure testing indicates a relatively tight hole, the Contracting Officer may direct that the grouting of that hole be omitted for that stage and the hole be left open for drilling and grouting of the next stage.

b. After the grouting of any hole, the grout within the hole shall be allowed to set and subsequently the hole shall be redrilled.

c. After the interval of time as specified in paragraph SECOND STAGE, the primary holes not already drilled to the limit of the first zone shall be drilled as directed to additional depths not exceeding the zone limit.

d. The primary holes thus deepened shall again be washed and pressure tested and then grouted at higher pressures as directed. Again, the grout within the hole shall be removed as described above.

e. The process of successively drilling primary holes to additional depths and grouting at higher and higher pressures in stages, as directed, shall be repeated until all of the primary holes on the maximum spacing (see paragraph GROUT AND EXPLORATORY HOLES) have been completely drilled and grouted to the depth of the first zone in that

section of the grout curtain.

3.3.2.2 Successive Holes

After the primary holes in the first zone have been completed in any section as specified above, the second and succeeding series of holes, as determined by the "split spacing method," shall be drilled and grouted to the depth of the first zone in like manner until the first zone of that section is completely grouted as directed.

3.3.2.3 Completion of Section

The process of successively drilling to additional depths and grouting at higher and higher pressures in stages for the first series of holes and then for succeeding series of holes shall be repeated for the second and subsequent zones of that section. Other sections along the grout curtain shall be grouted in like manner until grouting of the foundation is completed to the satisfaction of the Contracting Officer. As the drilling and grouting work progresses, it may develop that conditions are such that all or parts of the foundation already grouted require additional grouting. In such event, the equipment shall be returned and additional holes shall be drilled and grouted as directed.

3.3.3 Stop Grouting

Stop grouting is a method whereby each hole is drilled to a final depth and grouted by stops through an expansion plug or packer which is set at successively shallower depths. It involves the placement of a grout curtain by drilling and grouting in accordance with the following general procedure:

a. Drill hole to the full depth and wash as specified in paragraph GROUT HOLE DRILLING.

b. The holes thus drilled and washed shall be pressure washed and tested as specified in paragraph PRESSURE WASHING AND PRESSURE TESTING.

c. The expansion plug, or packer, shall be placed in the hole at the top of the interval to be grouted blocking off the higher portion of the hole, and the interval is grouted. The lowest zone is grouted first. In no case will the Contractor be required to set the packer deeper than 175 feet, as measured along the hole from the collar of the hole.

d. After placing the grout at the pressure and mix directed by the Contracting Officer, the expansion plug, or packer, shall be left in place until the grout pressure drops to that pressure required for the next higher stop or as directed by the Contracting Officer.

e. The expansion plug, or packer, shall then be moved to the next higher stop and grout placed at the lower pressure as directed by the Contracting Officer.

f. The procedures described in subparagraphs "d" and "e" above shall be repeated until grouting of the hole is complete.

g. After the primary holes in the first zone have been completed in any section as specified above, the second and succeeding series of holes, as determined by the "split spacing method" shall be drilled and

grouted in like manner until all zones of that section are completely grouted as directed.

h. Other sections along the grout curtain shall be grouted in like manner until grouting of the foundation is completed to the satisfaction of the Contracting Officer.

i. As the drilling and grouting work progresses, it may develop that conditions are such that all or parts of the foundation already grouted require additional grouting. In such event, the equipment shall be returned and additional holes for grouting shall be drilled and grouted as directed. No allowance above contract unit prices will be made for drilling and grouting such holes. Expense for movement of equipment necessary to the performance of such work shall be compensated for at agreed upon rates.

3.3.4 Pressure Washing and Pressure Testing

Immediately before the pressure grouting operation, the hole shall be thoroughly washed under pressure and pressure tested. All intersected rock seams and crevices containing clay or other washable materials shall be washed with water and air under pressure to remove as much of these materials as possible. If practicable, as determined by the Contracting Officer, such material shall be ejected from one or more holes by introducing water and air under pressure into an adjacent hole. In no case shall such pressure exceed the maximum grouting pressure, as directed by the Contracting Officer. All grout holes shall be tested with clean water under continuous pressure up to the maximum grouting pressure as directed. All holes sufficiently tight to build up the maximum required pressure shall be washed at such pressure and the washing shall continue as long as there is any increase in the rate at which water is taken, such increase indicating the fractures are being opened by the washing operation. Grout holes with water takes of less than 3 Lugeon units shall be considered tight and will not require grouting. Lugeon unit = (cubic feet per foot per minute/0.01076)*(142 psi/actual test pressure in psi). Open holes in which no pressure can be built up shall be washed for a period of 5 minutes, with the pump operating at full capacity, or for such period of time as fracture-filling is being removed, as evidenced by the escape of muddy water through surface openings or other grout holes.

3.3.5 Stage Grouting Procedures

3.3.5.1 First Stage

The Contractor shall perform the first stage of curtain grouting by washing and grouting holes at locations indicated or as directed, using the "split spacing" method described in paragraph SPLIT SPACING. Similar stages of drilling and grouting are repeated as necessary to reach the bottom of the first zone. Before grouting is begun in any hole of a given series in any section, at least the nearest two holes in advance of each such hole in that series shall be completely drilled for the same stage and the adjacent hole completely washed to facilitate washing and flushing out of any intervening clay-filled seams, fractures, or solution channels.

3.3.5.2 Second Stage

After all primary holes in the first stage grouting in any section has been completed, as specified above, the Contractor shall proceed, when so directed, with second stage drilling and grouting in accordance with the

procedure outlined herein but in no case shall the deepening of any hole preparatory to grouting be commenced before the previously placed grout has set. Second stage grouting shall not be conducted within a distance of approximately 100 feet of any hole in which a previous stage of grouting has been completed until the grout in such previous stage hole has taken its set. Grouting at subsequent stages shall conform to the same requirements as to minimum time and distance. Upon completion of all primary holes to the bottom of the first zone, and after the waiting period, secondary and tertiary holes are drilled and grouted in the first zone. The process of drilling, washing, pressure washing, pressure testing, and grouting at progressively higher pressures is continued until the ground is satisfactorily tight to the required depth.

3.3.6 Stop Grouting Procedures

3.3.6.1 Stop Grouting of Grout Holes

The Contractor shall perform the grouting by washing and grouting holes at locations indicated or as directed. Before grouting is begun in any hole of a given series in any section, at least the nearest two holes in the advance of each such hole in that series shall be completely drilled and the adjacent hole completely washed to facilitate washing and flushing out of any intervening clay-filled seams, fractures, or solution channels.

3.3.6.2 Grouting of Existing Exploratory Holes

Existing exploratory holes or portions of holes more than five feet deep after excavation shall be cleaned and pressure grouted as specified for grout holes. Holes less than 5 feet deep shall be back-filled with grout mixed in proportions directed by the Contracting Officer. Gravity grouting or backfilling shall be done in accordance with paragraph BACKFILLING OF HOLES.

3.3.7 Grouting Pressures

Grouting pressures to be used in the work will vary with conditions encountered in the respective holes and pressures used shall be as directed. It is anticipated that pressures, as measured at a gauge at the surface, will range from 0 psi to 30 psi but in no event will gauge pressures in excess of 50 psi be required or allowed.

3.3.8 Grouting

All pressure grouting operations shall be performed in the presence of the Contracting Officer, and shall be in accordance with the following general procedures.

3.3.8.1 Grout Mixes

Mixes shall be in the proportions approved by the Contracting Officer who will, from time to time, direct changes to suit the conditions found to exist in the particular grout hole. The cement grout will include 2 percent to 5 percent (by weight of cement) of sodium bentonite. The water/cement ratio by volume will be varied to meet the characteristics of each hole as revealed by the grouting operation and will range between 4:1 and 0.8:1. The Contractor shall conduct periodic tests on the grout mix using funnel and mud balance tests to insure consistency of grout mixes. The types of grout shall be as follows:

a. Cement Grout shall consist of cement, bentonite and water.

b. Mortar Grout shall consist of cement, bentonite, sand, and water.

3.3.8.2 Grout Injection

a. In general, if pressure tests indicate a tight hole, grouting shall be started with a thin mix or may not be required. If an open hole condition exists, as determined by loss of drill water or inability to build up pressure during washing operations, then grouting shall be started with a thicker mix and with a grout pump operating as nearly as practicable at constant speed at all times; the water/cement ratio will be decreased, if necessary, until the required pressure has been reached. If this procedure does not produce the desired pressure, mortar grout can be used and the mix varied as necessary to produce the desired results, as directed by the Contracting Officer.

b. When the pressure tends to rise too high, the water/cement ratio shall be increased and/or the mix of mortar grout changed or discontinued as may be required to produce the desired results. If necessary to relieve premature stoppage, periodic applications of water under pressure shall be made. Under no conditions shall the pressure or rate of pumping be increased suddenly as either may produce a water-hammer effect which may promote stoppage.

c. The grouting of any hole shall not be considered complete until that hole takes grout at the rate of one cubic foot of grout or less in ten minutes measured over at least a five minute period at the pressure required for that portion of the hole being grouted.

d. Should grout leaks develop on the ground surface from the formation, the Contractor shall caulk such leaks when and as directed, the cost thereof being included in the contract price for unit price pay item "Placing Grout", in accordance with Section 01025 MEASUREMENT AND PAYMENT. If grout leaks develop underwater from the formation, the mix will be thickened in an attempt to stop the leak and/or grouting will be terminated, as directed by the Contracting Officer.

e. If, due to size and continuity of fracture, it is found impossible to reach the required pressure after pumping a reasonable volume of grout at the minimum workable water/cement ratio or mortar grout with the maximum volume of sand at the minimum workable water/cement ratio, the speed of the pumping shall be reduced or pumping shall be stopped temporarily and intermittent grouting shall be performed, allowing sufficient time between grout injections for the grout to stiffen. Following such reduction in pumping speed, if the desired result is not obtained, grouting in the hole shall be discontinued when directed. In such event, the hole shall be cleaned, the grout allowed to set, and additional drilling and grouting shall then be done in this hole or in the adjacent areas as directed, until the desired resistance is built up.

f. After the grouting of any stage or stop of a hole is finished, the pressure shall be maintained by means of a stop-cock or other suitable device until the grout has set to the extent that it will be retained in the hole.

g. Grout that cannot be placed, for any reason, within two hours after mixing shall be wasted. If such grout is mixed at the direction of the

Contracting Officer or with his knowledge and consent, such wasted grout, except as specified in Section 01025 MEASUREMENT AND PAYMENT, shall be paid for at the contract unit prices for the materials contained therein.

3.3.8.3 Backfilling of Holes

Where directed by the Contracting Officer, holes shall be backfilled with grout proportioned as directed by the Contracting Officer and generally having a water/cement ratio less than 1.0. The backfilling shall be accomplished by injection of grout through a tremie pipe or hose inserted to full depth of hole. When grout vents at the surface, the tremie shall be gradually withdrawn, maintaining grout in pipe or hose until completely removed. Holes containing freshly injected grout shall not be backfilled until the injected grout has set. No separate payment will be made for backfilling holes; however, grout will be paid for at the contract unit price for the Portland cement therein.

3.3.8.4 Equipment Arrangement and Operation

The arrangement of the grouting equipment shall be such as to provide a continuous circulation of grout throughout the system and to permit accurate pressure control by operation of a valve on the grout return line, regardless of how small the grout take may be. The equipment and lines shall be prevented from becoming fouled by the constant circulation of grout and by the periodic flushing out of the system with water. Flushing shall be done with the grout intake valve closed, the water supply valve open, and the pump running at full speed.

3.3.8.5 Protection to Work and Cleanup

During grouting operations the Contractor shall take such precautions as may be necessary to prevent drill cuttings, equipment exhaust oil, wash water, and grout, from defacing or damaging the permanent structure. Daily maintenance may be required along grout lines, in order to offer better inspection of interconnected holes and breakouts. The Contractor will be required to furnish such pumps as may be necessary to care for waste water and grout from his operations. The Contractor shall, upon completion of his operations, clean up all waste resulting from his operations that is unsightly or would interfere with the efficient operation of the project as anticipated by the original design.

3.3.9 Records

The Contractor will keep records of all grouting operations, such as a log of the grout holes, results of washing and pressure testing operations, time of each change of grouting operation, pressure, rate of pumping, amount of cement for each change in water/cement ratio, and other data as deemed by him to be necessary. The Contractor shall furnish these records to the Contracting Officer within 24 hours of grouting operations.

3.3.10 Communications

When, for his own convenience, the Contractor has the individual elements of his plant so located that communication by normal voice between these elements is not satisfactory, the Contracting Officer may require him to install a satisfactory mechanical means of communications, such as a telephone or other suitable device.

-- End of Section --

SECTION 02300

EARTHWORK

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 422	(1963; R 1998) Particle-Size Analysis of Soils
ASTM D 1140	(1997) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 4318	(1998) Liquid Limit, Plastic Limit, and Plasticity Index of Soils

1.2 DEFINITIONS

1.2.1 Satisfactory Materials

Satisfactory materials shall comprise any materials classified by ASTM D 2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP.

1.2.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include rock excavated from the Fish Bypass Facility footprint and new approach channel excavation, man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. The Contracting Officer shall be notified of any contaminated materials.

1.2.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Testing required for classifying materials shall be in accordance with ASTM D 4318, ASTM C 136,

ASTM D 422, and ASTM D 1140.

1.2.4 Rockfall Control Measures

This term applies to the method and materials used to restrain or remove small blocks of rock, generally greater than approximately 6-inches and less that approximately 3 feet in their largest dimension, from falling from excavated rock slopes

1.2.5 Rock Reinforcement

Any combination of ground support systems, including rock bolts, rock anchors, shotcrete, welded wire fabric, and weep holes specified to support the excavation slopes.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Excavation Plan

The Excavation Plan shall contain written descriptions of the following: 1) Methods and equipment used for providing survey control to establish excavation limits, lines, and grades to the tolerances specified, 2) Methods and equipment used for excavation, loading, and transportation of any and all material encountered in the excavations, 3) Methods and equipment used to scale rock slopes, install rock bolts and rock and soil anchors, shotcrete, welded wire fabric, and weep holes, 4) Methods and equipment for draining the excavation of both surface water runoff and groundwater, and 5) The sequence of operations, including stripping of common excavation, drilling and blasting, excavation, loading and hauling excavated material, scaling and installing rock reinforcement on slopes, and measures taken to drain the excavation and project exposed rock surfaces. The descriptions shall be accompanied by schematic and scale drawings showing the order in which each operation shall be accomplished.

SD-03 Product Data

Earthwork; G.

Procedure and location for disposal of unsatisfactory and unused satisfactory material. Proposed source of borrow material.

Rockfall Control Measures; G

The Contractor shall submit for approval proposed Rockfall Control Measures, including descriptions and manufacturer's product literature of all required materials, equipment and methods intended to be used.

SD-06 Test Reports

Testing; G.

Within 24 hours of conclusion of physical tests, 3 copies of test results, including calibration curves and results of calibration tests.

SD-07 Certificates

Testing; G.

Qualifications of the commercial testing laboratory or Contractor's testing facilities.

1.4 SITE CONDITIONS

A foundation investigation has been made at the site by the Government and data is presented on the foundation exploration drawings. Logs of core borings are shown on the drawings. While the foundation information is representative of subsurface conditions at the respective locations of borings, local variations in the characteristics of the subsurface materials may be anticipated. Local variations which may be encountered include, but are not limited to, classification and thickness of rock strata, fractures, and other discontinuities in the rock structure. Such variations will not be considered as differing materially within the purview of the CONTRACT CLAUSES, paragraph DIFFERING SITE CONDITIONS. Core from the borings indicated on the drawings are available for inspection as specified in the SPECIAL CONTRACT REQUIREMENTS, paragraph PHYSICAL DATA. The Contracting Officer is responsible for location of all utilities that may be affected by construction. The Contractor is responsible for verifying the location of all utilities that may be affected by construction or the installation of the rock bolts.

1.5 CLASSIFICATION OF EXCAVATION

Excavation specified shall be done on a classified basis, in accordance with the following designations and classifications.

1.5.1 Rock Excavation

Rock excavation shall include blasting, excavating by mechanical methods, grading, and disposing of material classified as rock and shall include the satisfactory removal and disposal of boulders 1/2 cubic yard or more in volume; solid rock; rock material, which cannot be removed without systematic drilling and blasting, or mechanical excavation using a D-9 Dozer or equivalent with a single point ripper. The removal of any concrete or masonry structures, exceeding 1/2 cubic yard in volume that may be encountered in the work shall be included in demolition. If at any time during excavation, the Contractor encounters material that may be classified as rock excavation, such material shall be uncovered and the Contracting Officer notified by the Contractor. The Contractor shall not proceed with the excavation of this material until the Contracting Officer has classified the materials as common excavation or rock excavation and the Contractor has taken cross sections as required. The frequency of the cross sections will be specified by the Contracting Officer based on the irregularity of the rock surface. Failure on the part of the Contractor to uncover such material, notify the Contracting Officer, and allow ample time for classification and cross sectioning of the undisturbed surface of such material will cause the forfeiture of the Contractor's right of claim to any classification or volume of material to be paid for other than that allowed by the Contracting Officer for the areas of work in which such deposits occur.

1.5.2 Common Excavation

Common excavation shall include the satisfactory removal and disposal of all materials not classified as rock excavation or included under Demolition.

1.6 BLASTING

Blasting shall be performed as specified in Section 02212.

1.7 UTILIZATION OF EXCAVATED MATERIALS

All unsatisfactory and unused satisfactory materials removed from excavations shall be disposed of in designated waste disposal or spoil areas. No excavated material shall be disposed of to obstruct the flow of any stream, endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

Where indicated or directed, topsoil shall be stripped to a depth of 24 inches. Topsoil shall be spread on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Topsoil shall be kept separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations. Any surplus of topsoil from excavations and grading shall be removed from the site.

3.2 GENERAL EXCAVATION

The Contractor shall perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Grading shall be in conformity with the typical sections shown and the tolerances specified in paragraph FINISHING. Such excavated material and the satisfactory material ordered as replacement shall be included in excavation. Surplus satisfactory excavated material not required for fill or embankment shall be disposed of in areas approved for surplus material storage or designated waste areas. Unsatisfactory excavated material shall be disposed of in designated waste or spoil areas. During construction, excavation and fill shall be performed in a manner and sequence that will provide proper drainage at all times. Material required for fill or embankment in excess of that produced by excavation within the grading limits shall be excavated from the borrow areas indicated or from other approved areas selected by the Contractor as specified.

3.2.1 Rock Excavation

3.2.1.1 General

Systematic drilling and blasting of rock encountered in the 1b and 1c excavations areas shall be accomplished in lifts not exceeding 20 vertical

feet, except as modified herein.

As the excavation progresses, the Contractor shall remove loose and overhanging material and install rock reinforcement on all slopes. Rockfall control measures for all slopes shall be selected by the Contractor and approved by the Contracting Officer prior to installation.

In addition to the requirement set forth in this Section all drilling and blasting and mechanical excavation in the 1b and 1C excavation areas shall be performed as specified in Section 02212, CONTROLLED BLASTING.

The Contractor shall not commence drilling of either test or production blast holes until adequate survey control has been established.

3.2.1.2 Excavation Bench Height Restrictions

The depth of the excavation benches shall not exceed 8 feet or not extend more than 2 feet below the next row of proposed rock bolts, whichever is less, in the vicinity of the existing seismic retrofit slab. This criterion applies to the north excavation slope between Station 3+75 and 4+00 and between El. 1140 and 1094.

The depth of the excavation benches shall not exceed 8 feet or not extend more than 2 feet below the next row of proposed or existing bolts (bolts installed during a previous contract in the sidewall of the existing Outlet Works Tunnel) below the elevation of the crown of the existing Outlet Works Tunnel.

3.2.1.3 Rock Excavation Adjacent to Permanent Retaining Wall

Excavation by drilling and blasting shall not be performed within 3 feet of the permanent soldier pile wall. Excavation within 3 feet of the soldier pile wall shall be accomplished using mechanical methods.

3.2.1.4 Excavation Tolerances in Rock

The excavation tolerance in rock is -0 feet and +0.5 feet for up to 20-foot excavation lifts. No underexcavtion shall be allowed.

3.2.1.5 Excavation Access

After each blast and after the excavated rock has been removed, and prior to placement of shotcrete, the Contractor shall provide the Contracting Officer access to the bench to assess the slope conditions. Access shall be provided in 2 hour and 4 hour continuous blocks of the 1b and 1c excavation areas, respectively.

3.2.2 Rockfall Control Measures and Rock Reinforcement

3.2.2.1 3.2.2.1 Rock Scaling

All rock surfaces shall be scaled immediately after excavation to remove all rock that is loose, hanging or which creates a potentially dangerous situation. Payment for scaling shall be incidental to the contract unit price for excavation.

3.2.2.2 Cement-Grouted Untensioned Rock Bolts and Rock Anchors

Cement-Grouted Untensioned Rock Bolts and Rock Anchors shall be installed

as required and indicated in accordance with Sections 02491, CEMENT-GROUTED UNTENSIONED ROCK BOLTS and 02490, SOIL AND ROCK ANCHORS, respectively.

Cement-grouted untensioned rock bolts and rock anchors shall be advanced commensurate with excavation. The unreinforced height of excavated slopes shall not exceed 20 feet or the specified excavation bench height, whichever is less.

3.2.2.3 Shotcrete

Shotcrete applied to final surfaces in the 1b and 1c excavation areas as indicated on the Plans shall be in accordance with Section 03371, SHOTCRETE.

The Contractor shall apply shotcrete to rock surfaces within 24 hours after the rock surface is exposed following excavation.

3.2.2.4 Rockfall Control Measures

The Contractor shall provide a method to prevent rockfall from all slopes in the 1b or 1c excavation areas. Payment for rockfall control measures shall be incidental to the contract price for excavation.

3.2.3 Ditches

Excavation of ditches shall be accomplished by cutting accurately to the cross sections, grades, and elevations shown. Ditches shall not be excavated below grades shown. Excessive open ditch or gutter excavation shall be backfilled with satisfactory, thoroughly compacted, material or with suitable stone or cobble to grades shown. Material excavated shall be disposed of as shown or as directed, except that in no case shall material be deposited less than 4 feet from the edge of a ditch. The Contractor shall maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris through the duration of the contract.

3.3 SELECTION OF BORROW MATERIAL

Borrow material shall be selected to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Borrow material shall be obtained from the borrow areas selected by the Contractor. Unless otherwise provided in the contract, the Contractor shall obtain from the owners the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling. Borrow material from approved sources on Government-controlled land may be obtained without payment of royalties. Unless specifically provided, no borrow shall be obtained within the limits of the project site without prior written approval. Necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon shall be considered related operations to the borrow excavation.

3.4 OPENING AND DRAINAGE OF EXCAVATION

The Contractor shall notify the Contracting Officer sufficiently in advance of the opening of any excavation to permit elevations and measurements of the undisturbed ground surface to be taken. Except as otherwise permitted, excavation areas shall be excavated providing adequate drainage. Overburden and other spoil material shall be transported to designated spoil areas or otherwise disposed of as directed. The Contractor shall ensure that excavation of any area or dumping of spoil material results in

no detrimental effects on natural environmental conditions.

3.5 GRADING AREAS

Where indicated, work will be divided into grading areas within which satisfactory excavated material shall be placed in embankments. The Contractor shall not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing.

3.6 FINISHING

The surface of excavations, other than excavations in rock, shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for graded areas shall be within 0.1 foot of the grades and elevations indicated. Gutters and ditches shall be finished in a manner that will result in effective drainage. If the Contractor over excavates, the area will be backfilled with approved satisfactory material and track-walked using five passes of a dozer having a ground pressure of 5 psi.

3.7 SUBGRADE AND EMBANKMENT PROTECTION

During construction, excavations shall be kept shaped and drained. Ditches and drains shall be maintained to drain effectively at all times. The finished subgrade shall not be disturbed by traffic or other operation and shall be protected and maintained by the Contractor in a satisfactory condition.

-- End of Section --

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SECTION 02330

EMBANKMENT FOR EARTH DAMS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1140	(1997) Amount of Material in Soils Finer than the No. 200 (75-micrometer) Sieve
ASTM D 1556	(1990; R 1996) Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D 2487	(1998) Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D 6092	(1997) Practice for Specifying Standard Sizes of Stone for Erosion Control

1.2 DEFINITIONS

The term "embankment" as used in these specifications is defined as the earth and rock fill portions of the temporary cofferdam structure and includes all types of earth fill and filter materials for the dam and all other specified or directed earth and rock fills within the limits of the dam. "Compacted fill" includes all fill, deposited in layers and compacted by rolling or tamping. The types of compacted earth fill are:

a. "Pervious fill" forming the upstream and downstream sections of the embankment.

The term "Earth Berm Cut-off Wall" as used in these specifications is defined as a cut-off wall constructed in the vicinity of the south abutment to reduce the natural permeability of the soil and rock material. The cut-off wall will be constructed adjacent to and integral with concrete counterfort walls, earth embankment and existing soil deposits to retain flood pools between elevations 1,151 and 1,169.

1.3 SUBMITTALS

SD-01 Preconstruction Submittals

Earth Berm Cut-off Wall Design and Plan; G

The Earth Berm Cut-off Wall Design and Plan shall contain written description of the following: 1) Calculations supporting the Contractor's

design for the proposed cut-off wall (including estimates of seepage through the wall), 2) Plans, profiles, and sections showing the proposed cut-off wall construction, 3) Methods, materials, and equipment used to construct the cut-off wall, 4) Sequence of construction, including construction of the concrete counterfort walls, placement and compaction of the soil embankment, and excavation of 2H: 1V (horizontal to vertical) in soil 5) Methods and equipment to control seepage through the cut-off wall.

1.4 GENERAL PROVISIONS

1.4.1 Lines and Grades

The embankment shall be constructed to the lines, grades and cross sections indicated unless otherwise directed. The Government reserves the right to increase or decrease the foundation widths or the embankment slopes or make such other changes in the embankment sections as may be deemed necessary to produce a safe structure. Increases in height of section, made to compensate for shrinkage or consolidation of the embankment material subsequent to the completion of the embankment, will not exceed five (5) percent of the height above the foundation indicated. The end slopes and side slopes of partial fill sections shall not be steeper than those shown.

1.4.2 Conduct on the Work

The Contractor shall maintain and protect the embankment in a satisfactory condition at all times until final completion and acceptance of all work under the contract. If in the opinion of the Contracting Officer the hauling equipment causes horizontal shears or slick sides, rutting, quaking, heaving, cracking or excessive deformation of the embankment, the Contractor shall limit the type, load or travel speed of the hauling equipment on the embankment. Any approved embankment material which is lost in transit or rendered unsuitable after being placed in the embankment and before final acceptance of the work, shall be replaced by the Contractor in a satisfactory manner and no additional payment will be made therefor. The Contractor shall excavate and remove from the embankment any material which the Contracting Officer considers objectionable and shall also dispose of such material and refill the excavated area as directed, all at no cost to the Government. The Contractor may be required to remove, at his own expense, any embankment material placed outside of prescribed slope lines.

1.4.3 Haul Roads

Haul roads shall be located and constructed as approved. They shall be designed to maintain the intended traffic, to be free draining and shall be maintained in good condition throughout the contract period, unless otherwise directed. Haul roads within the area of contact between the embankment and its foundation and abutments shall be removed and the area shall be treated as specified in paragraph PREPARATION OF FOUNDATION, PARTIAL FILL SURFACE, AND ABUTMENTS.

1.4.4 Stockpiling from Approved Borrow Sources

When the excavation from approved borrow sources progresses at a faster rate than placement in the fill is being accomplished, such excavated material shall be stockpiled at approved locations adjacent to the work until its use is authorized. No payment will be made for such stockpiling nor for the reloading and hauling of this material to its final position in the embankment.

PART 2 PRODUCTS

2.1 MATERIALS

Classification of soils will be in accordance with ASTM D 2487.

2.1.1 General

The origin of any fill material in no way determines where it may be used in the embankment. Materials for embankment fills shall be secured from sources selected by the Contractor and approved by the Contracting Officer.

2.1.2 Pervious Fill

Material for compacted pervious fill shall be clean, free draining sand or sand and gravel obtained from sources selected by the Contractor and approved by the Contracting Officer. Particles of material shall be free from any objectionable coating and not more than 10 percent of the material, by weight, shall pass a Standard No. 200 sieve.

2.1.3 Rock Fill

2.1.3.1 Rock

Stone classed as "rock" shall be sound; well graded and free draining. Rock shall be obtained from sources selected by the Contractor and approved by the Contracting Officer and shall meet the requirements for ASTM D 6092, R-60 riprap.

PART 3 EXECUTION

3.1 PREPARATION OF FOUNDATION, PARTIAL FILL SURFACES AND ABUTMENTS

3.1.1 Earth

After excavation or stripping of the embankment foundation to the extent indicated or otherwise required, the sides of stump holes, test pits, and other similar cavities or depressions shall be broken down, where so directed, so as to flatten out the slopes, and the sides of the cut or hole shall be scarified to provide bond between the foundation material and the fill. Unless otherwise directed, each depression shall be filled with pervious, material. The fill shall be placed in layers, moistened, and compacted in accordance with the applicable provisions of paragraphs PLACEMENT, MOISTURE CONTROL, and COMPACTION. Materials which cannot be compacted by roller equipment because of inadequate clearances shall be spread in 12-inch layers and compacted with power tampers to an extent equal to that of the contiguous embankment fill material. After filling of depressions and immediately prior to placement of compacted fill in any section of the embankment, the foundation of such section shall be loosened thoroughly by scarifying, plowing, discing or harrowing to a minimum depth of 6 inches, and the moisture content shall be adjusted to the amount specified in paragraph MOISTURE CONTROL for the appropriate type of material, except in areas where this requirement is waived by the Contracting Officer. After removal of roots or other debris turned up in the process of loosening, the entire surface of the embankment foundation area shall be compacted by complete coverages of the compaction equipment as specified for the appropriate type of fill. Prior to placement of

compacted fill on or against the surfaces of any partial fill section, all soft or loose material, all material containing cracks or gullies, shall be removed. The remaining surface of the partial fill shall be loosened by scarifying, plowing, discing or harrowing to a minimum depth of 6 inches, and the moisture content shall be adjusted as specified in paragraph MOISTURE CONTROL for the appropriate type of material. The surface of the partial fill section upon which fill is to be placed shall then be compacted as hereinafter specified for the appropriate type of fill. No separate payment will be made for loosening and rolling the foundation area, the abutment area, or the surfaces of partial fill sections, but the entire cost thereof shall be included in the applicable contract price for fill.

3.1.2 Rock

All rock surfaces upon which or against which embankment materials are to be placed shall be cleaned in accordance with the applicable provisions of Section 02217 FOUNDATION PREPARATION. Prior to the placement of embankment material upon or against a rock surface, all open joints and cracks in that surface shall be filled with pervious fill to the depths cleaned.

3.1.3 South Abutment Cut-off Wall

The required earth berm cut-off wall at the South Abutment shall be designed by the Contractor and submitted to the Contracting Officer for approval. The continuous cut-off wall shall consist of a slurry trench, a continuous grout curtain, or equivalent. The cut-off wall shall extend a minimum of 5 feet into rock and extend up to elevation 1170 feet (the top of the pervious fill embankment) along the entire length of the proposed cut-off wall. As shown on the drawings, this will require that the cut-off wall extend to the southwest through native materials to a location where the top of bedrock is located above elevation 1170 feet. The cut-off wall is required to reduce seepage flow through the native soils located south of the berm location. The minimum width of the continuous cut-off wall shall depend upon the type of cut-off wall selected by the Contractor. If a contiuous grout curtain is utilized, it shall have a minimum width of 5 feet to assure adequate cut-off and satisfactory performance. The approximate alignment of the proposed cut-off wall is shown on the drawings. The cut-off wall shall reduce the natural permeability of the native soil and rock material as well as the constructed berm so that the Contractor can control inflows into the excavation.

3.2 PLACEMENT

3.2.1 General

No fill shall be placed on any part of the embankment foundation until such areas have been inspected and approved. The gradation and distribution of materials throughout the compacted earth fill section of the dam shall be such that the embankment will be free from lenses, pockets, streaks, and layers of material differing substantially in texture or gradation from surrounding material of the same class. Successive loads of material shall be dumped at locations on the fill as directed or approved. No fill shall be placed upon a frozen surface, nor shall snow, ice, or frozen earth be incorporated in the embankment.

3.2.2 Frozen Material

Embankment shall not be placed on a foundation which contains frozen

material. This prohibition encompasses all foundation types, including the natural ground, all prepared subgrades, whether in an excavation or on an embankment, and all layers of previously placed and compacted earth fill which become the foundations for successive layers of earthfill. All material that freezes or has been subjected to freeze-thaw action during the construction work, or during periods of temporary shutdowns, such as, but not limited to, nights, holidays, weekends, or winter shutdowns or earthwork operations, shall be removed to a depth that is acceptable to the Contracting Officer and replaced with new material. Alternatively, the material shall be thawed, dried, reworked, and recompacted to the specified criteria before additional material is placed. The Contracting Officer will determine when placement of fill shall cease due to cold weather. The Contracting officer may elect to use average daily air temperatures, and/or physical observation of the soils for his determination. Levee embankment material shall not contain frozen clumps of soil, snow, or ice.

3.2.3 Rock

3.2.3.1 Rock Fill

The upstream sections of the embankment shall be constructed of quarry run sizes of durable rock placed to the lines and grades shown, and in such manner as to produce a reasonably well graded mass. All bridging in rock fills shall be broken as well as all slabs and slabby rock. Special care shall be exercised in placing rock fill in all areas within 3 feet of structures to avoid damage to such structures.

3.3 MOISTURE CONTROL

The materials in each layer of the fill shall contain the amount of moisture, within the limits, specified below or as directed, necessary to obtain the specified compaction. Material that is not within the specified limits after compaction shall be reworked, regardless of density.

3.3.1 Pervious Section

Pervious material shall be wetted by sprinkling after spreading on the embankment and the moisture content of each layer shall be maintained at the optimum for compaction during rolling. Prewetting of pervious material at the sources of excavation or borrow will not be required. Sprinkling shall be done with hoses connected to header pipes along the faces of the embankment, by water trucks with pressure spray bars, or by any other approved method. All connections in the water supply system, including the hose connections to the header pipes, shall be watertight. Jets shall not be directed at the embankment with such force that the finer materials will be washed out. The capacities of pumps and sizes of header pipes shall be sufficient to supply the required amount of water at all times.

3.3.2 Rock Fill

No moisture control will be necessary on rock fills.

3.4 COMPACTION

3.4.1 Equipment

Compaction equipment shall conform to the following requirements and shall be used as prescribed in subsequent paragraphs.

3.4.1.1 Tamping Rollers

Towed - tamping rollers shall consist of two or more non-vibratory roller drums mounted side-by-side in a suitable frame and towed by either a crawler-type or rubber tired tractor having sufficient power to pull the roller satisfactorily when the drums are fully ballasted. Each drum shall be free to pivot about an axis parallel to the direction of travel. Rollers operated in tandem sets shall be controlled in a manner such that the prints produced by the tamping feet of the tandem units are staggered. Each drum of a roller shall have an outside diameter of not less than 5 feet and shall be not less than 5 feet in length. The space between two adjacent drums, when on a level surface, shall not be less than 12 inches nor more than 15 inches.

3.4.1.2 Vibratory Rollers

Vibratory rollers for compacting rock fills and pervious sand and gravel fills, shall be equipped with a smooth steel compaction drum and shall be operated at a frequency of vibration during compaction operations between 1100 and 1500 vpm. Vibratory rollers may be either towed or self-propelled and shall have an unsprung drum weight that is a minimum of 60 percent of the rollers' static weight. Towed rollers shall have at least 90 percent of their weight transmitted to the ground through the compaction drum when the roller is standing in a level position hitched to the towing vehicle. Rollers for compacting rock fill, sand and gravel fills shall have a minimum static weight of 20,000 pounds, a minimum dynamic force of 40,000 pounds when operating at 1400 vpm, and an applied force not less than 9,000 pounds per foot of compaction drum length. The level of amplitude and vibration frequency during compaction will be maintained uniform throughout the embankment zone within which it is operating. Rollers shall be operated at speeds not to exceed 1.5 mph. The equipment manufacturer shall furnish sufficient data, drawings, and computation for verification of the above specifications, and the character and efficiency of this equipment shall be subject to approval.

3.4.1.3 Rubber-tired Rollers

Rubber-tired rollers shall have a minimum of four wheels equipped with pneumatic tires. The tires shall be of such size and ply as can be maintained at tire pressures between 80 and 100 psi for a 25,000 pound wheel load during rolling operations. The roller wheels shall be located abreast and be so designed that each wheel will carry approximately equal load in traversing uneven ground. The spacing of the wheels will be such that the distance between the nearest edges of adjacent tires will be greater than 50 percent of the tire width of a single tire at the operating pressure for a 25,000 pound wheel load. The roller shall be provided with a body suitable for ballast loading such that the load per wheel may be varied, from 18,000 to 25,000 pounds. The roller shall be towed at speeds not to exceed 5 mph. The character and efficiency of this equipment shall be subject to approval.

3.4.1.4 Power Tampers

Compaction of material, in areas where it is impracticable to use a roller or tractor, as provided in paragraph EARTH, shall be performed by the use of approved power tampers.

3.4.2 Testing

Testing shall be performed by an approved commercial testing laboratory or by the Contractor subject to approval. If the Contractor elects to establish testing facilities, no work requiring testing will be permitted until the Contractor's facilities have been inspected and approved by the Contracting Officer. Field in-place density shall be determined in accordance with ASTM D 1556. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, the material shall be removed, replaced and recompacted to meet specification requirements. Tests on recompacted areas shall be performed to determine conformance with specification requirements. Inspections and test results shall be certified by a registered professional civil engineer. These certifications shall state that the tests and observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.4.2.1 Materials Gradation

One test per 50 cubic yards stockpiled or in-place source material. Gradation of fill and backfill material shall be determined in accordance with ASTM D 1140.

3.4.2.2 In-Place Densities

a. One test per 500 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by other than hand-operated machines.

b. One test per 500 square feet, or fraction thereof, of each lift of fill or backfill areas compacted by hand-operated machines.

3.4.2.3 Optimum Moisture and Laboratory Maximum Density

Tests shall be made for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 50 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.4.3 Pervious Fill

After each layer of pervious material has been dumped and spread, and the moisture content is in accordance with the provisions of paragraph PERVIOUS SECTION, the entire surface of the layer shall be compacted to an average of 92 percent of Modified Proctor density.

3.4.4 Additional Rolling for Compaction

If, in the opinion of the Contracting Officer, the desired compaction of any portion of the embankment is not secured by the minimum number of coverages specified, additional complete coverages shall be made over the surface area of such designated portion until the desired compaction has been obtained.

3.4.5 Rock Fill

After the rock fill has been placed to the thickness specified, the entire surface of the layer shall be handled and placed using an excavator such that its in-place gradation meets ASTM D 6092, R-60 requirements. Rock

fill shall be compacted by pounding it with an excavator bucket.

-- End of Section --

SECTION 02464

METAL SHEET PILING

PART 1 GENERAL

The Contractor shall utilize metal sheet piling for Contractor-designed tremie concrete formwork. Metal sheet piling shall conform to this specification.

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Metal Sheet Piling; G

Detail drawings for sheet piling including fabricated sections shall show complete piling dimensions and details, driving sequence and location of installed piling. Detail drawings shall include details and dimensions of templates and other temporary guide structures for installing piling. Detail drawings shall provide details of the method of handling piling to prevent permanent deflection, distortion or damage to piling interlocks.

1.2 DELIVERY, STORAGE AND HANDLING

Materials delivered to the site shall be undamaged. The manufacturer's logo and mill identification mark shall be provided on the sheet piling as required by the referenced specifications. Sheet piling shall be stored and handled in the manner recommended by the manufacturer to prevent permanent deflection, distortion or damage to the interlocks. Storage of sheet piling should also facilitate required inspection activities.

PART 2 PRODUCTS

2.1 METAL SHEET PILING

Metal sheet piling shall be hot-rolled or cold-formed steel sections with mechanical properties sufficient to withstand the anticipated form loads.

2.2 APPURTENANT METAL MATERIALS

Metal plates, shapes, bolts, nuts, rivets and other appurtenant fabrication and installation materials shall conform to manufacturer's standards and to the requirements specified in the respective sheet piling standards.

2.3 TESTS, INSPECTIONS, AND VERIFICATIONS

Requirements for material tests, workmanship and other measures for quality assurance shall be as specified and in Section 05055 METALWORK FABRICATION,

MACHINE WORK, AND MISCELLANEOUS PROVISIONS.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Placing

Any excavation required within the area where sheet pilings are to be installed shall be completed prior to placing sheet pilings. Pilings shall be carefully located as shown. Pilings shall be placed plumb with out-of-plumbness not exceeding 1/4 inch per foot of length and true to line. Temporary wales, templates, or guide structures shall be provided to insure that the pilings are placed to the correct alignment. Pilings properly placed and driven shall be interlocked throughout their length with adjacent pilings to form a continuous diaphragm throughout the length or run of piling wall.

3.1.2 Cutting-Off and Splicing

Pilings extending above the required top elevation in excess of the specified tolerance shall be cut off to the required elevation. Pilings adjoining spliced pilings shall be full length unless otherwise approved.

3.1.3 Inspection of Installed Piling

The Contractor shall inspect the interlocked joints of pilings. Pilings found to be out of interlock shall be removed and replaced at the Contractor's expense. The Contractor shall use divers to inspect underwater interlocked joints of sheet piling. The inspection of sheet pile formwork shall be performed, prior to placing tremie concrete.

-- End of Section --

SECTION 02490

SOIL AND ROCK ANCHORS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 301	(1999) Structural Concrete

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO

AASHTO M 252	(1996) Corrugated Polyethylene Drainage Tubing

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53/A 53M	(1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 500	(1999) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 536	(1984; R 1999e1) Ductile Iron Castings
ASTM A 572/A 572M	(1999) High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A 722/A 722M	(1998) Uncoated High-Strength Steel Bar for Prestressing Concrete
ASTM C 33	(1999ae1) Concrete Aggregates
ASTM C 109/C 109M	(1999) Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50 mm) Cube Specimens)
ASTM C 144	(1999) Aggregate for Masonry Mortar
ASTM C 150	(1999a) Portland Cement
ASTM C 1107	(1999) Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM D 1248	(2000) Polyethylene Plastics Molding and Extrusion Materials

ASTM D 1784	(1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 1785	(1999) Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 4101	(2000) Propylene Plastic Injection and Extrusion Materials

POST-TENSIONING INSTITUTE (PTI)

PTI Spec	(Dec 2000, Second Edition) Specification for Unbonded Single Strand Tendons
PTI Rec	(June 1996, Third Edition) Recommendations for Prestressed Rock and Soil Anchors
PTI Post Tensioning Manual	(Nov 1990, Fifth Edition) Post Tensioning Manual

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(1996) Safety and Health Requirements Manual

1.2 DEFINITIONS

The following definitions are in addition to those given in PTI Rec, Section 2.0:

Anchored Structure - The wall, foundation or other structure to which the anchor is to transfer force.

Demonstration Test Anchor - An anchor which is performance tested to verify design assumptions and installation practices.

1.3 SYSTEM DESCRIPTION

1.3.1 General

The work includes fabrication, installation, and testing of soil and rock anchors for the permanent soldier pile with tiebacks retaining wall, and the fabrication, installation, and testing of rock anchors to tie down the cofferdam structure and to support the cofferdam slope and wall at the left abutment, and the fabrication, installation, and testing of rock anchors at the north flood/retaining wall.

1.3.1.1 Soil and Rock Anchors for the Permanent Soldier Pile with Tiebacks Retaining Wall

The fabrication, installation, and testing of the soil and rock anchors for the permanent soldier pile with tiebacks retaining wall shall be as shown on the drawings and as specified in these specifications. General criteria for the soil and rock anchors for the permanent retaining wall are shown on the drawings. The materials, stressing, load testing, and acceptance shall be in accordance with PTI Rec and these specifications. Soil and rock

anchors for the permanent retaining wall shall be threaded bar type. The Contractor shall be responsible for determining drilling methods, fabrication and installation. Approval of the drilling methods, fabrication and installation by the Contracting Officer shall not relieve the Contractor of responsibility for performance of the soil and rock anchors. Payment for soil and rock anchors as specified in Section 01025 MEASUREMENT AND PAYMENT, shall include all costs in connection with fabricating, installing, and testing the anchors.

1.3.1.2 Rock Anchors for the Cofferdam and for the North Flood/Retaining Wall

Fabrication, installation, and testing of the rock anchors to tie down the cofferdam and to support the left abutment slope and wall, and for the north flood/retaining wall shall be as shown on the drawings and as specified in these specifications. The materials, stressing, load testing, and acceptance shall be in accordance with PTI Rec and these specifications. Rock anchors shall be threaded bar type. Payment for rock anchors as specified in Section 01025, MEASUREMENT AND PAYMENT, shall include all costs in connection with fabricating, installing, and testing the anchors.

1.3.2 Permanent Soldier Pile with Tiebacks Retaining Wall Anchor Design Requirements

The individual soil and rock anchors shall meet the following criteria and the criteria shown on the drawings:

The Lock-off Load shall be 30 percent of the ultimate strength of the prestressing steel. The maximum Test Load shall not exceed 40 percent of the ultimate strength of the prestressing steel.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Fabrication and Installation Drawings; G

Shall include: drawings and detailed installation procedures and sequences showing complete details of the installation procedure and equipment; anchor fabrication; grouting methods; grout mix designs; anchor and casing placement and installation; corrosion protection for bond length and for unbonded length, details of corrosion protection, including details of anchorage and installation; stressing length and anchorage; anchorage and trumpet; stressing and testing procedures with lengths, forces, deformations, and elongations for the approval by the Contracting Officer. Shop drawings for anchors shall include locations and details of the spacers, centralizers, and banding. If different types of anchors are to be installed, each anchor type shall be readily identifiable. Once reviewed by the Contracting Officer, no changes or deviation from shop drawings shall be permitted without further review by the Contracting Officer.

Equipment

The Contractor shall submit catalog cuts, brochures, or other descriptive literature describing the equipment to be used for drilling, grouting, handling, and installing the soil and rock anchors. The Contractor shall also submit sketches, drawings or details showing the access and temporary supports where required for the drilling equipment and stressing frames. Descriptions of stressing jacks, gages, dynamometers, load cells, or other devices for measuring stressing load, certified calibration records for each set of jacking equipment, and current testing curves for stress measurement gages which show that gages have been calibrated for the jacks for which they are used shall be submitted for review 30 days prior to the start of the testing operations.

Fabricator Qualifications; G
Installer Qualifications; G
Core Logging and Soil Sampling Qualifications; G

The qualifications and experience records shall be submitted for approval. Experience records shall identify all the individuals responsible for the anchors and shall include a listing of projects of similar scope performed within the specified period along with points of contact. The Contractor shall submit the qualifications prior to the installation of any anchors specified in this section.

Installation Plan; G

The Contractor shall submit to the Contracting Officer for review and comment a plan for installing the soil and rock anchors. The proposal shall describe the sequence for installation and other restrictions as outlined on the drawings or specified. The anchor and casing installation procedures shall be determined by the Contractor as part of the anchor design. The installation plan shall also include descriptions of methods and equipment to be used by the Contractor for alignment checking of anchor holes and casings.

SD-06 Test Reports

Prestressing Steel

Certified test reports for each heat or lot of prestressing steel shall be submitted with materials delivered to the site.

Cement Grout Mixture Proportions

Thirty days prior to installation of anchors, the Contractor shall submit the mixture proportions that will produce grout of the quality required. Applicable test reports shall be submitted to verify that the grout mixture proportions selected will produce grout of the quality specified.

SD-07 Certificates

Prestressing Steel

The Contractor shall furnish five copies of mill reports and five copies of a certificate from the manufacturer stating chemical properties, ultimate strengths, yield strengths, modulus of elasticity, and any other physical properties needed for the required computations, for the type of steel furnished.

SD-11 Closeout Submittals

Anchor Records

Upon completion of installation of each anchor, the Contractor shall furnish top of bond zone elevation, bond length, free stressing length of anchor, grout mix, grouting pressure, bags of cement injected, and a report of performance test or proof test and extended creep test results. The performance test, proof test and extended creep test results shall include measured lengths of drill holes and anchors, the loads and elongations recorded during testing, monitoring and stressing of the anchors, and graphs of test results. In addition as-built drawings showing the completed installation of the anchors shall be furnished upon completion of installation of all anchors.

1.5 QUALIFICATIONS

Anchor fabricator and installer qualifications shall be submitted for approval in accordance with paragraph SUBMITTALS. The submittals shall, where applicable, identify individuals who will be working on this contract and their relevant experience. No changes shall be made in approved personnel without prior approval of the Contracting Officer.

1.5.1 Fabricator Qualifications

The anchors shall be fabricated by a manufacturer that has been in the practice of designing and fabricating soil and rock anchors similar in size and scope to this project for at least ten years.

1.5.2 Installer Qualifications

The anchors shall be installed by a firm which is regularly engaged in the installation of soil and rock anchors and has at least ten years experience in the installation of similar anchors. The superintendent shall have installed anchors on at least five projects of similar scope and size.

1.6 PREPARATORY MEETING

Prior to commencing any work on the anchors, the Contractor, including all field personnel to be involved in drilling and installation of the anchors, shall meet with representatives of the Contracting Officer to review the plans and specifications, work plans, and submittals. Drilling may commence upon approval of the anchor installation plan and procedures described in paragraph SUBMITTALS and after the conduct of the Preparatory Meeting.

1.7 DELIVERY, STORAGE AND HANDLING

Materials shall be suitably wrapped, packaged or covered at the factory or shop to prevent being affected by dirt, water, oil, grease, and rust. Materials shall be protected against abrasion or damage during shipment and

handling. Materials stored at the site shall be placed above ground on a well supported platform and covered with plastic or other approved material. Materials shall be protected from adjacent construction operations. Grounding of welding leads to prestressing steel shall not be permitted. Prestressing steel which is damaged by abrasion, cuts, nicks, heavy corrosions, pitting, welds or weld spatter shall be rejected and removed from the site. Prestressing steel shall be inspected prior to insertion into anchor holes for damage to corrosion protection. Any such damage shall be repaired in a manner recommended by the prestressing steel manufacturer and approved by the Contracting Officer.

1.8 SITE CONDITIONS

A foundation investigation has been made at the site by the Government and data is presented on the foundation exploration drawings. Logs of core borings and subsurface soil data logs are shown on the drawings. While the foundation information is representative of subsurface conditions at the respective locations, local variations in the characteristics of the subsurface materials may be anticipated. Local variations which may be encountered include, but are not limited to, classification and thickness of rock strata, fractures, and other discontinuities in the rock structure, and variation in the soil classifications. Such variations will not be considered as differing materially within the purview of the CONTRACT CLAUSES, paragraph DIFFERING SITE CONDITIONS. Core from the borings indicated on the drawings are available for inspection as specified in the SPECIAL CONTRACT REQUIREMENTS, paragraph PHYSICAL DATA. The Contracting Officer is responsible for location of all utilities that may be affected by construction. The Contractor is responsible for verifying the location of all utilities that may be affected by construction or the installation of the rock bolts.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Prestressing Steel

2.1.1.1 High-Strength Steel Bars

ASTM A 722/A 722M, Type II (deformed), (150 ksi ultimate tensile strength) meeting all supplementary requirements.

Mechanical couplings shall support the minimum ultimate tensile strength of the coupled bars.

2.1.2 Structural Steel

ASTM A 572/A 572M, Grade 50 (Fy = 50ksi)

2.1.3 Steel Pipe

ASTM A 53/A 53M,Type E or S, Grade B.

2.1.4 Steel Tube

ASTM A 500; grade B

2.1.5 Ductile Iron Castings

ASTM A 536.

2.1.6 Polyethylene Tubing

2.1.6.1 Smooth Polyethylene Tubing

ASTM D 1248, Type III.

2.1.6.2 Corrugated Polyethylene Tubing

AASHTO M 252, with average minimum wall thickness of 0.06 inch.

2.1.7 Polypropylene Tubing

2.1.7.1 Smooth Polypropylene Tubing

ASTM D 4101, designation PP 210 B5542-11.

2.1.8 Polyvinyl Chloride (PVC) Pipe

ASTM D 1785, Schedule 40.

2.1.9 Polyvinyl Chloride (PVC) Tubing

2.1.9.1 Smooth Polyvinyl Chloride (PVC) Tubing

ASTM D 1784.

2.1.9.2 Corrugated Polyvinyl Chloride (PVC) Tubing

Manufactured from rigid PVC compounds conforming to ASTM D 1784, Class 13464-8 with average minimum wall thickness of 0.04 inch.

2.1.10 Heat Shrinkable Sleeve

Radiation cross linked polyolefin tube internally coated with an adhesive sealant.

2.1.11 Corrosion Inhibiting Compound

The corrosion inhibiting compound shall conform to the requirements of Section 3.2.5 of PTI Spec.

2.2 MANUFACTURED ITEMS

2.2.1 Anchor Head

Anchor head shall consist of steel bearing plate with nut for threaded bar anchors, and corrosion protection. Anchorage devices shall be capable of developing 95 percent of the guaranteed ultimate strength of prestressing steel. The anchorage devices shall conform to the static strength requirements of Section 3.1.6 (1) and (2) of the PTI Post Tensioning Manual.

2.2.2 Prestressing Steel Couplers

Prestressing steel couplers for bars shall be capable of developing 100 percent of the minimum specified ultimate tensile strength of the prestressing steel.

2.2.3 Centralizers and Spacers

Centralizers and spacers shall be fabricated from plastic, steel or other approved material which is nondetrimental to the steel. Wood shall not be used. The centralizer shall be able to support the anchor in the drill hole and position the tendon so a minimum of 0.5 inch of grout cover is provided. Centralizers and spacers shall permit grout to freely flow up the drill hole.

2.2.4 Casing

Casing shall be selected and sized by the Contractor where required. Casing shall be the necessary type and size to permit proper drilling of anchor holes and placing of anchors as specified herein and shown on the drawings. Straightening of casings and machining of joints may be necessary in order to meet specified alignment tolerances.

2.3 GROUT

2.3.1 Cement

ASTM C 150, Type I, II, or III.

2.3.2 Water

Water shall be fresh, clean, potable, and free from injurious amounts of sewage, oil, acid, alkali, salts, or organic matter.

2.3.3 Aggregates

Fine aggregate for sand-cement grout shall conform to ACI 301 and ASTM C 33 for grout for backfilling holes or ASTM C 144 for grout for pregrouting. Aggregates shall not contain substances which may be deleterioulsy reactive with alkalies in the cement.

2.3.4 Admixtures.

Admixtures which control bleed, improve flowability, reduce water content and retard set may be used in the grout subject to the approval of the Contracting Officer. Any admixtures used shall be compatible with the steel and shall be mixed in accordance with the manufacturer's recommendations.

2.3.5 Grout for Anchors

2.3.5.1 Cement Grout

Cement grout mixture proportions shall be the responsibility of the Contractor. Grout for grouting anchors shall consist of a homogenous, pumpable, stable mixture of portland cement and water. The Contractor shall submit his proposed mix design to the Contracting Officer for approval. The water content shall be the minimum necessary for proper placement but the water-cement ratio shall not exceed 0.45 by weight. Final proportions of materials shall be based on results of tests made on sample mixtures of grout. The minimum compressive strength of two-inch cubes, molded, cured, and tested in accordance with ASTM C 109/C 109M, shall be 3,500 psi at the time of stressing. The Contractor shall be responsible for taking, curing, and breaking of grout test cubes for determining mix design, and all testing shall be done by an independent

laboratory approved by the Contracting Officer. Soil and rock conditions and temperatures shall be replicated in the curing process.

2.3.6 Sand-Cement Grout

Grout for holes which are abandoned shall consist of a mixture of portland cement, masonry sand and water. The grout mix proportions shall be the responsibility of the Contractor. The Contractor shall submit his proposed mix design to the Contracting Officer for approval. The water content shall be the minimum necessary for proper placement. Final proportions of materials shall be based on results of tests made on sample mixtures of grout. The minimum compressive strength of two-inch cubes, molded, cured, and tested in accordance with ASTM C 109/C 109M, shall be 4,000 psi. The Contractor shall be responsible for taking, curing, and breaking of grout test cubes for determining mix design, and all testing shall be done by an independent laboratory approved by the Contracting Officer. Soil and rock conditions and temperatures shall be replicated in the curing process.

2.3.7 Grout for Anchor Pads

Grout for leveling bearing plates shall be nonshrink grout conforming to ASTM C 1107.

2.4 ANCHOR FABRICATION

2.4.1 General

Fabrication of the anchors shall be as recommended by the suppliers. Anchors shall be completely assembled with all centralizers, spacers, grout and vent tubes and corrosion protection prior to insertion into the hole. Fabricated anchors shall be protected, transported and stored in a manner to prevent contamination or damage to any components.

2.4.2 Bond Breaker

Bond breaker for free stressing length of unbonded anchors shall consist of smooth polyethylene tubing, minimum wall thickness 0.04 in., or smooth PVC tubing, minimum wall thickness 0.04 in.

2.4.3 Vent Tubes

Vent tubes used during grouting operations, if necessary, shall be any appropriate type for the job, as recommended by the supplier of the anchors.

2.4.4 Grout Tubes

Grout tubes shall be polyethylene tubing or as recommended by the anchor manufacturer and approved by the Contracting Officer. Inside diameter of grout tubes shall be adequate to fully grout the entire hole.

2.4.5 Corrosion Protection

Corrosion protection shall be as indicated. Corrosion protection shall be provided for the entire anchor (free stressing length and bond length).

2.4.5.1 Free Stressing Length Encapsulation

Encapsulation for free stressing length shall consist of a sheath of smooth polyethylene tubing, minimum wall thickness 0.06 inch; smooth polypropylene

tubing, minimum wall thickness 0.06 inch; smooth PVC tubing, minimum wall thickness 0.04 inch; steel pipe or tube with minimum wall thickness 0.20 inch or corrugated tubing conforming to paragraph BOND LENGTH ENCAPSULATION. Sheath for bars may be heat shrinkable sleeve with a minimum thickness of 0.024 inch. Free stressing length encapsulation shall extend at least 4 inches into the trumpet, but shall not contact the bearing plate during testing and stressing of the prestressing steel. Where corrugated tubing is used for sheath for unbonded anchors, a separate bond breaker shall be provided.

2.4.5.2 Bond Length Encapsulation

Bond length encapsulation shall consist of corrugated polyethylene tubing, minimum wall thickness 0.060 inch or corrugated PVC tubing, minimum wall thickness 0.040 inch.

2.5 TESTS, INSPECTIONS, AND VERIFICATIONS

The Contractor shall have required material tests performed on prestressing steel and accessories by an approved laboratory to demonstrate that the materials are in conformance with the specifications. Grout shall be tested in accordance with ASTM C 109/C 109M. These tests shall be at the Contractor's expense. Prestressing steel test results shall be furnished prior to beginning fabrication of any anchors. Grout test results shall be provided to the Contracting Officer within 24 hours of testing.

PART 3 EXECUTION

3.1 EQUIPMENT

The Contractor's Quality Control manager shall verify that the equipment used on site is the same as the equipment submitted for approval.

3.1.1 Drilling Equipment

Drilling equipment shall be suitable for advancing the drill tools to the depths and at the alignment specified.

3.1.2 Grouting Equipment

3.1.2.1 Grout Mixer

The grout mixer shall be a high-speed, high-shear, colloidal type grout mixer capable of continuous mechanical mixing that will produce uniform and thoroughly mixed grout which is free of lumps and undispersed cement. The mixer shall be equipped with a suitable water and admixture measuring devices calibrated to read in cubic feet and tenths and so designed that after each delivery the hands can be conveniently set back to zero.

3.1.2.2 Grout Pump

The grout pump shall be of the positive displacement type, and shall be capable of pumping at all flow rates below 20 gallons per minute, shall be capable of pumping at the pressure of at least 50 psi at zero flow rate. For neat cement grout, the pump shall have a screen with 0.125 inch maximum clearance to sieve the grout before being introduced into the pump. Screens are not required for shear type mixers. A pump shall also be available which is capable of pumping both neat cement grout mixes and sanded grout mixes. The pumping equipment shall have a pressure gage

capable of measuring pressures of at least 150 psi or twice the required grout pressure, whichever is greater.

3.1.2.3 Material Safety

Cement, lime, and bentonite clay are respiratory and skin irritants. See Section No. 6 of EM 385-1-1 shall be strictly adhered to and workers shall be equipped with respirators and skin protection during mixing of dry cement and bentonite products. The manufacturer's safety equipment and instructions shall be used.

3.1.3 Stressing Equipment

Stressing equipment shall be hydraulically operated and shall have a capacity sufficient to stress the anchors to the specified Test Loads within the rated capacity in one stroke. Pumps shall be capable of applying each load increment in less than 60 seconds and shall be capable of maintaining the hydraulic pressure within 50 psi. The equipment shall permit stressing of the prestressing steel in increments and raising or lowering the load in the prestressing steel. The equipment shall be calibrated with an accuracy of $\pm$2% and the calibration certificate and graphs shall be available at the site. The production gage shall have graduations of 100 psi or less. A second certified gage shall be maintained for periodic verification of the production gage. A dial gage or approved device shall be provided to measure total tendon elongation at each load increment to the nearest 0.001 inch. The dial gage shall be capable of measuring the entire anchor movement without being reset. Calibration of gages shall be verified no more than 30 calendar days prior to commencing work under this contract and at six-month intervals throughout the period of use.

3.1.4 Testing Equipment

Testing equipment shall consist of a hydraulic jack with calibrated pressure gage for applying the load and a dial gage or vernier scale to measure anchor movement. The ram travel of the stressing equipment shall be not less than the theoretical elastic elongation of the total anchor length at the maximum Test Load. The pressure gage shall be graduated in 100 psi increments. The stressing equipment and pressure gage must have been calibrated as a unit no more than 30 calendar days prior to commencing work under this contract and at six-month intervals throughout the period of use. The movement measuring device shall have a minimum travel equal to the theoretical elastic elongation of the total anchor length at the maximum Test Load without resetting the device. An approved dial gage or vernier scale and stand shall be provided to measure movement of the wall.

3.2 DRILLING HOLES

3.2.1 General

The physical conditions indicated on the drawings are the result of soil sampling and core boring. (See also paragraph "PROJECT SITE CONDITIONS"). Holes shall be drilled at the locations and inclinations shown and to the depths and diameters determined by the Contractor to provide the design bond length and capacity indicated on the drawings. The locations of the holes may be changed only as approved by the Contracting Officer. Any redesign due to relocation of anchor holes will be performed by the Government. Unless otherwise specified, the Contractor shall determine the drilling method to be used. No holes shall be drilled within 20 feet

(horizontal and vertical) of a grouted hole until the grout has set at least 24 hours. Pressure grouting and drilling shall not be simultaneously performed within a distance of 20 feet. Care shall be taken while drilling to avoid damage of any kind to the existing structures. Damages of any nature will be evaluated by the Contracting Officer and repairs or replacements shall be made at his discretion. Holes shall be drilled a maximum of 1 foot beyond the required anchor bond length. Waste water from drilling operations shall be collected and recycled or treated; it shall not be discharged directly into the river or lake or on the ground. See also Section 01061 ENVIRONMENTAL PROTECTION.

3.2.2 Drilling In Soil

Holes in soil may be drilled by rotary drilling, rotary percussive, vibratory driven casing, or using other methods suitable for the intended purpose. Holes in soil shall be provided with steel casing where required for support of the surrounding material.

3.2.3 Casing

Casing shall be utilized for drilling through unstable soil formations.

3.2.4 Drilling in Rock

Holes in rock may be drilled by rotary drilling, percussion drilling, down-the-hole hammer, or using other methods suitable for the intended purpose. Precast cofferdam segments shall not be damaged during drilling operations for the rock anchors for the precast cofferdam segments.

3.2.5 Records

The presence of a Government inspector or the keeping of separate drilling records by the Contracting Officer shall not relieve the Contractor of the responsibility for the work specified in this paragraph. Payment will not be made for any work for which the required records have not been furnished by the Contractor.

3.2.6 Alignment

3.2.6.1 Tolerances

The anchor hole shall be located within 12 inches of the plan location, unless noted otherwise. The anchor holes for anchoring the precast cofferdam segments shall be located within 1 inch of the plan location. The entry angle shall be within 3 degrees of the specified inclination, unless noted otherwise. The entry angle shall be within 1 degree of the specified inclination for the cofferdam precast segments. The alignment of the drilled hole shall be within 3 degrees of the theoretical alignment, unless otherwise noted. The alignment of the drilled hole for the cofferdam precast segments shall be within 1 degree of the theoretical alignment. If the hole alignment is not within these tolerances, the hole shall be backfilled with cement or sand-cement grout and a new hole drilled adjacent to the rejected hole.

3.3 INSTALLATION OF ANCHORS

3.3.1 General

The Contractor shall be responsible for each drilled hole until the anchor

has been installed, grouted, stressed and accepted. Holes in rock and casings shall be cleaned by pressurized air and/or water to remove drill cuttings and mud. Precast cofferdam segments shall not be damaged during the installation of the rock anchors in the precast cofferdam segments.

3.3.2 Placing

All the equipment used in handling and placing the anchors shall be such that it does not damage or deteriorate the prestressing steel, corrosion protection, or the anchorages. Each anchor shall be inspected prior to insertion into the hole. Any damage to corrosion protection shall be repaired prior to insertion or, if determined by the Contracting Officer to be not repairable, the anchor shall be replaced. Insertion of anchors shall be in accordance with PTI Rec.

3.3.3 Cement Grouted Rock Anchors

Grouting equipment shall be of type and capacity required for successful installation of the rock anchors. All anchors shall use single stage grouting to encase the anchor. Grouting shall be performed by a method in accordance with PTI Rec, paragraph 7.6. Grouting shall commence at the bottom of the grout zone and proceed to the top of the zone.

3.3.4 Grouting of Soil and Rock Anchors

3.3.4.1 General

Within the bond length, grout placement shall proceed such that the hole is filled in a manner to prevent air voids. The rock anchor hole shall be progressively filled with grout and maintained completely full from bottom to top of the zone until the grout has set. Grouting may be accomplished through the casing pipe, grout tubes, hollow-stem augers or hollow drill rods. The grouting procedure used shall provide rock anchors which meet the specified design capacity.

3.3.4.2 Watertightness Test

A watertightness test shall be conducted in drilled holes located above the water surface prior to installing cement-grouted bolts. If the leakage rate exceeds 5 inches of water drop (measured along the drilled hole alignment) in 5 minutes then the hole shall be grouted, then redrilled after the grout sets for 18 hours and retested for watertightness. If the test is not satisfactory, the grouting and redrilling shall continue until the hole is watertight at no additional cost to the Government. The Contractor shall assume that 40 percent of the rock bolt holes will fail the watertightness test and require grouting and redrilling.

3.3.4.3 Gravity Grouting

Gravity grouting shall proceed from the bottom of the hole to the top of the hole. Gravity grouting is not allowed for the soil and rock anchors of the permanent retaining wall.

3.3.4.4 Pressure Grouting (Soil and Rock Anchors for Permanent Retaining Wall)

The method of pressure grouting shall be determined by the Contractor.

Grouting pressures and pumping rates shall be controlled to prevent ground surface heave or fracturing. Grouting pressures shall be incrementally increased until a refusal is reached or an acceptable amount of grout is pumped.

3.3.4.5 Post-Grouting (Soil and Rock Anchors for Permanent Retaining Wall)

The number of phases of post-grouting shall be determined by the Contractor. Grouting pressures and pumping rates shall be controlled to prevent ground surface heave or fracturing. Grouting pressures shall be incrementally increased until a refusal is reached or an acceptable amount of grout is pumped.

3.3.5 Installation

The bearing plate and nut (threaded bar anchors) and bearing plate, shall be installed perpendicular to the anchor, within 3 degrees, and centered on the anchor without bending of the stressing steel. Nuts, couplers, and threaded bar shall be free of dirt, grout or other contaminants. Corrosion protection shall be maintained intact at the anchorage and any damage shall be repaired prior to stressing.

3.4 STRESSING

After the anchor grout in the bond zone has reached sufficient strength as verified by grout cube break, the anchors shall be stressed. Prior to stressing, surfaces upon which the stressing equipment is resting must be clean and the stressing equipment shall be aligned as nearly with the center of the hole as possible. An Alignment Load of 10 percent of the Design Load shall be applied to the anchor prior to setting dial gauges. The Contractor shall stress the anchor in accordance with the anchor manufacturer's recommendation, subject to the approval of the Contracting Officer. Design and Lock-off loads are given on the drawings. The Contractor shall determine the lock-off procedure so that the lift-off results meet the acceptance criteria specified in paragraph ACCEPTANCE. The maximum stress shall never exceed 80 percent of the guaranteed ultimate strength of anchor steel. The process of stressing the anchors shall be so conducted that accurate elongation of the anchor steel can at all times be recorded and compared with the computations submitted to, and accepted by the Contracting Officer. Safety precautions shall be taken to prevent workers from being behind or in front of the stressing equipment during stressing. Stressing of the anchors shall be performed in a sequence submitted by the Contractor for review by the Contracting Officer. All stressing shall be done in the presence of a representative of the Contracting Officer. At no time during the stressing and testing of an anchor shall the stressing equipment be disconnected from the temporary stressing head or anchor.

3.4.1 Lock-off

After completion of all the required tests, the load shall be returned to the Alignment Load and the Lock-off Load specified on the drawings shall be applied to the anchor. A lift-off test shall be made to verify the load in the anchor before the anchor is locked-off and the stressing equipment is removed. The lift-off reading shall be within 5 percent of the specified lock-off load. If the lift-off reading is not within five percent of the specified lock-off load, the anchorage shall be reset and another lift-off reading shall be made. This procedure shall be repeated until a satisfactory lift-off reading is obtained.

3.5 FIELD QUALITY CONTROL

3.5.1 General

3.5.1.1 Soil and Rock Anchors for Permanent Soldier Pile with Tiebacks Retaining Wall

The first three anchors and a minimum of 5 percent of the remaining anchors shall be performance tested. All other anchors shall be proof tested. During stressing of each anchor, a record shall be kept of gage pressure and of anchor elongation at each stage of stressing to the specified test or Lock-off Load, as applicable. The Test Load shall not be exceeded. The Contractor shall provide a qualified engineer to evaluate the anchor test results and determine the acceptability of the anchors in accordance with the criteria indicated hereunder. Final acceptance of each anchor will be made by the Contracting Officer. All tests shall be run in the presence of the Contracting Officer or his representative.

3.5.1.2 Rock Anchors to Tie-Down the Cofferdam and the North Flood/Retaining Wall

The first three anchors at the cofferdam shall be performance tested. All other anchors shall be proof tested. During stressing of each anchor, a record shall be kept of gage pressure and of anchor elongation at each stage of stressing to the specified test or Lock-off Load, as applicable. The Test Load shall not be exceeded. The Contractor shall provide a qualified engineer to evaluate the anchor test results and determine the acceptability of the anchors in accordance with the criteria indicated hereunder. Final acceptance of each anchor will be made by the Contracting Officer. All tests shall be run in the presence of the Contracting Officer or his representative.

3.5.1.3 Rock Anchors to Support Cofferdam Slope and Wall

Five percent of the anchors shall be proof tested. No performance tests will be conducted. During stressing of each anchor, a record shall be kept of gage pressure and of anchor elongation at each stage of stressing to the specified test or Lock-off Load, as applicable. The Test Load shall not be exceeded. The Contractor shall provide a qualified engineer to evaluate the anchor test results and determine the acceptability of the anchors in accordance with the criteria indicated hereunder. Final acceptance of each anchor will be made by the Contracting Officer. All tests shall be run in the presence of the Contracting Officer or his representative.

3.5.2 Rock and Soil Anchor Performance Testing

The Contractor shall conduct performance tests on selected rock and soil anchor installations as specified and as directed by the Contracting Officer.

Cement grouted rock and soil anchors shall be tested following a period of time not less than seven days after the installation has been completed. Minimum compressive strength of the cement grout at time of testing shall be 3,500 psi.

Performance test procedures shall be in accordance with recommendations presented in PTI Post Tensioning Manual for Performance Tests, and shall conform to the following requirements

1. The maximum test load shall not exceed 80 percent of the guaranteed minimum ultimate tensile strength of the bar.

2. A dial gage having a minimum range of 2.0 inches capable of measuring 0.001-inch shall be used to measure movement of the pulling head of the rock bolt. The gage shall be mounted on a stable reference system approved by the Contracting Officer.

3. A hydraulic center-hole jack and hand pump of the type typically used for testing rock bolts shall be used to apply the test load. The jack and pressure gauge shall be calibrated as a unit by an independent firm. The pressure gauge shall be graduated in 100 psi increments or less. The pressure gauge shall be used to measure the applied load. The ram travel of the jack shall not be less than 6 inches. A calibrated master pressure gauge shall be kept at the site. The master gauge shall be used to calibrate the test jack and pressure gauge approximately every five test bars.

4. The performance test shall be performed by cyclically and incrementally loading the rock and soil anchors in accordance with the following schedule. The anchor movements shall be measured from the alignment load and recorded to the nearest 0.001 inches with respect to an independent fixed reference point at each increment of load. The alignment load is a nominal load maintained on the anchor to keep the testing equipment in position. The test load shall be monitored with the pressure gauge. At load increments other than the maximum test load, the load shall be held just long enough to obtain the movement reading.

Performance Test Schedule

AL
0.25 DL*

AL
0.25 DL
0.50 DL*

AL
0.25 DL
0.50 DL
0.75 DL*

AL
0.25 DL
0.50 DL
0.75 DL
1.00 DL*

AL
0.25 DL
0.50 DL
0.75 DL
1.00 DL
1.20 DL*

AL
0.25 DL

0.50 DL
0.75 DL
1.00 DL
1.20 DL
1.33 DL* (Max. Test Load)
Reduce to Lock-Off Load

Where: AL is the alignment load (less than 0.10 DL)
DL is the design load

5. The maximum test load shall be held for 10 minutes. The load-hold period shall start as soon as the maximum test load is applied. The anchor movement, with respect to a fixed reference, shall be measured at 1, 2, 3, 4, 5, 6, and 10 minutes. If the anchor movement between 1minute and 10 minutes exceeds 0.04 inches, the maximum test load shall be held for an additional 50 minutes. If the load hold is extended, the anchor movement shall be recorded at 15, 20, 25, 30 45, and 60 minutes. The Contractor shall plot the rock anchor movement versus test load for each load increment marked with an asterisk(*) in the performance test schedule and plot the residual movement of the anchor at each alignment load versus the highest previously applied load.

6. The Contracting Officer shall determine the acceptability of all performance tests, and may reject those that do not conform to the specifications.

3.5.3 Proof Test

Proof test shall consist of incrementally loading the rock and soil anchors and shall be conducted in accordance with PTI Rec. During the testing of each rock and soil anchor, a record shall be kept of gage pressure and of rock bolt elongation at each stage of stressing to the Test Load required by PTI Rec. Measurements of the elongation of steel bar shall be made in accordance with PTI Rec. If the total movement at the end of 10 minutes at the maximum Test Load exceeds 0.040 inches, the Test Load shall be held an additional 50 minutes and the movement readings shall be taken at the interval specified in PTI Rec, paragraph 4.3.7.2. Test records shall be furnished upon acceptance of each proof tested rock bolt in accordance with paragraph: SUBMITTALS, subparagraph: SD-11 Closeout Submittals.

Proof Test Schedule

AL
0.25 DL
0.50 DL
0.75 DL
1.00 DL
1.20 DL
1.33 DL (Max. test Load)
Reduce to Lock-Off Load

Where: AL is the alignment load (less than 0.10 DL)
DL is the design load for ground anchor
(DL = 0.60 *Fpu *Aps for untensioned rock bolts)

3.5.4 Anchor Records

Upon completion of installation of each anchor, the Contractor shall furnish anchor records to the Contracting Officer as specified in paragraph

SUBMITTALS.

3.6 ACCEPTANCE

3.6.1 General

Acceptance of anchors shall be determined by the Contracting Officer. The following criteria will be used in determination of the acceptability of each anchor:

a. Creep - Creep movement shall not exceed 0.040 inch at maximum Test Load during the first 10 minutes of the performance or proof test. If the creep movement exceeds this limit, it shall not exceed 0.080 inch at the maximum Test Load at the end of 60 minutes. If the creep movement exceeds 0.080 inch at the maximum Test Load at the end of 60 minutes, the anchor shall be rejected.

b. Movement - Apparent free length shall be calculated from the observed elastic movement in accordance with PTI Rec.

1. Minimum Apparent Free Length - The calculated free length shall be not less than 80% of the designed free tendon length plus the jack length. If the anchor does not meet this criteria, the anchor shall be restressed from the Alignment Load to the Test Load and the apparent free length shall be recalculated. If the anchor does not meet this criteria after 3 attempts (original plus 2 restresses), the anchor shall be rejected.

2. Maximum Apparent Free Length - The calculated free length shall be not more than 100% of the designed free length plus 50% of the bond length plus the jack length. If the anchor does not meet this criteria, and the cause of the behavior is not investigated and explained to the satisfaction of the Contracting Officer, the anchor shall be rejected.

c. Initial Lift-Off Reading - The initial lift-off reading shall be within 5% of the specified Lock-off Load. If the anchor does not meet this criteria, the anchor shall be adjusted as necessary and the lift-off reading shall be repeated.

3.6.2 Replacement of Rejected Anchors

Any anchor that fails the performance or proof test or is rejected by the Contracting Officer shall be replaced. A replacement anchor, including a new anchor hole, shall be provided by the Contractor at no expense to the Government. The location of the replacement anchor shall be as directed by the Contracting Officer. The Contractor shall provide all materials, supplies, equipment, and labor necessary to provide a new anchor assembly to the satisfaction of the Contracting Officer. No drilling shall be performed for a replacement anchor until the grouting of all anchors within 50 feet (horizontal and vertical) of the replacement anchor location has been allowed to set for at least 24 hours. Payment will not be made for rejected or failed anchors. The Contractor shall either remove failed anchors and thoroughly ream and clear the anchor hole or remove the load and cut the anchor and casing flush.

-- End of Section --

SECTION 02491

CEMENT-GROUTED UNTENSIONED ROCK BOLTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(1997ae1) Carbon Structural Steel
ASTM A 325	(1997) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 615/A 615M	(2000) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 722	(1998) Uncoated High-Strength Steel Bar for Prestressing Concrete
ASTM A 775/A 775M	(2000) Epoxy-Coated Reinforcing Steel Bars
ASTM C 109/C 109M	(1999) Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50 mm) Cube Specimens)
ASTM C 150	(1999a) Portland Cement
ASTM F 432	(2001) Roof and Rock Bolts and Accessories

POST-TENSIONING INSTITUTE (PTI)

PTI Rec	(June 1996, Third Edition) Recommendations for Prestressed Rock and Soil Anchors
PTI Post Tensioning Manual	(Nov 1990, Fifth Edition) Post Tensioning Manual

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 400	(1963) Requirements for Water for Use in Mixing and Curing Concrete
EM 385-1-1	(1996) Safety and Health Requirements Manual

1.2 PURPOSE OF ROCK BOLTING

Cement-grouted untensioned threadbar rock bolts (Rock Bolts) shall be installed in contractor drilled holes. The rock bolts are being installed as rock slope support for the Fish Bypass Facility Excavation.

1.3 DEFINITIONS

The following definitions are in addition to those given in PTI Rec, Section 2.0:

Anchored Structure - The wall, foundation or other structure to which the anchor is to transfer force.

Demonstration Test Anchor - An anchor which is performance tested to verify design assumptions and installation practices.

Weep Hole - Unlined 3 inch diameter hole drilled into the excavated slope to promote drainage of the rock mass.

1.4 SYSTEM DESCRIPTION

1.4.1 General

The work includes fabrication and installation of the threadbar rock bolt system, and installation of weep holes. General installation criteria are shown on the drawings. Rock bolt materials, load testing, and acceptance shall be in accordance with PTI Rec and these specifications. Rock bolts shall be threaded bar type. The Contractor shall be responsible for determining drilling methods, and determining hole diameter adequate to accommodate the rock bolt and other component parts of each installation (e.g., centralizers, couplers, grout tubes, etc.). The minimum hole diameter shall be 3.5 inches for #8 threaded bar and 4.0 inches for #11 threaded bar. The Contractor shall prepare fabrication and installation drawings and an installation plan for approval by the Contracting Officer.

The untensioned cement-grouted rock bolts will generally be 20 or 30 feet long. However, the Contractor shall be required to install bolts up to 40 feet long upon the request of the Contracting Officer.

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Fabrication and Installation Drawings; G

Shall include drawings and detailed installation procedures and sequences showing complete details of the installation procedure and equipment; rock bolt fabrication; grouting methods; grout mix designs; rock bolt placement and installation; epoxy coating of threadbar and bolt head; welded wire fabric; testing procedures for the approval by the Contracting Officer. Shop drawings for rock bolts shall include locations and details of the grout tubes, vent tubes, bond breaker, and centralizers. If different types of

rock bolts are to be installed, each rock bolt type shall be readily identifiable. Once reviewed by the Contracting Officer, no changes or deviation from shop drawings shall be permitted without further review by the Contracting Officer.

Equipment

The Contractor shall submit catalog cuts, brochures, or other descriptive literature describing the equipment to be used for drilling, grouting, handling, and installing the rock bolts. Descriptions of stressing jacks, gages, load cells, or other devices for measuring stressing load, certified calibration records for each set of jacking equipment, and current testing curves for stress measurement gages which show that gages have been calibrated for the jacks for which they are used shall be submitted for review 30 days prior to the start of the testing operations.

Fabricator Qualifications; G
Installer Qualifications; G

The qualifications and experience records shall be submitted for approval. Experience records shall identify all the individuals responsible for the rock bolts and shall include a listing of projects of similar scope performed within the specified period along with points of contact. The Contractor shall submit the qualifications and receive approval prior to the installation of any rock bolts specified in this section.

Installation Plan; G

The Contractor shall submit to the Contracting Officer for review and comment a plan for installing the rock bolts. The proposal shall describe the sequence for installation and other restrictions as outlined on the drawings or specified. The rock bolt installation procedures shall be determined by the Contractor. The installation plan shall also include descriptions of methods and equipment to be used by the Contractor for alignment checking of rock bolt holes.

SD-06 Test Reports

Grade 75 and 150 Steel

Certified test reports for each heat or lot of Grade 75 and 150 steel shall be submitted with materials delivered to the site.

Cement Grout Mixture Proportions

Thirty days prior to installation of rock bolts, the Contractor shall submit the mixture proportions that will produce grout of the quality required. Applicable test reports shall be submitted to verify that the grout mixture proportions selected will produce grout of the quality specified.

Rock Bolt Performance Testing; G

Performance tests shall be performed on selected rock bolt installation and shall be submitted to the Government for review.

SD-07 Certificates

Grade 75 and 150 Steel

The Contractor shall furnish five copies of mill reports and five copies of a certificate from the manufacturer stating chemical properties, ultimate strengths, yield strengths, modulus of elasticity, and any other physical properties needed for the required computations, for the type of steel furnished.

Epoxy-Coated Rock Bolts

Written certification for coating material and coated bars shall be submitted with the delivery of the bars.

SD-11 Closeout Submittals

Rock Bolt Records
Drilling Logs

Upon completion of installation of each rock bolt, the Contractor shall furnish the station and elevation of the rock bolt head, rock bolt length, rock bolt inclination, grout mix, grouting pressure, bags of cement injected, and a report of proof and performance tests conducted. The performance and proof test results shall include measured lengths of drill holes and rock bolts, the loads and elongations recorded during testing, and graphs of test results. Contractor shall also provide drilling records for each hole indicating drilling equipment used, dates and times when operations (drilling, grouting, and rock bolt installation) depths and descriptions of voids encountered in the rock mass, and groundwater conditions. In addition, the Contractor shall furnish as-built drawings showing the completed installation of the rock bolts.

1.6 QUALIFICATIONS

Rock bolt fabricator and installer qualifications shall be submitted for approval in accordance with paragraph SUBMITTALS. The submittals shall, where applicable, identify individuals who will be working on this contract and their relevant experience. No changes shall be made in approved personnel without prior approval of the Contracting Officer.

1.6.1 Fabricator Qualifications

The rock bolts shall be fabricated by a manufacturer that has been in the practice of designing and fabricating rock bolts similar in size and scope to this project for at least ten years.

1.6.2 Installer Qualifications

The rock bolts and weep holes shall be installed by a firm which is regularly engaged in the installation of rock bolts and weep holes and has at least ten years experience in the installation of similar rock bolts and weep holes. The superintendent shall have installed rock bolts and weep holes on at least five projects of similar scope and size.

1.7 PREPARATORY MEETING

Prior to commencing any work on the rock bolts, the Contractor, including all field personnel to be involved in drilling and installation of the rock bolts, shall meet with representatives of the Contracting Officer to review the plans and specifications, work plans, and submittals. Drilling may commence upon approval of the rock bolt installation plan and procedures described in paragraph SUBMITTALS and after the conduct of the Preparatory Meeting.

1.8 DELIVERY, STORAGE AND HANDLING

Materials shall be suitably wrapped, packaged or covered at the factory or shop to prevent being affected by dirt, water, oil, grease, and rust. Materials shall be protected against abrasion or damage during shipment and handling. Materials stored at the site shall be placed on a well supported platform and covered with plastic or other approved material. Materials shall be protected from adjacent construction operations. Grounding of welding leads to steel shall not be permitted. Steel which is damaged by abrasion, cuts, nicks, heavy corrosions, pitting, welds or weld spatter shall be rejected and removed from the site. Rock bolts shall be inspected prior to insertion into anchor holes for damage to epoxy coating. Any such damage shall be repaired in a manner recommended by the rock bolt manufacturer and approved by the Contracting Officer.

1.9 SITE CONDITIONS

A foundation investigation has been made at the site by the Government and data is presented on the foundation exploration drawings. Logs of core borings are shown on the drawings. While the foundation information is representative of subsurface conditions at the respective locations of borings, local variations in the characteristics of the subsurface materials may be anticipated. Local variations which may be encountered include, but are not limited to, classification and thickness of rock strata, fractures, and other discontinuities in the rock structure. Such variations will not be considered as differing materially within the purview of the CONTRACT CLAUSES, paragraph DIFFERING SITE CONDITIONS. Core from the borings indicated on the drawings are available for inspection as specified in the SPECIAL CONTRACT REQUIREMENTS, paragraph PHYSICAL DATA. The Contracting Officer is responsible for location of all utilities that may be affected by construction. The Contractor is responsible for verifying the location of all utilities that may be affected by construction or the installation of the rock bolts.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Rock Bolts

2.1.1.1 Epoxy-Coated Rock Bolts

Each rock bolt shall consist of a single threadbar, one steel bearing plate, one nut, flat washer, and beveled washers as required. The threadbar rock bolt grade 150 ksi and 75 ksi shall have a continuous hot rolled in pattern of threadlike deformations along their entire length. The grade 150 ksi threaded bar shall conform to ASTM A 722 and the 75 ksi threaded bar shall conform to ASTM A 615/A 615M. Threadbar, bearing plate, nut, and washers shall be epoxy coated as per ASTM A 775/A 775M (12 mils minimum thickness).

2.1.2 Bearing Plates

Steel bearing plates shall conform to ASTM A 36/A 36M and shall meet load and deflection criteria of ASTM F 432. The bearing plates shall be 1/2-flat steel or equal, providing a 36-square-inch area for each bolt and with a hole drilled and sized to allow at least a 15 degree skew of the bolt in all directions form normal to the plate.

2.1.3 Hex Nuts

Hex nuts used on threaded portions of rock bolts shall have hexagonal heads of the heavy-duty type. Nuts shall develop an ultimate strength of not less than 125 percent of the minimum yield strength of the rock bolts.

2.1.4 Washers

Washers for use with threaded bolts shall ensure that there is continuous load transfer between the tightened hex nut and the bearing plate. Beveled washers shall be steel or malleable iron. Flat steel washers shall conform to the requirements of ASTM A 325. Two beveled washers and one flat washer shall be provided with each rock bolt.

2.1.5 Steel Couplers

Steel couplers for threadbars, with epoxy coating (12 mils minimum thickness), shall be compatible with the rock bolt to be coupled and capable of developing 100 percent of the minimum specified ultimate tensile strength of the Grade 75 or 150 steel, as specified.

2.1.6 Centralizers

Centralizers shall be fabricated from plastic, steel or other approved material which is nondetrimental to the Grade 75 or 150 steel. Wood shall not be used. The centralizer shall be able to support the rock bolt in the drill hole and position the rock bolt so a minimum of 0.5 inch of grout cover is provided. Centralizers shall permit grout to freely flow up the drill hole. Spacing of centralizers shall not be more than 10 feet and the first centralizer shall be located not more than 5 feet from the tip of the rock bolt.

2.2 GROUT

2.2.1 Cement

ASTM C 150, Type I, II, or III.

2.2.2 Water

Fresh, clean, potable mixing water or nonpotable water which meets the requirements of COE CRD-C 400 shall be used.

2.2.3 Admixtures.

Admixtures which control bleed, improve flowability, reduce water content and retard set may be used in the grout subject to the approval of the Contracting Officer. Any admixtures used shall be compatible with the Grade 75 or 150 steel and shall be mixed in accordance with the manufacturer's recommendations.

2.2.4 Grout for Anchors

2.2.4.1 Cement Grout

Cement grout mixture proportions shall be the responsibility of the Contractor. Grout for grouting anchors shall consist of a homogenous, pumpable, stable mixture of portland cement and water. The Contractor shall submit his proposed mix design to the Contracting Officer for approval. The water content shall be the minimum necessary for proper placement but the water-cement ratio shall not exceed 0.45 by weight. Final proportions of materials shall be based on results of tests made on sample mixtures of grout. The minimum compressive strength of two-inch cubes, molded, cured, and tested in accordance with ASTM C 109/C 109M, shall be 3,500 psi at 7 days and 6,000 psi at 28 days. The Contractor shall be responsible for sampling, curing, and breaking of grout test cubes for determining mix design, and all testing shall be done by an independent laboratory approved by the Contracting Officer. Rock conditions and temperatures shall be replicated in the curing process.

2.3 ROCK BOLT FABRICATION

2.3.1 General

Fabrication of the rock bolts shall be as recommended by the suppliers. Rock bolts shall be assembled with all centralizers, grout and vent tubes and epoxy coating prior to insertion into the hole. Fabricated rock bolts shall be protected, transported and stored in a manner to prevent contamination or damage to any components.

2.3.2 Vent Tubes

Vent tubes used during grouting operations, if necessary, shall be any appropriate type for the job, as recommended by the supplier of the anchors.

2.3.3 Grout Tubes

Grout tubes shall be polyethylene tubing or as recommended by the rock bolt manufacturer/supplier and approved by the Contracting Officer. Inside diameter of grout tubes shall be adequate to fully grout the entire hole.

2.3.4 Corrosion Protection (Epoxy Coating)

Epoxy coating shall conform to the coating requirements of ASTM A 775/ A 775M, 12 mils minimum thickness. Epoxy coating shall be provided for the entire rock bolt bearing plate, washers, and hex nut.

2.4 TESTS, INSPECTIONS, AND VERIFICATIONS

The Contractor shall have required material tests performed on rock bolts and accessories by an approved laboratory to demonstrate that the materials are in conformance with the specifications. Grout shall be tested in accordance with ASTM C 109/C 109M. These tests shall be at the Contractor's expense. Grout tests shall be performed on each batch of grout mixed and used for rock bolt installation. Grade 75 and 150 steel test results shall be furnished prior to beginning fabrication of any rock bolts. Grout test results shall be provided to the Contracting Officer within 24 hours of testing.

2.5 Welded Wire Fabric

Welded wire fabric for temporary slopes shall be selected by the Contractor.

PART 3 EXECUTION

3.1 EQUIPMENT

The Contractor's Quality Control manager shall verify that the equipment used on site is the same as the equipment submitted for approval.

3.1.1 Drilling Equipment

Drilling equipment shall be suitable for advancing the drill tools to the depths and at the alignment specified.

3.1.2 Grouting Equipment

3.1.2.1 Grout Mixer

The grout mixer shall be a high-speed, high-shear, colloidal type grout mixer capable of continuous mechanical mixing that will produce uniform and thoroughly mixed grout which is free of lumps and undispersed cement. The mixer shall be equipped with a suitable water and admixture measuring devices calibrated to read in cubic feet and tenths and so designed that after each delivery the hands can be conveniently set back to zero.

3.1.2.2 Grout Pump

The grout pump shall be of the positive displacement type, and shall be capable of pumping at all flow rates below 20 gallons per minute, shall be capable of pumping at the pressure of at least 50 psi at zero flow rate. A pump shall also be available which is capable of pumping both neat cement grout mixes and sanded grout mixes. The pumping equipment shall have a pressure gage capable of measuring pressures of at least 150 psi.

3.1.2.3 Material Safety

Cement, lime, and bentonite clay are respiratory and skin irritants. Section No. 6 of EM 385-1-1 shall be strictly adhered to and workers shall be equipped with respirators and skin protection during mixing of the dry cement and bentonite products. The manufacturer's recommended safety equipment and instructions shall be used.

3.1.3 Testing Equipment

Testing equipment shall consist of a hydraulic jack with calibrated pressure gage for applying the load and a dial gage or vernier scale to measure rock bolt movement. The ram travel of the stressing equipment shall be not less than 6 inches. The pressure gage shall be graduated in 100 psi increments. The stressing equipment and pressure gage must have been calibrated as a unit no more than 30 calendar days prior to commencing work under this contract and at six-month intervals throughout the period of use. The movement measuring device shall have a minimum travel equal to the theoretical elastic elongation of the total rock bolt length at the maximum Test Load without resetting the device.

3.2 DRILLING HOLES

3.2.1 General

The physical conditions indicated on the drawings are the result of core borings and as-built drawings. The area to be supported shall be inspected and scaled as required to assure safety and to provide adequate faces to seat the bearing plate. Holes shall be drilled at the locations depths and inclinations shown on the drawings and to diameters determined by the Contractor to provide the design bond length and capacity. The locations of the holes may be changed only as approved by the Contracting Officer. Unless otherwise specified, the Contractor shall determine the drilling method to be used. No holes shall be drilled within 16 feet (horizontal and vertical) of a grouted hole until the grout has set at least 24 hours. Care shall be taken while drilling to avoid damage of any kind to the existing structures. Damages of any nature will be evaluated by the Contracting Officer and repairs or replacements shall be made at his discretion. Waste water from drilling operations shall be collected and recycled or treated. See also Section 01061 ENVIRONMENTAL PROTECTION.

3.2.2 Drilling Under Water

The excavated rock slope in the cofferdam slope and approach channel slope will be underwater below approximate El. 1080. The contractor shall be required to drill rock bolt holes and install rock bolts under water.

3.2.3 Drilling in Rock

Holes in rock may be drilled by rotary drilling, percussion drilling, rotary/percussion drilling, down-the-hole hammer or using other methods suitable for the intended purpose.

3.2.3.1 Drilling Weep Holes

Weep holes shall be installed at the locations, angle and depth as indicated in the plans or as directed by the Contracting Officer. The weep holes shall not be overdrilled by more than 10 feet or vary from the designated inclination by more than 5 degrees. The use of grease, "rod dope" or other lubricants on the drill rods shall not be permitted. Each hole drilled shall be protected form becoming clogged or obstructed. Any hole that becomes clogged or obstructed shall be cleaned out. Upon completion of drilling, the holes shall be blown clear of cuttings using air with a minimum pressure of 50 psi introduced at the bottom of the hole.

3.2.4 Records

The Contractor shall submit driller logs and records as specified in SD-11 Closeout Submittals. The presence of a Government inspector or the keeping of separate drilling records by the Contracting Officer shall not relieve the Contractor of the responsibility for the work specified in this paragraph. Payment will not be made for any work for which the required records have not been furnished by the Contractor.

3.2.4.1 Tolerances

The entry angle shall be within 3 degrees of the specified inclination. The alignment of the drilled hole shall be within 3 degrees of the theoretical alignment. If the hole alignment is not within these tolerances, the hole shall be backfilled with cement or sand-cement grout

and a new hole drilled adjacent to the rejected hole.

3.3 INSTALLATION OF ROCK BOLTS

3.3.1 General

The Contractor shall be responsible for each drilled hole until the rock bolt has been installed, grouted, and accepted. Holes in rock shall be cleaned by pressurized air and/or water to remove drill cuttings and mud.

3.3.2 Placing

All the equipment used in handling and placing the rock bolts shall be such that it does not damage or deteriorate the Grade 75 or 150 steel, epoxy coating, or the rock bolt head. Each rock bolt shall be inspected prior to insertion into the hole. Any damage to rock bolts or rock bolt heads shall be repaired prior to insertion or, if determined by the Contracting Officer to be not repairable, shall be replaced. Insertion of rock bolts shall be in accordance with PTI Rec.

3.3.3 Cement Grouted Rock Bolts

Grouting equipment shall be of type and capacity required for successful installation of the rock bolts. All rock bolts shall use single stage grouting to encase the rock bolts. Grouting shall be performed by a method in accordance with PTI Rec.

3.3.4 Anchorage Installation

The bearing plate and nut shall be installed perpendicular to the rock bolt, within 3 degrees, and centered on the rock bolt without bending of the steel. Epoxy coating shall be maintained intact and any damage shall be repaired prior to acceptance of the rock bolt.

3.3.5 Installing Rock Bolts Under Water

The excavated rock slope in the cofferdam slope and approach channel slope will be underwater below approximate El. 1080. The contractor shall be required to install rock bolts under water.

3.3.6 Grouting of Rock Bolts

3.3.6.1 Watertightness Test

A watertightness test shall be conducted in drilled holes located above the water surface prior to installing cement-grouted bolts. If the leakage rate exceeds 5 inches of water drop (measured along the drilled hole alignment) in 5 minutes then the hole shall be grouted, then redrilled after the grout sets for 18 hours and retested for watertightness. If the test is not satisfactory, the grouting and redrilling shall continue until the hole is watertight at no additional cost to the Government. The Contractor shall assume that 40 percent of the rock bolt holes will fail the watertightness test and require grouting and redrilling.

3.3.6.2 General

Grout placement shall proceed such that the hole is filled in a manner to prevent air voids. The rock bolt hole shall be progressively filled with grout and maintained completely full from bottom to top of the rock bolt

hole until the grout has set.

3.3.6.3 Grouting

Grouting shall commence at the bottom of the grout zone to the top of the grout zone.

3.4 TIGHTENING

Nuts shall be tightened on thread bar, using a calibrated torque wrench to 100 foot-pound plus or minus 10 foot-pounds.

3.5 FIELD QUALITY CONTROL

3.5.1 General

Thirty sacrificial rock bolts shall be performance tested, and five percent of production bolts shall be proof tested. During the testing of each rock bolt, a record shall be kept of gage pressure and of rock bolt elongation at each stage of stressing to the specified test. The Test Load shall not exceed 1.33P, where P = 35,000 lbs for #8 Grade 75 rock bolts and 100,000 lbs for #11, Grade 150 rock bolts. The Contractor shall provide a qualified Engineer to evaluate the rock bolt test results and determine the acceptability of the production rock bolts in accordance with the criteria indicated hereunder. Final acceptance of each production rock bolt will be made by the Contracting Officer. All tests shall be run in the presence of the Contracting Officer or his representative.

3.5.2 Rock Bolt Performance Testing

The Contractor shall conduct performance tests on selected rock bolt installations as specified and as directed by the Contracting Officer. A minimum of ten performance tests shall be conducted on sacrificial #8 bolts prior to installing production bolts. Ten additional performance tests for each type of rock bolt (#8 and #11) shall be conducted by the Contractor on sacrificial bolts, randomly during the installation of each different type of rock bolt. All test bolt locations will be selected by the Contracting Officer.

Cement grouted rock bolts shall be tested following a period of time not less than seven days after the installation has been completed. Minimum compressive strength of the cement grout at time of testing shall be 3,500 psi.

Performance test rock bolts shall conform to the following requirements:

1. Performance testing shall be conducted on sacrificial test bolts in proximity to production rock bolts.

2. The test rock bolts shall be 10 to 30 feet in length as directed by the Contracting Officer, and shall have the same borehole diameter, anchor bar diameter and grade, and cement grout as production rock bolts.

3. The test rock bolt shall be fabricated and installed to develop a bonded length directed by the Contracting Officer, ranging in length from 1 to 6 feet, at the bottom of the hole, with the remaining length of rock bolt unbonded. The unbonded length shall be obtained by using a bond breaker consisting of sheeting or heat shrink material.

4. The design load for each performance test shall be directed by the Contracting Officer. Contractor shall anticipate a maximum test load of 134 kips.

5. At the conclusion of the performance test, the contractor shall grout the remaining unbonded portion of the test rock bolt.

Performance test procedures shall be in accordance with recommendations presented in PTI Post Tensioning Manual for Performance Tests, and shall conform to the following requirements

1. The maximum test load shall not exceed 80 percent of the guaranteed minimum ultimate tensile strength of the bar.

2. A dial gage having a minimum range of 2.0 inches capable of measuring 0.001-inch shall be used to measure movement of the pulling head of the rock bolt. The gage shall be mounted on a stable reference system approved by the Contracting Officer.

3. A hydraulic center-hole jack and hand pump of the type typically used for testing rock bolts shall be used to apply the test load. The jack and pressure gauge shall be calibrated as a unit by an independent firm. The pressure gauge shall be graduated in 100 psi increments or less. The pressure gauge shall be used to measure the applied load. The ram travel of the jack shall not be less than 6 inches. A calibrated master pressure gauge shall be kept at the site. The master gauge shall be used to calibrate the test jack and pressure gauge approximately every five test bolts.

4. The performance test shall be performed by cyclically and incrementally loading the rock bolt in accordance with the following schedule. The rock bolt movements shall be measured from the alignment load and recorded to the nearest 0.001 inches with respect to an independent fixed reference point at each increment of load. The alignment load is a nominal load maintained on the rock bolt to keep the testing equipment in position. The test load shall be monitored with the pressure gauge. At load increments other than the maximum test load, the load shall be held just long enough to obtain the movement reading.

Performance Test Schedule

AL
0.25 DL*

AL
0.25 DL
0.50 DL*

AL
0.25 DL
0.50 DL
0.75 DL*

AL
0.25 DL
0.50 DL
0.75 DL

1.00 DL*

AL
0.25 DL
0.50 DL
0.75 DL
1.00 DL
1.20 DL*

AL
0.25 DL
0.50 DL
0.75 DL
1.00 DL
1.20 DL
1.33 DL*

Where: AL is the alignment load
DL is the design load

5. The maximum test load shall be held for 10 minutes. The load-hold period shall start as soon as the maximum test load is applied. The rock bolt movement, with respect to a fixed reference, shall be measured at 1, 2, 3, 4, 5, 6, and 10 minutes. If the rock anchor movement between 1minute and 10 minutes exceeds 0.04 inches, the maximum test load shall be held for an additional 50 minutes. If the load hold is extended, the rock anchor movement shall be recorded at 15, 20, 25, 30 45, and 60 minutes. The Contractor shall plot the rock anchor movement versus test load for each load increment marked with an asterisk(*) in the performance test schedule and plot the residual movement of the anchor at each alignment load versus the highest previously applied load.

6. The Contracting Officer shall determine the acceptability of all performance tests, and may reject those that do not conform to the specifications.

3.5.3 Proof Test

Proof test shall consist of incrementally loading the rock bolt and shall be conducted in accordance with PTI Rec. During the testing of each rock bolt, a record shall be kept of gage pressure and of rock bolt elongation at each stage of stressing to the Test Load required by PTI Rec. Measurements of the elongation of steel bar shall be made in accordance with PTI Rec. If the total movement at the end of 10 minutes at the Test Load exceeds 0.040 inches, the Test Load shall be held an additional 50 minutes and the movement readings shall be taken at the interval specified in PTI Rec, paragraph 4.3.7.2. Test records shall be furnished upon acceptance of each proof tested rock bolt in accordance with paragraph: SUBMITTALS, subparagraph: SD-11 Closeout Submittals.

3.5.4 Rock Bolt Records

Upon completion of installation of each rock bolt, the rock bolt records shall be furnished to the Contracting Officer as specified in paragraph SUBMITTALS.

3.6 ACCEPTANCE

3.6.1 General

Acceptance of rock bolts shall be determined by the Contracting Officer. The following criteria will be used in determination of the acceptability of each rock bolt:

a. Total movement with respect to a fixed reference point shall not exceed 0.040 inch at maximum Test Load during the first 10 minutes of the proof test. If the total movement exceeds this limit, it shall not exceed 0.080 inch at the maximum Test Load at the end of 60 minutes. If the movement exceeds 0.080 inch at the maximum Test Load at the end of 60 minutes, the rock bolt shall be rejected.

3.6.2 Replacement of Rejected Rock Bolts

Any rock bolt that fails the proof test or is rejected by the Contracting Officer shall be replaced. A replacement rock bolt, including a new rock bolt hole, shall be provided by the Contractor at no expense to the Government. The location of the replacement rock bolt shall be as directed by the Contracting Officer. The Contractor shall provide all materials, supplies, equipment, and labor necessary to provide a new rock bolt assembly to the satisfaction of the Contracting Officer. No drilling shall be performed for a replacement rock bolt until the grouting of all rock bolts within 16 feet (horizontal and vertical) of the replacement rock bolt location has been allowed to set for at least 24 hours.

- End of Section - -- End of Section --

SECTION 02521

WATER WELLS

PART 1 GENERAL

1.1 SUMMARY

This Section applies to the construction of water wells at the Howard Hanson Dam Fish Passage Facility located near Palmer, Washington.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53/A 53M	(1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM C 150	(1999a) Portland Cement
ASTM D 4750	(1987; R 1993e1) Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)
ASTM D 5299	(1992el; R 1997) Decommissioning of Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities
ASTM D 5521	(1994el)Guide for Development of Ground-Water Monitoring Wells in Granular Aquifers

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA EWW	(1999) Standard Methods for the Examination of Water and Wastewater
AWWA A100	(1997) Water Wells
AWWA C206	(1997) Field Welding of Steel Water Pipe

STATE OF WASHINGTON DEPARTMENT OF ECOLOGY (WAC)

WAC 173-160	(1998) State of Washington, Department of Ecology, Minimum Standards for Construction and Operators
WAC 173-162	(1998) State of Washington, Department of Ecology, Regulations and Licensing of Well Contractors and Operators

STATE OF WASHINGTON DEPARTMENT OF LICENSING (WAC)

WAC 308-15 (2002) The law relating to Geologists

1.3 GENERAL REQUIREMENTS

Each well shall be located and constructed in accordance with these specifications and WAC 173-160. Each well shall be installed to prevent aquifer contamination by the drilling operation and equipment, intra- and inter-aquifer contamination, and vertical seepage of surface water adjacent to the well into the subsurface, especially the well intake zone.

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Diagrams.

As-built installation diagram for each well installed, prepared by the hydrogeologist present during well installation operations, within 5 working days of the completion of the well installation procedure. Diagrams shall include rock and hydrogeologic conditions.

SD-03 Product Data

Well Installation Plan; G.

A plan as specified in paragraph WELL INSTALLATION PLAN describing the drilling methods, sampling, and well construction and well development 30 calendar days prior to beginning drilling operations. Mobilization activities may start prior to submittal of the plan. The plan shall be approved and signed by a licensed hydrogeologist as specified in paragraph QUALIFICATIONS.

Dewatering Plan; G.

A plan as specified in paragraph DEWATERING PLAN describing the method. Installation, operation, and maintenance details shall be submitted for approval by the Contracting Officer prior to dewatering.

Catalog Data.

Catalog data, and name of supplier, for well screens (to include the screen slot size), casing, riser pipe, filter pack material, bentonite, cement, centralizers, surface protective covers, well vaults, locking caps, airline oil filters for pneumatic drilling, dedicated sampling equipment, pumps, and chemical specifications on drill lubricants, tracers, disinfecting agents, and drill fluid additives, if used. Catalog data shall include any information, written or otherwise, supplied by the manufacturers or suppliers of the above listed items.

Qualifications.

Personnel qualification documentation.

Permits.

A copy of all permits, licenses, or other legal requirements necessary for execution of the work shall be furnished 30 working days before commencement of the work.

SD-06 Test Reports

Survey Maps and Notes.

Survey maps and notes, including a tabulated list of all wells and monuments, copies of all field books, maps showing the locations, and elevations of all wells, datum used (e.g. state plane NAD27, NAD83, UTM, etc.), elevation datum, units of measurement, and all computation sheets shall be submitted within 10 working days after completion of the survey. Also, a diagram showing where on the top of the well the elevation was determined by the surveyor.

Well Development Records.

A well development record, for each well, within 5 working days of the completion of development.

Decommissioning/Abandonment Records.

A well decommissioning record, for each well, or test hole abandoned, within 5 working days of the completion of the abandonment procedure.

Filter Pack.

Filter pack material test results; sieve and chemical analyses, shall be submitted within 15 working days after completion of the borehole.

Tests.

Test Reports within 24 hours following the conclusion of each test.

Well Capacity Test

Record of the test shall be delivered to the Contracting Officer.

Water Source; G

The Contractor shall, prior to its use at the site, sample and test the water source, and obtain approval from the Contracting Officer

Weekly Monitoring Report

A weekly report shall include a description of all dewatering

activities including daily monitoring records of flows from all wells and sumps, and the results instrumentation (vibrating wire piezometer) monitoring.

1.5 WELL INSTALLATION PLAN

The following requirements shall be incorporated into the Contractor's Well Installation Plan and followed in the field. The plan shall include, but shall not be limited to, a discussion of the following:

a. Plans showing all wells, piping layout, flow meters, discharge points, generators and tanks.

b. Description of well drilling methods, and installation procedures, including any temporary casing used, placement of filter pack and seal materials, drill cuttings and fluids disposal, and soil/rock sample disposition.

c. Description of well construction materials, including well screen, riser pipe, centralizers, tailpiece (if used), filter pack and filter pack gradation, bentonite, drilling fluid additives (if used), drilling water, cement, and well protective measures.

d. Description of quality control procedures to be used for placement of filter pack and seals in the boring, including depth measurements.

e. Forms to be used for installation diagrams of wells, well development records, well sampling data records, state well registration forms, and well abandonment records.

f. Description of contamination prevention and well materials and equipment decontamination procedures.

g. Description of protective cover surface completion procedures, including any special design criteria/features relating to frost heave prevention. The maximum frost penetration for the site shall be included in this description. Description of surface protection required to protect the wells from flood inundation.

h. Description of well development methods to be used.

i. List of applicable publications, including state and local regulations and standards.

j. List of personnel assignments for this project, and personnel qualifications.

k. Description of well decommissioning/abandonment procedures.

l. Description of well capacity testing techniques.

m. Description of sumps and permanent pumps to be installed, and discussion of pump operating tests to be employed at the site.

n. Description of specific methods to be employed to control potential contamination or pollution arising from well installation activities.

o. Schedule and timing of all activities.

1.6 DEWATERING PLAN

a. This Section specifies the definition, responsibilities, and execution for dewatering. Monitoring well/instrumentation specifications are defined in Section 02214, GEOTECHNICAL INSTRUMENTATION.

b. Dewatering shall consist of the furnishing, installation, testing, operation and maintenance of dewatering systems to achieve proper completion of all work performed under this Contract. The systems shall consist of a deep well dewatering system and a passive pressure relief well system (see Section 02525, RELIEF WELLS) and sumps within the excavation. The dewatering systems shall conform to the design and schedule requirements given in this specification. The Contractor shall measure existing monitoring wells and pool levels prior to drilling for a minimum 2-week period in order to gain an understanding of groundwater conditions. The measurements shall be collected on an hourly basis.

c. The dewatering system shall be installed after grouting activities (Section 02251, FOUNDATION DRILLING AND GROUTING) are complete. A minimum of eight deep dewatering wells will initially be installed prior to excavation. Passive pressure relief wells and two additional deep dewatering wells will later be installed during excavation within the excavation footprint (see Section 02525, RELIEF WELLS). These wells within the excavation footprint could be installed prior to excavation provided that they are protected from damage from all construction activities including blasting. They shall be installed prior to excavation below elevation 1,074 feet. If the completed system does not satisfy the dewatering system acceptance requirement in paragraph, DEWATERING SYSTEM ACCEPTANCE, additional dewatering wells shall be installed.

d. The Contractor shall collect, route and/or pump water including relief well discharge and precipitation, from work areas and from within excavations, and shall dispose of all water in a manner that is compliant with all pertinent permitting and regulatory requirements. The Contractor shall at all times have on hand sufficient pumping equipment and machinery in good working condition for all emergencies, including power outage and flooding, and shall have available at all times competent workers for the continuous and successful operation of the dewatering and monitoring systems. These systems shall not be shut down between shifts, on holidays, or weekends, or during work stoppage without written permission from the Contracting Officer. The Contractor shall be responsible for maintaining all electric power service connections to the dewatering system components.

e. The Contractor shall control groundwater such that basal instability of the excavation shall not occur. Dewatering systems shall be designed and operated so as to prevent damage to existing structures or interruption of site work. The Contractor shall maintain water levels at or below the bottom of all excavations at all times and under all conditions except when a flood event overtops the cofferdam.

f. During excavation below the water table, construction of structures, installing of pipelines, placing working base, structure and trench backfill, the placing and setting of concrete, and prior to the acceptance of the work or any portion of the work, the Contractor shall keep the excavation free of water. The Contractor shall control surface runoff so as to prevent entry or collection of water in excavations or in other isolated areas of the site.

g. Before dewatering is started, submit to the Contracting Officer for approval the method, installation and details of the dewatering system the Contractor proposes to use. Review by the Contracting Officer of the method, installation and operation and maintenance details submitted by the Contractor shall not in any way be considered to relieve the Contractor from full responsibility of errors therein or from the entire responsibility for complete and adequate performance of the system in controlling the water level in the excavated areas. The Contractor shall be solely responsible for proper installation, operation, maintenance, and any failure of any component of the dewatering system for this Contract.

h. The flow for the baseline deep dewatering system (all installed wells) is anticipated to range from 10 to 300 gallons per minute (gpm) per well. The total flow for the passive pressure relief well system (all installed passive relief wells, Section 02525, RELIEF WELLS) is anticipated to be less than 600 gpm. The actual rates may vary according to bedrock and hydrogeologic conditions.

i. The Contractor shall leave the deep dewatering well system (including pumps, wells, header pipe, tanks, materials, etc.) in place after the end of this contract. The system shall become the property of the Government. Prior to the turnover of the system, it shall be inspected by the Contractor and the Contracting Officer. Any defects or non-working components shall be replaced with new equipment at no additional cost to the Government.

j. Water generated during development, well tests, and dewatering system tests must be disposed of in accordance with local, state and federal standards. See also Section 01060, WATER QUALITY STANDARDS in Division 1

1.7 QUALIFICATIONS

A Washington State licensed hydrogeologist (WAC 308-15) shall provide supervision and observe all borehole logging, drilling, well installation, developing and testing activities. The driller shall be licensed in the State of Washington, according to the state requirements. The Contractor shall have a minimum of 10 years of well installation and dewatering experience WAC 173-162.

1.8 BOREHOLES AND DEWATERING WELLS

Before starting construction of the well, a borehole of at least 12 inches in diameter shall be drilled at the location of the well into the target water bearing stratum extending to a minimum of 100 feet and a maximum of 200 feet below elevation 1021. The actual depth shall be determined based on the well production and the response of the adjacent vibrating wire piezometers during drilling. Mud rotary drilling shall not be permitted.

Boreholes should be drilled in a manner to protect the subsurface from surface contamination. The borehole shall be used to determine the expected yield from the well and the water quality. The borehole shall be cased, and screened in accordance with these specifications. This well may be considered as the permanent well, if it is in accordance with these specifications. If this well is not used for the permanent well, it shall be abandoned as specified in paragraph WELL DECOMMISSIONING/ABANDONMENT. A minimum of ten (10) dewatering wells are required, four (4) along the south edge of the excavation on approximately 50-foot centers; three (3)along the north edge on 50 to 25-foot centers; one on the west edge of the excavation (see Plate GT4.5 for approximate well locations) and two within the excavation, along the east side adjacent to the cofferdam.

1.9 ABANDONMENT OF WELLS

If the Contractor fails to construct a well of the required capacity, or if the well is abandoned because of loss of tools, or for any other cause, the Contractor shall abandon the hole as specified in paragraph WELL DECOMMISSIONING/ABANDONMENT.

1.10 NOTIFICATION

The Contracting Officer shall be notified 30 days prior to drilling. The Contractor shall be responsible for contacting the State of Washington in accordance with the applicable reporting requirements. Before beginning work, the local United States Geological Survey office (USGS) and the Washington State Department of Ecology shall be notified of the type and location of wells to be constructed, the method of construction and anticipated schedule for construction of the wells. The Contractor shall provide a copy of each start card for the Contracting Officer.

1.11 DELIVERY, STORAGE, AND HANDLING

Well materials shall be stored and maintained in a clean, uncontaminated condition throughout the course of the project. Filter pack material shall not be allowed to freeze before installation.

1.12 SITE CONDITIONS

Access to each well site, including any utility clearance, permits, licenses, or other requirements and the payment thereof necessary for execution of the work, is the responsibility of the Contractor. The Contractor shall visit each proposed well location to observe any condition that may hamper transporting equipment or personnel to the site. If clearing, or relocation is necessary, the Contractor, and the Contracting Officer shall agree on a suitable clearing, or relocation plan, and the location of any required access road.

PART 2 PRODUCTS

2.1 CASING

Casing and well screen shall be installed within each borehole to prevent the collapse of formation material. All casing, screen, and other well material shall be of compatible materials to prevent galvanic reaction between components of the completed well. Casing shall be of sufficient strength to prevent casing collapse or breakage due to installation, formation slough, or filter pack placement. Metal or Schedule 80 PVC will be accepted. Centralizers shall be used to maintain the casing in the

center of the borehole.

2.1.1 Casing and Couplings

Casing shall be new 8 inch diameter, minimum. Metal or Schedule 80 PVC will be accepted. Joints shall be either threaded and coupled, or field welded in accordance with AWWA C206.

2.2 WELL SCREENS

Well Screens shall prevent the collapse of formation material into the well and shall be a minimum of 8 inches nominal diameter, and shall be directly connected to the bottom of the inner casing by an approved method. The length of the screen shall be sufficient to provide an intake area capable of passing not less than the minimum required yield of the well, at an entrance velocity not exceeding 0.1 fps and shall generally extend from about 3 feet below the bottom of the seal to the well bottom. The opening, or slot size of the screen, shall be determined by the Contractor, be compatible with the material surrounding the screen, and shall be submitted for approval as part of the well installation plan. The well screen shall be of sufficient size and design to hold back and support the gravel used in the filter pack envelope,if required, and in-situ material surrounding the screen. The screen and all accessories required for satisfactory operation shall be essentially standard products of manufacturers regularly engaged in the production of such equipment. The screen shall be of sufficient strength to prevent screen collapse or breakage. Metal or Schedule 80 PVC will be accepted. Field constructed screen is not acceptable. "Blanks" in the well screen may be utilized in nonproductive zones, or where centering devices are needed in the screened area, and shall be considered "casing." The bottom section, below the screen, shall be sealed watertight by means of a welded end cap of the same material as the well screen. Centralizers shall be used to maintain the well screen in the center of the borehole.

2.2.1 Metal Screen

If metal screens are used then the screen shall be of an approved wire-wound type and shall be type 304 or type 316 stainless steel, conforming to the applicable requirements of AWWA A100. A wire-wound screen manufactured with supporting bars or core of material different from the wire will not be acceptable. Joints shall be made of threaded couplings of the same material as the screens or by brazing or welding in accordance with AWWA C206.

2.3 FILTER PACK

Filter pack material (if required by state standards or for formation and/or well stabilization) shall be a product of a commercial sand and gravel supplier, shall be properly sized and graded for the surrounding soil/rock encountered, and shall be composed of clean, round, hard, waterworn siliceous material, free of flat or elongated pieces, organic matter, or other foreign matter. The filter material shall be of a size which will allow the maximum flow of water into the well and must prevent the infiltration of native sand and silt. The filter material must be graded to prevent entry through screen openings. The gradation of the filter material shall be such that the uniformity coefficient is not more than 2.5. The filter material shall be placed as directed.

2.4 BENTONITE SEAL

The bentonite seal, intended to keep grout from entering the filter pack, shall consist of hydrated granular, or pelletized, sodium montmorillonite furnished in sacks or buckets from a commercial source and shall be free of impurities which adversely impact the water quality. If the bentonite seal is located above any borehole fluid levels, a layer of fine sand shall be placed at the top of the bentonite seal, to provide an additional barrier to any downward migration of grout.

2.5 CEMENT AND BENTONITE GROUT

2.5.1 Cement Grout

Cement grout shall consist of Portland cement conforming to ASTM C 150, Type I or II, sand and water. Cement grout shall be proportioned not to exceed 2 parts, by weight, of sand to 1 part of cement with not more than 6 gallons of water per 94 lb bag of Portland cement, with a mixture of such consistency that the well can be properly grouted. No more than 5 percent by weight of bentonite powder may be added to reduce shrinkage.

2.5.2 Bentonite Grout

High-solids bentonite grout shall be made from sodium bentonite powder and/or granules. Water from an approved source shall be mixed with these powders or granules to form a thick bentonite slurry. The slurry shall consist of a mixture of bentonite and the manufacturer's recommended volume of water to achieve an optimal seal. The slurry shall contain at least 20 percent solids by weight and have a density of 9.4 lb/gallon of water or greater.

2.6 PUMP

Pump shall be an approved submersible type with a capacity sufficient to deliver 10 to 300 gpm. The pump shall be connected to the pump controls by a three-wire drop line or equivalent. Piping for the well drop line shall be galvanized steel pipe conforming to ASTM A 53/A 53M. The pump motor shall be of sufficient size to operate the pump under the maximum operating conditions without exceeding its rating. Pump shall be equipped with necessary controls to provide for automatic operation of the pump.

2.7 POWER SUPPLY AND BACKUP GENERATORS

The electrical service used for dewatering shall be separate from all other Contractor electrical requirements and dedicated solely to the operation of the dewatering system. A backup generator shall be supplied to provide electrical service in case of a system breakdown.

PART 3 EXECUTION

3.1 PROTECTION OF EXISTING CONDITIONS

The Contractor shall maintain existing survey and instrument monuments, instrumentation conduits, and wells and protect them from damage from equipment and vehicular traffic. Any items damaged by the Contractor shall be repaired by the Contractor. Wells requiring replacement due to Contractor negligence shall be re-installed according to these specifications. Wells scheduled for abandonment shall be protected from damage so that abandonment may be performed according to these specifications. Prior to excavation, the Contractor shall locate the

existing outlet tunnel and position all wells a minimum of 3 feet away from the existing tunnel. Dewatering wells are approximately located on Plate GT4.5. The actual location shall be determined by the Contractor and shall also be a minimum of 3 feet away from any proposed structures or tunnels.

3.2 PREPARATION

3.2.1 Water Source

If well drilling/installation requires the use of water the Contractor shall use water from the reservoir or Well 219. If the Contractor chooses to use a water source other than the reservoir or Well 219, the Contractor shall, prior to its use at the site, sample and test the water source, and obtain approval from the Contracting Officer. The Contractor shall be responsible for locating the source, obtaining the water from the source, transporting it to, and storing it at the site.

3.2.2 Observation Well Monitoring

The Contractor shall monitor observation wells and instrumentation on an hourly frequency prior to well drilling/installation activities for a minimum of two weeks. The Contractor shall also monitor these during drilling activities, including well development, to assess dewatering well productivity and radius of influence.

3.3 WELL CONSTRUCTION

The drilling method shall be as approved by the Contracting Officer and shall conform to all state and local standards for water well construction. Mud rotary drilling shall not be permitted. The execution of the work shall be by competent workers and shall be performed under the direct supervision of a licensed well driller. The drilling method shall prevent the collapse of formation material against the well screen and casing during installation of the well. The inside diameter of any casing used shall be sufficient to allow accurate placement of the screen, riser, centralizer(s), filter pack (if required), seal and grout. Casing pipe, well screens, and joint couplings shall be of compatible materials throughout each well. The well shall be a filter pack well or a naturally developed well. The hole below the outer casing shall penetrate the water bearing stratum a sufficient depth to produce the required amount of water and required drawdown at observation points without causing excessive velocities through the aquifer. During construction of the wells, precautions shall be used to prevent tampering with the well or entrance of foreign material. Runoff shall be prevented from entering the well during construction. If there is an interruption in work, such as flooding, overnight shutdown or inclement weather, the well opening shall be closed with a watertight uncontaminated cover. Surface protection is required to protect the well from flood inundation. The cover shall be secured in place or weighted down so that it cannot be removed except with the aid of the drilling equipment or through the use of drill tools. Typical well details are provided on Plate GT4.5.

3.4 WELL DEVELOPMENT

Within 7 days of completion of each well, but no sooner than 48 hours after cement grouting is completed, the well shall be developed. Predevelopment, or development after the filter pack has been installed, but before the annular seal is installed, may be initiated before this minimum 48 hour period. The well shall be developed in accordance with the Well

Installation Plan, by approved methods until the water pumped from the well is substantially free from sand, and until the turbidity is less than 5 on the Jackson Turbidity Scale specified in AWWA EWW. Developing equipment shall be of an approved type and of sufficient capacity to remove all cutting fluids, sand, rock cuttings, and any other foreign material. The well shall be thoroughly cleaned from top to bottom before beginning the well tests. Development shall be performed using only mechanical surging, over pumping, or a combination thereof per ASTM D 5521. Details of the proposed development method shall be included in the Well Installation Plan. At the time of development of any well, the well shall be free of drawdown or surcharge effects due to pump testing, developing or drilling at another location. The Contractor shall be responsible for maintaining at the well site the needed access and work area and clearance, necessary to accomplish development. The Contractor shall furnish, install, or construct the necessary discharge line and troughs to conduct and dispose of the discharge. Development shall be conducted to achieve a stable well of maximum efficiency. During predevelopment of the well, filter pack material shall be added to the annular space around the screen to maintain the top elevation of the filter pack to the specified elevation. The Contractor shall provide an open tube or other approved means for accurately determining the water level in the well under all conditions. If, at any time during the development process it becomes apparent in the opinion of the Contracting Officer that the well may be damaged, development operations shall be immediately terminated. The Contracting Officer may require a change in method if the method selected does not accomplish the desired results. The Contracting Officer may order that wells which continue to produce excessive amounts of fines after development for 6 hours be abandoned, plugged, and backfilled, and may require the Contractor to construct new wells nearby at no additional cost to the Government. All materials pulled into the well by the development process shall be removed prior to performing the well test.

3.4.1 Intermittent Pumping

Intermittent pumping shall be performed by pumping the well at a capacity sufficient to produce a rapid drawdown, stopping the pump (backflow through pump will not be permitted) to permit the water surface to rise to its former elevation, and repeating this procedure. Cycle time for this procedure will vary as directed but will not be more than 3 cycles per minute. A deep well turbine pump, or electric submersible pump with check valve, shall be used with any attachment necessary to accomplish rapid starting and stopping for intermittent pumping. The intake shall be set at least 10 feet below the maximum expected drawdown in the well. Prior to commencing intermittent pumping, and periodically during development by this method, all sand and/or other materials shall be removed from inside the screen. The amount of drawdown may be decreased if, in the opinion of the Contracting Officer, the efficiency of the well might otherwise be impaired.

3.4.2 Surging

Surging of the well shall require use of a circular block, or multiple blocks, which are approximately 1 inch smaller in diameter than the inside diameter of the well and are constructed of a material which will not damage the screen if the block comes in contact with the screen, and a bailer or pump to remove materials drawn into the well. The surging shall be continued for a period until little or no additional material from the foundation or filter pack can be pulled through the screen. The surge block shall be moved by a steady motion up and down the full length of the

well screen. Prior to commencing surging, and periodically during development by this method, all sand and/or other materials shall be removed from inside the screen. All materials pulled into the well by the surging process shall be removed by the Contractor.

3.4.3 Well Development Criteria

A well development record shall be maintained in accordance with paragraph Well Development Records. Development is complete when all of the following criteria are met:

a. Well water is clear to the unaided eye and tested turbidity is less than 5 NTU,

b. Sediment thickness in the well is less than 1 percent of the screen length,

c. A minimum of three times the standing water volume in the well is removed plus three times the volume of all added water and drilling fluid lost during drilling and installation of the well is removed, and

d. The length of time to achieve full water level recovery in the well has stabilized.

3.5 DEWATERING WELL ACCEPTANCE CRITERIA

After well development and during testing (paragraph WELL CAPACITY TEST), the well efficiency shall be determined for each well. For individual well acceptance, a well efficiency of 60% is required.

3.6 DEWATERING

a. The Contractor shall drill and install deep dewatering wells, and passive pressure relief wells (Section 02525, RELIEF WELLS)consistent with the requirements of this specification. The Contractor shall perform a dewatering system test for system acceptance and shall install additional wells as directed by the Contracting Officer.

b. The Contractor shall, in the following order:

1) install, develop, step-test(see paragraph WELL CAPACITY TEST) and operate a minimum of eight deep dewatering wells, after grouting activities but prior to excavation activities;

2) perform a dewatering system test (see paragraph DEWATERING SYSTEM ACCEPTANCE) and possibly install additional deep dewatering wells, prior to excavation activities;

3) continue to monitor dewatering activities and site groundwater levels, during excavation activities;

4) install two additional deep dewatering wells (DW-9 and DW-10) and passive relief wells according to Section 02525, RELIEF WELLS, and Plate GT4.5;

5) assess groundwater conditions. If required, additional deep dewatering wells should be installed. The need for these

additional wells will be dependent on the effectiveness of the dewatering system.

c. Provide sufficient number of pumps (one pump for each well) with adequate capacity at the site. Provide appropriate sumps and ditches.

d. Provide backup power generation and minimum 20% dewatering system components, including valves, flowmeters, pumps and piping, and devise emergency procedures for maintaining continuous uninterrupted groundwater control operations. The recovery of water levels in the rock may be rapid if pumping is interrupted. Stand-by equipment shall be installed and ready to operate to assure continuous pumping in the event that any or all of the dewatering system becomes inadequate.

e. Maintain the dewatering system during all phases of construction.

f. Provide adequate protection and warning signs where construction equipment crosses over, or is in the vicinity of discharge piping.

g. The Contractor shall provide separate flowmeters and totalizers at each of the main line headers for the deep wells, and seepage collection distribution piping so that flow rates can be monitored and recorded on a daily basis.

h. The Contractor shall be responsible for testing, operating, maintaining, and daily monitoring the dewatering system. System maintenance shall include, but not be limited to, at least daily supervision by some responsible person skilled in the operation, maintenance, and monitoring of flow rates from wells and sumps, replacement of system components, and any other work required to maintain the performance of the system. The system operation shall be continuous, and interruptions shall not be permitted.

i. Sufficient personnel skilled in the operation, maintenance, and replacement of the dewatering system components shall be on site 24 hours per day, seven days a week, including holidays, at all times when the system is in operation.

j. The Contractor shall maintain records and submit a weekly monitoring report of the Groundwater Control System installation and performance data. The records shall include geologic and hydrogeologic conditions, well depths, elevations, dates of installation, approximates rates of flow, total volume of water removed, daily water levels, and sump and piping locations. Daily flow rates shall be recorded during operation of the dewatering system.

3.7 Well Capacity Test

The Contractor shall furnish and install an approved temporary test pump, near the well bottom with discharge piping of sufficient size and length to conduct the water being pumped to point of discharge, and equipment necessary for measuring the rate of flow and water level in the well. Four (4) to eight (8) hour step-drawdown capacity tests shall be performed while measuring the pumping rate, drawdown at the pump well, drawdown at the observation wells and the reservoir pool level. Measurements shall be recorded every 1/2 minute during the first 5 minutes after starting the

pump; then every 5 minutes for the duration of the step. Readings shall be taken until the water level stabilizes or one hour minimum. This measurement schedule shall be repeated for each step. Observation wells (piezometers) shall be read on the same schedule as the pump well. During the step-drawdown test, the pumping rate shall be increased in steps. Drawdown at the end of the final step should be within 5 feet of the pump intake. Specific capacity shall be measured for each step. The well efficiency shall be determined for each well using water level measurements made at the pump well and nearby observation wells. If the specific capacity cannot be maintained, the well efficiency is less than 60% or the drawdown is not observed at observation wells for the test period, the capacity tests shall be terminated and the dewatering well re-installed at no additional cost to the Government. When the pump is shut off, water level readings shall be taken during the rebound period for the same intervals of time as the drawdown test. The record of the test, in triplicate, shall be delivered to the Contracting Officer.

3.8 INSTALLATION OF PUMP

The well pump shall be installed within 5 feet of the bottom of the well. The pump shall be secured at the required depth as recommended by the pump manufacturer. After installation of the pumping units and appurtenances is complete, operating tests shall be carried out to assure that the pumping installation operates properly. Tests shall assure that the pumping units and appurtenances have been installed correctly, that there is no objectionable heating, vibration, or noise from any parts, and that all manual and automatic controls function properly.

3.9 DEWATERING SYSTEM ACCEPTANCE

The dewatering system shall be designed, installed, and successfully tested prior to excavation. The system shall be operated for a minimum of 14 days to simulate dewatering requirements necessary when the excavation is at final subgrade, determine if the system will lower water levels below the excavation, and determine the required pumping rates to do so. If the system does not meet the requirements of the dewatering plan (paragraph DEWATERING PLAN), the Contractor shall install additional dewatering wells. System testing shall continue until the requirements are satisfied, and as directed by the Contracting Officer.

3.10 SITE CLEAN-UP

After completion of the work, tools, appliances, surplus materials, temporary drainage, rubbish, and debris incidental to work shall be removed. Excavation and vehicular ruts shall be backfilled and dressed to conform with the existing landscape. Utilities, structures, roads, fences, or any other pre-existing item which must be repaired or replaced due to the Contractor's negligence shall be the Contractor's responsibility; repair or replacement shall be accomplished prior to completion of this contract.

3.11 DRILLING WASTE DISPOSAL

Slurry, drill cuttings, rock core; other solid or liquid material bailed, pumped, or otherwise removed from the borehole during drilling, installation, completion, and well development procedures; and fluids from material/equipment decontamination activities shall be properly and legally disposed of by the Contractor.

3.12 SURVEYS

As-built location for each well/borehole in horizontal position and elevation including:

1. Elevation referenced to the vertical datum N.G.V.D. (1929) to an accuracy of ± 0.01 foot, together with the location of the point used for the elevation measurement for both the ground surface adjacent to the well borehole and the highest point on the top of the riser pipe.

2. Horizontal position referenced to the North American Datum of 1983 (NAD 83) to an accuracy of ± 0.1 foot, together with the location of the point used for horizontal position measurement.

3. A location sketch showing the instrument number, taped horizontal distances to the instrument, measured to an accuracy of ± 1 foot from permanent physical features in the field. A sufficient number of taped measurements shall be included on the sketch to establish a unique horizontal position for the instrument. If such features are removed, the Contractor shall provide a new sketch, prior to removal, with taped measurements to other features.

3.13 WELL DECOMMISSIONING/ABANDONMENT

Any well disapproved by the Contracting Officer, or any well decommissioned/abandoned by the Contractor for any reason shall be decommissioned/abandoned according to the requirements of the State of Washington (WAC 173-160), ASTM D 5299, and the requirements of these specifications. Well decommissioning/abandonment includes the removal of all materials left in the borehole/well, excluding the filter pack, and including backfill materials, casing, screen, and any other material placed into the hole before the decision was made to abandon the borehole/well. The Contractor shall maintain a well decommissioning/abandonment record as specified in paragraph Well Decommissioning/Abandonment Records. Groundwater levels, if encountered before the decision is made for decommissioning/abandonment, shall be measured in all borings prior to backfilling. These water levels shall be included in the well decommissioning/abandonment records. No well shall be decommissioned/abandoned without the approval of the Contracting Officer.

3.14 DOCUMENTATION AND QUALITY CONTROL REPORTS

The Contractor shall establish and maintain documentation and quality control reports for well construction and development to record the desired information and to assure compliance with contract requirements, including, but not limited to, the following:

3.14.1 Installation Diagrams

The well will not be accepted before the geologic logs and installation diagrams are received. The diagram shall illustrate the as-built condition of the well and include, but not be limited to, the following items:

a. Name of the project and site.

b. Well identification number.

c. Name of driller and name and signature of the geologist preparing diagram.

d. Date of well installation.

e. Description of material from which the well is constructed, including well casing/riser pipe and screen material, centralizer composition, diameter and schedule of casing and screen, gradation of filter pack, lithologic description, brand name (if any), source, and processing method, and method of placement of the filter pack, bentonite seal type (pellets, granules, chips, or slurry), grout type (cement or high-solids bentonite) and type of protective cover (protective casing or flush-to-ground),if used.

f. Total depth of well.

g. Nominal hole diameter.

h. Depth to top and bottom of screen, and filter pack.

i. Depth to top and bottom of any seals installed in the well boring (grout or bentonite).

j. Type of cement and/or bentonite used, mix ratios of grout, method of placement and quantities used.

k. Elevations/depths/heights of key features of the well, such as top of well casing/riser pipe, top and bottom of protective casing (if used), ground surface, the depth of maximum frost penetration (frost line), bottom of well screen, top and bottom of filter pack, and top and bottom of seal.

l. Other pertinent construction details, such as slot size and percent open area of screen, type of screen, and manufacturer of screen.

m. Well location by coordinates. A plan sheet shall also be included showing the coordinate system used and the location of each well. A plan sheet is not required for each well installation diagram; multiple wells may be shown on the same sheet.

n. Static water level in the well and the reservoir pool level upon completion of the well.

o. Special problems and their resolutions; e.g., grout in wells, lost casing, or screens, bridging, etc.

p. Description of surface completion.

q. Geologic log describing rock and hydrogeologic conditions.

3.14.2 Well Development Records

A well development record shall be prepared for each well installed under the supervision of the geologist present during well installation operations. Information provided on the well development record shall include, but not be limited to, the following:

a. Date, time, and elevation of water level in the well, before development.

b. Depth to bottom of well, name of project and site, well identification number, and date of development.

c. Method used for development, to include size, type and make of equipment, bailer, and/or pump used during development.

d. Time spent developing the well by each method, to include typical pumping rate, if pump is used in development.

e. Volume and physical character of water removed, to include changes during development in clarity, color, particulates, and odor.

f. Volume of water added to the well, if any.

g. Volume and physical character of sediment removed, to include changes during development in color, and odor.

h. Source of any water added to the well.

i. Clarity of water before, during, and after development. Nephelometric turbidity unit (NTU) measurements.

j. Total depth of well and the static water level as per ASTM D 4750 from top of the casing, and the reservoir pool level immediately after pumping/development, and 24 hours after development.

k. Time for recovery of water levels to the static water level.

l. Name and job title of individual developing well.

m. Name and/or description of the disposal facility/area, for the waters removed during development.

3.14.3 Well Decommissioning/Abandonment Records

Decommissioning/abandonment records shall include, as a minimum, the following:

a. Project name.

b. Well or borehole number.

c. Well/boring location, depth and diameter.

d. Date of decommissioning/abandonment.

e. Method of decommissioning/abandonment.

f. All materials used in the decommissioning/abandonment procedure and the interval in which test materials were placed.

g. Casing, and or other items left in hole by depth, description, and composition.

h. Description and total quantity of grout used initially.

i. Description and daily quantities of grout used to compensate for settlement.

j. Water or mud level (specify) prior to grouting and date measured.

k. The reason for decommissioning/abandonment of the well/test hole.

3.14.4 Survey Maps and Notes

A tabulated list of all wells and monuments, copies of all field books, maps showing the locations, and elevations of all wells, datum used (e.g. state plane NAD27, NAD83, UTM, etc.), elevation datum, units of measurement, and all computation sheets shall be prepared as a submittal. The tabulation shall consist of the designated number of the well or monument, the X and Y coordinates, and all the required elevations. Also, a diagram showing where on the top of the well the elevation was determined by the surveyor shall be prepared.

-- End of Section --

SECTION 02525

RELIEF WELLS

PART 1 GENERAL

See paragraphs 1.6, 1.7 and 3.6 in Section 02521 WATER WELLS regarding dewatering.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33	(1999ae1) Concrete Aggregates
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM D 75	(1987; R 1997) Sampling Aggregates
ASTM E 11	(1995) Wire-Cloth Sieves for Testing Purposes

STATE OF WASHINGTON DEPARTMENT OF ECOLOGY (WAC)

WAC 173-160	(1998) State of Washington, Department of Ecology, Minimum Standards for Construction and Operators
WAC 173-162	(1998) State of Washington, Department of Ecology, Regulations and Licensing of Well Contractors and Operators

STATE OF WASHINGTON DEPARTMENT OF LICENSING (WAC)

WAC 308-15	(2002) The law relating to Geologists

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Protection from Damage

Submit methods used to protect wells from damage from all construction activities including blasting.

SD-02 Shop Drawings

Shop Drawings; G

Submit shop drawings.

SD-03 Product Data

Well Screen; G

Before installation, all well screen shall be approved.

Filter Pack; G

The filter pack material and its gradation shall be approved before it is placed.

Cement Grout Mixture Proportion; G

Submit the cement grout mixture proportion to be used in plugging abandoned wells.

SD-06 Test Reports

Tests

Submit sampling and testing reports for each relief well, logs of the borings, well screen and riser pipe, and backfill material. Register each well with the state as required by the state in which the well is installed.

1.3 REGULATORY REQUIREMENTS

The state statutory and regulatory requirements form a part of this specification to the extent referenced.

1.4 PROJECT/SITE CONDITIONS

1.4.1 Shop Drawings

The shop drawings shall present details of the Contractor's methods for drilling, coupling well screen and riser sections together, placement of centralizers, installing the well screen and riser, and limit(s) of backfilling. The shop drawings shall show the type of screen and size; slot size, shape and pattern; bottom plug tailpipe material; and installation detail. The riser pipe, check valve(s) and well discharge details shall also be shown on the shop drawings. Any contractor-proposed substitutes or alternates in material construction details or methods must be presented in the shop drawings. No phase of the work shall be initiated until all shop drawings concerning that activity have been approved.

1.4.2 Location

The exact location of each well, with respect to distance from the Juvenile Fish Passage Facility construction baseline, will be determined in the field by the Contractor's licensed hydrogeologist (WAC 308-15) prior to drilling and approved by the Contracting Officer. Relief wells shall be surveyed according to Section 02521,WATER WELLS, paragraph SURVEYS. The passive pressure relief wells will be installed on 5-foot centers along the

west side of the proposed cofferdam (east side of excavation) and near the middle of the excavation. A minimum of 20 passive pressure relief wells are required. The total number of wells and spacings may be modified by the Contracting Officer as the work proceeds. Approximate relief well locations are provided on Plate GT4.5.

1.4.3 Depth of Well

The pressure relief well depth shall extend to 60 feet below final excavation subgrade.

1.4.4 Obstructions Encountered

If obstructions are encountered during drilling which, in the opinion of the Contracting Officer, render it impracticable to complete the well to the directed depth, the Contracting Officer may direct the Contractor to abandon the well, plug the hole by backfilling with approved material by an approved procedure, and construct another well at an adjacent site.

1.4.5 Well Design

The pressure relief wells must be drilled and constructed in accordance with state guidelines WAC 173-160. The wells shall be designed to maximize the flow of formation water to the surface. The Contractor shall meet regulation and licensing requirements in accordance with WAC 173-162. The Contractor shall provide a licensed hydrogeologist (WAC 308-15) to determine the diameter of the well screen (minimum 2-inch), size of openings, the lengths and positions of the screens, and the gradation of the material for the filter pack (if required by state standards or for formation and/or well stability)which is to be installed within and around the well screen. A protective cover system shall be installed to allow water to exit the wells and prevent debris from entering the wells. Typical well details are provided on Plate GT4.5.

1.4.6 Well Construction Sequence

The Contractor shall install relief wells prior to or during excavation activities, and prior to excavation below elevation 1,074 feet.

PART 2 PRODUCTS

2.1 WELL SCREEN

The Contractor may, at his option, furnish and install well screen constructed of stainless steel or PVC. Screen openings shall be uniform in size and pattern, and shall be spaced approximately equally around the circumference of the pipe.

2.1.1 PVC Well Screen

If PVC is used, the well screen shall be of PVC with machine slots providing maximum open area and equivalent to that manufactured by Johnson Screens, St. Paul, MN 55164, telephone (612) 636-3900.

2.1.1.1 Couplings

Couplings (if used) for stainless steel well screen shall consist of the same material as the well screen and shall be threaded. PVC couplings (if used) shall be threaded or glued and screwed. The couplings shall conform

in design to the couplings recommended by the manufacturer of the well screen.

2.2 RISER PIPE

The relief well riser pipe material and method of manufacture shall conform to the requirements specified in paragraph WELL SCREEN, except that the screen perforations or opening shall be omitted and metal casing may be used. The relief well riser pipe diameter and discharge details shall be approved by the Contracting Officer. Couplings to the well screen and between riser pipe sections shall be as specified in paragraph COUPLING.

2.3 FILTER PACK

Material for the filter pack around and inside of the riser pipes and screens shall be composed of rounded, colored (for field location and identification) hard, tough, and durable particles free from adherent coating. The filter pack shall not be crushed stone. The filter pack material shall contain no detrimental quantities of organic matter nor soft, friable, thin, or elongated particles in accordance with the quality requirements in ASTM C 33, Table 1 and Table 3, Class 5S, and in ASTM E 11, Table 1. The filter pack must be graded to prevent the entry of native material through the screen openings.

PART 3 EXECUTION

3.1 DRILLING

Wells must be drilled by an approved method, which will insure proper placement of the well screen, riser pipe, and filter pack. Methods which involve radical displacement of the formation, or which may reduce the yield of the well, will not be permitted. Mud rotary drilling shall not be permitted. Excavated material shall be disposed of as directed.

3.2 INSTALLATION OF RISER PIPE AND SCREEN

3.2.1 Assembly

All riser pipe and screen shall be new and all couplings and other accessory parts shall be securely fastened in place. The successive lengths of pipe shall be arranged to provide accurate placement of the screen sections in the bore hole. Centralizers shall be attached to the assembled riser pipe and screen in such numbers and of a type that they will satisfactorily center the riser pipe and screen in the well and will hold it securely in position while the filter pack material is being placed.

3.2.2 Joints

Sections of relief well pipe shall be joined together as specified in paragraph COUPLINGS. Joints shall be designed and constructed to have the strength of the pipe and where possible a strength capable to support the weight of the relief well stem as it is lowered into the hole. When not practicable to construct joints that will support the weight of the relief well stem, the stem shall be supported at the lower end by any approved means that will assure that the joints do not open while being lowered into place in the well.

3.2.3 Installation

The assembled riser pipe and screen shall be placed in the bore hole in such manner as to avoid jarring impacts and to insure that the assembly is centered and not damaged or disconnected. The screen should be suspended in the hole and not resting on the bottom of the hole. After the screen and riser pipe have been placed, a filter pack shall be constructed around and inside of (required for well strength in order to withstand rock-blasting activities) the screen section as specified in paragraph FILTER PACK PLACEMENT and the well developed as specified in paragraph DEVELOPMENT. The top of the riser pipe shall be held at the designated elevation during placement of the filter pack.

3.2.4 Discharge Water

The Contractor must remove all water discharging from the relief wells; water must be diverted and/or pumped from the excavation without significant head losses at the relief well.

3.3 FILTER PACK PLACEMENT

After the well screen and riser pipe have been installed, the filter pack material shall be placed by tremie, when using a well graded material, in an approved manner such that segregation will not occur. When using a uniform graded filter material, the material may be poured around and inside of the well screen at a rate that will prevent bridging of the material. The material should be placed around all sides of the screen to assure that the screen is not pushed against the side of the bore hole causing the screen to come in contact with foundation material or prevent the proper thickness of filter from being placed uniformly around the screen. The filter pack shall have a minimum thickness of 2 inches between the outside of the well screen and the natural formation. The filter pack shall be placed at a constant rate from the start of placement until it has reached the elevation a minimum of 2 feet above the top of the well screen. If a tremie is required, a double string of tremie pipe shall be used. The pipes shall be placed on opposite sides of the screen and/or casing, that is, 180 degrees apart, and shall be guided in such a manner that they will remain in this position throughout the placing process. The tremie pipes shall be set in place, filled completely with filter pack prior to being lifted off the bottom of the hole. The filter pack in the tremie pipe shall be kept a minimum of 1 foot above the water surface in the well throughout the placing process. In no case shall the gradation of the filter pack fall outside of the range specified in paragraph FILTER PACK.

3.4 DEVELOPMENT

3.4.1 General

Following placement of filter pack materials outside of the casing and screen, the Contractor shall develop the relief well by surging, intermittent pumping, or other approved methods as may be necessary to give the maximum yield of water per foot of drawdown. The Contractor shall be responsible for maintaining at the relief well the needed access and work area and clearance in the relief well necessary to accomplish development. The Contractor shall furnish, install, or construct the necessary discharge line and troughs to conduct and dispose of the discharge a sufficient distance from the work areas to prevent damage. Development shall be conducted to achieve a stable well of maximum efficiency and shall be continued until water is clear to the unaided eye and sand content is minimized. As development proceeds, filter pack material shall be added to the annular space around the screen to maintain the top elevation of the

filter pack to the specified elevation. If, at any time during the development process it becomes apparent in the opinion of the Contracting Officer that the well may be damaged, development operations shall be immediately terminated. The Contracting Officer may require a change in method if the method selected does not accomplish the desired results. The Contracting Officer may order that wells which continue to produce excessive amounts of fines after development for 6 hours be abandoned, plugged, and backfilled, and may require the Contractor to construct new wells nearby. All materials pulled into the well by the development process shall be removed.

3.4.1.1 Surging

Surging of the well shall require use of a circular block which is approximately 1 inch smaller in diameter than the inside diameter of the relief well and is constructed of a material which will not damage the screen if the block comes in contact with the screen, and a bailer or pump to remove materials drawn into the well. The surging shall be continued for a period of approximately one hour or until little or no additional material from the foundation or filter pack can be pulled through the screen. The surge block shall be moved by a steady motion up and down the full length of the well screen. Prior to commencing surging, and periodically during development by this method, all sand and/or other materials shall be removed from inside the screen. All materials pulled into the well by the surging process shall be removed by the Contractor.

3.5 TESTS

3.5.1 Filter Pack Sampling and Testing

The Contractor shall verify that all materials conform to the specifications before delivery to the project. The particle size distribution of the filter pack shall be sampled and tested by the Contractor in accordance with ASTM C 136 and ASTM D 75. Prior to delivery to the project site, at least two samples of material should be collected and tested for every 750 tons produced under this contract. There shall be at least three particle size distribution tests on the filter pack.

3.5.2 Reports

Reports shall include, for each relief well, logs of the boring, elevations of the well screen, top of riser pipe, bottom of the tailpipe, filter pack gradation, quantity of filter pack added during development, and report of backfilling. The elevation of changes between materials on these logs shall be to the nearest 0.1 foot The log of backfill material shall include the filter pack particle size distribution test data, and notes concerning installation and development of the relief well. The relief well log shall be submitted to the Contracting Officer as part of the weekly quality control report specified in Section 01451 CONTRACTOR QUALITY CONTROL. The Contractor shall also submit a report of the well installation to the appropriate public agency and in the form required by state statutory and/or regulatory requirements specified in paragraph REGULATORY REQUIREMENTS.

3.5.3 Relief Well Inspection

Visual inspection of each relief well shall be performed periodically during excavation to ensure that each well is operating properly.

3.6 Well Protection

The Contractor shall protect all relief wells from damage from all construction activities including blasting and rock excavation.

-- End of Section --

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SECTION 02845

SOLDIER PILE WITH TIEBACKS RETAINING WALL

PART 1 GENERAL

1.1 DESCRIPTION

This work consists of furnishing and constructing soldier pile with tiebacks retaining walls at locations shown and in close conformity to the lines, grades, and dimensions shown on the plans and shall conform to the requirements herein.

1.2 RELATED WORK

See the following sections for related work:

Section 02490, SOIL AND ROCK ANCHORS
Section 03100, STRUCTURAL CONCRETE FORMWORK
Section 03201, STEEL BARS AND WELDED WIRE FABRIC FOR CONCRETE REINFORCEMENT FOR CIVIL WORKS
Section 03301, CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS
Section 05055, METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS
Section 05500, MISCELLANEOUS METAL

1.3 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 194	(2000) Chemical Admixture for Concrete
AASHTO T 23	(2000) Making and Curing Concrete Test Specimens in the Field

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 150	(1999a) Portland Cement
ASTM D 792	(2000) Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM D 1784	(1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
ASTM D 4716	(2000) Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head

STATE OF WASHINGTON DEPARTMENT OF TRANSPORTATION (WSDOT)

WSDOT Test Method 813	(2002) Field Method of Fabrication of 50 mm (2-in) Cube Specimens for Compressive Strength Testing of Grout and Mortars

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Tieback Wall Work Plan; G

Before the start of wall construction, the Contractor shall submit and have approved a work plan addressing the measures that will be employed to provide for the safety of traffic and the public. The work plan shall be signed by an engineer who is registered as a Civil Engineer in the State of Washington. As a minimum, the work plan shall include:

1. Detailed sequence and procedures for all phases of the wall installation.

2. List of the equipment and standby equipment to be utilized during installation of the tieback wall.

3. Qualifications of the workforce to be utilized in the wall installation.

4. The Contracting Officer shall take 2 weeks to review the tieback wall work plan.

Tieback Installation; G

Procedures and qualifications for altering piles for tieback installation shall be submitted for approval.

Mix Design; G

Mix Design shall be submitted for approval before installation.

SD-02 Shop Drawings

Tieback Drawings; G

Submit Working drawings and calculations for furnishing the specified number of tieback anchors providing the horizontal component and distribution of design force as provided by the tieback anchors shown in the plans.

SD-03 Product Data

Steel Solider Piles; G
Concrete; G
Reinforcing Steel; G
Geocomposite; G

Product data for all materials shall be reviewed and approved by the Contracting Officer.

SD-06 Test Reports

Concrete Mix Design; G

Concrete Mix Design Test Reports shall be submitted for Government approval.

SD-07 Certificates

Piles; G
Tiebacks; G

Certifications for piles and tiebacks shall be submitted to the Contracting Officer for approval.

PART 2 PRODUCTS

2.1 PILES

2.1.1 Soldier Piles

Steel soldier piles shall be of the size and quality as shown on the plans and as specified in Division 5 of the specifications.

2.1.2 Concrete Piles

Concrete filling for cast-in-place concrete piles is designated by compressive strength and shall have a minimum 28-day compressive strength of 4,000 psi, and shall conform to the plans and Division 3 of the specifications.

2.1.3 Reinforcing Steel

Reinforcing steel shall be Grade 60 and shall conform to Section 03201, STEEL BARS AND WELDED WIRE FABRIC FOR CONCRETE REINFORCEMENT FOR CIVIL WORKS.

2.1.4 Tiebacks

Tiebacks shall be of the size and quality as shown on the plans and as specified in Section 02490, SOIL AND ROCK ANCHORS.

2.2 Geocomposite

Manufactured core not less than 0.25 inch thick or more than 2 inches thick with one side covered with a layer of filter fabric.

Flow rate per ASTM D 4716 of at least 4.0 gallons per minute per foot of width at a hydraulic gradient of 1.0 and a minimum externally applied pressure of 3,800 psf.

PART 3 EXECUTION

3.1 PILE SHAFT EXCAVATION

Holes shall be drilled at the location and depth shown on the plans.

Drilled holes shall be accurately located and shall be drilled straight and true so the steel soldier piles meet the tolerances of being within 1 inch in each horizontal direction of the indicated position at each elevation. Holes which do not conform to the required tolerances shall be corrected at the Contractor's expense. Holes overdrilled by 6 inches or more shall be backfilled with concrete to required tip elevation as shown on the drawings.

Suitable casings shall be furnished and placed when necessary to control water or to prevent caving of the hole. Casing, if used in drilling operations, shall be removed from the hole as concrete is placed therein. The bottom of the casing shall be maintained not more than 5 feet nor less than one foot below the top of the concrete during withdrawal and placing operations unless otherwise permitted by the Contracting Officer. Separation of the concrete during withdrawal operations shall be avoided by hammering or otherwise vibrating the casing.

All loose materials existing at the bottom of the hole after drilling operations have been completed shall be removed before placing the cast-in drilled-hole (CIDH) pile and backfilling soldier pile with concrete.

Materials resulting from drilling holes shall be disposed of outside the site limits at the designated disposal areas.

Drilling mud or chemical stabilizers shall not be used except when permitted by the Contracting Officer.

Surface water shall not be permitted to enter the hole and all water in the hole shall be removed before placing reinforced concrete therein.

3.2 PILE INSTALLATION

Steel soldier piles shall not be driven.

Piles shall be installed, aligned and held securely for concreting in accordance with the approved procedures. Established tolerances shall be confirmed prior to placing concrete. Steel soldier piles shall be installed to a tolerance of within 1.0 inch in each horizontal direction of the indicated position at each elevation.

3.3 CONCRETE PLACEMENT

Unless otherwise noted, the proportioning, mixing, transporting, placing, curing, and finishing of the concrete shall be as per Section 03301 CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS.

Uncased excavations shall not be left open overnight; fill uncased excavations before work day is completed.

At the time concrete is placed, the excavation shall be free from accumulated seepage water in excess of 2 inches in depth and any loose material.

Concrete placement shall begin immediately after the pile placement has been approved by the Contracting Officer. Placement shall be continuous

throughout the length of the shaft, allowing only the necessary intervals for rodding concrete and pulling casings.

Free fall concrete may be used if there is no water in the shaft excavation and provided it is directed through a hopper equipped with a tube, elephant trunk, or equivalent to prevent segregation of materials, such that fall is vertical down center of shaft without hitting sides. The tube shall be in sections to permit the discharge end to be raised as the shaft is filled.

Concrete shall be of such workability as to require no vibrating and a minimum amount of rodding in the shaft length below 3 feet from the top.

The top 3 feet of shaft concrete shall be vibrated. Temporary casings shall be withdrawn before vibrating begins.

Once concrete is placed further work shall not proceed until the concrete has attained a compressive strength of not less than 2,600 psi.

3.4 REINFORCED CONCRETE FASCIA WALL

Concrete and reinforcement shall conform to Sections 03201, STEEL BARS AND WELDED WIRE FABRIC FOR CONCRETE REINFORCEMENT FOR CIVIL WORKS and 03301, CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS.

3.5 BANK EXCAVATION

Excavate to the level of the first lift to install the upper level of tiebacks.

Materials resulting from drilling holes shall be disposed of outside the site limits at the designated disposal areas.

3.6 TIMBER LAGGING INSTALLATION

Install initial level of the timber lagging after sufficient depth along adjacent soldier piles has been exposed by bank excavation. The timber lagging shall be Douglas Fir No. 1 Grade.

Lagging shall be secured in place during tieback installation, testing and lock off and excavation to the next level.

Subsequent levels of lagging shall be placed as installation and excavation moves downward.

3.7 TIEBACK ANCHORS

The fabrications, installation, and testing of the tieback anchors shall conform to Section 02490, SOIL AND ROCK ANCHORS, and as specified in this section.

Grouting equipment shall be capable of grouting at a pressure of at least 100 psi. The grout shall consist of Portland cement, water, and a water reducing admixture and shall be mixed in the following proportions:

Portland Cement Type 1 or II per ASTM C 150, 1 sack;
Water, 4.5 gallons maximum,;
Water Reducing Admixture per manufacturer's recommendation.
Fly Ash, (20 pounds maximum) is optional.

The water reducing admixture shall be limited to AASHTO M 194 Type A or D and shall not contain ingredients that may corrode steel (that is chlorides, fluorides, sulfates, or nitrates). Fly ash may be used at the option of the Contractor. The grout ejected from the anchor vent shall have a minimum flow of 15 seconds. The grout mix shall be injected within 30 minutes after the water is added to the cement. Test samples of 2-inch cubes shall be made in accordance with WSDOT Test Method 813 and stored in accordance with Method 2 of Field Operating Procedure for AASHTO T 23.

Smooth and corrugated plastic sheathing, including joints, shall be watertight. Polyvinyl chloride (PVC) sheathing shall conform to ASTM D 1784, Class 13464-B. High density polyethylene (HDPE) sheathing shall have a density between 0.940 and 0.960-gram/cm^3 as measured in accordance with ASTM D 792, A-2. Corrugated plastic sheathing shall be PVC or HDPE.

The transition between the corrugated plastic sheathing and the anchorage assembly shall be an approved detail that allows stressing to the design force without evidence of distress in the corrugated plastic sheathing.

Additional requirements for tiebacks with bar type tendons are as follows:

1. Corrugated sheathing for bar tendons shall have a nominal wall thickness of 40 mils.

Tieback anchors shall be installed in accordance with the manufacturer's recommendations. In case of a conflict between the manufacturer's recommendations and these special provisions, these special provisions shall prevail.

Water and grout from tieback anchor construction operations shall not be permitted to fall on public traffic, to flow across shoulders or lanes occupied by public traffic, or to flow into landscaping, gutters or other drainage facilities. Excessive amounts of water shall not be used in any of the drilling and the tieback anchor installation procedures.

The holes drilled in the foundation materials shall be drilled to a depth sufficient to provide the necessary bond length beyond the minimum unbonded length shown on the plans. The diameter of the hole shall be large enough to provide a minimum of one inch grout cover over the corrugated plastic sheathing for the frill-length of the tendon. Centralizers shall be used full-length of the tendon.

Tieback anchor holes in foundation material shall be drilled by either the rotary or percussion drilling method.

Prior to installing each tieback anchor into the anchor hole, the anchor shall be clean and free of oil, grease, din or other extraneous substance.

Tieback anchor steel shall be protected prior to completion of all grouting against rust, corrosion and physical damage. In addition, there shall be no evidence of distress in the plastic sheathing or crushing of the cement grout within the sheathing.

Tieback anchor grout placed in the drilled hole shall be placed using grout tubes.

Grout for all stages shall be injected at the low end of the void being filled and shall be expelled at the high end until there is no evidence of entrapped air, water or diluted grout.

After initial grouting, the tieback anchor shall remain undisturbed until the grout has reached a strength sufficient to provide anchorage during load testing.

Secondary grouting shall be completed after the tieback anchor has been locked off at the required load.

Bars for multiple bar tendons shall be stressed simultaneously.

Additional requirements for tiebacks with bar type tendons are as follows:

1. The bar tendons in the unbonded area shall be sheathed with smooth plastic that extends into the steel tube of the permanent tieback anchorage assembly, as shown on the plans. For this portion of smooth sheathing there is no minimum wall thickness and the sheathing shall be either PVC or HDPE.

2. In addition, bar tendons shall be sheathed full-length with corrugated plastic. The annular space between the bar and the corrugated sheathing shall be pregrouted prior to placing the tendons in the drilled hole.

3. There shall be a seal between the smooth sheathing and the corrugated sheathing at the top and bottom of the length of smooth sheathing.

4. For bar tendons, the initial grout in the drilled hole may be placed before or after insertion of the bar tendons.

5. For drilled holes 6 inches in diameter or less, the initial grouting outside of the corrugated plastic sheathing shall extend to 2 feet below the end of the steel tube of the anchorage assembly. For drilled holes greater than 6 inches in diameter, the initial grouting outside of the corrugated plastic sheathing shall be within the limits of the bonded length.

3.8 TESTING

All tiebacks shall be load tested by either a performance test or a proof test. Testing requirements are given in Section 02490, SOIL AND ROCK ANCHORS.

3.9 LOCK-OFF

After successful testing of the tieback anchors, the tieback anchors shall be locked off. The lock-off requirements are given in Section 02490, SOIL AND ROCK ANCHORS.

After lock-off, the grout shall be extended to the secondary grout level shown on the plans. At least 24 hours after the secondary grout has set, the remaining void in the steel tube and bearing plate shall be filled with grout. Grout shall be injected at the low end and expelled at the high end until there is no evidence of entrapped air or water. A minimum grout head of 2 feet shall be maintained until the grout has set.

The tieback anchor head or anchor nuts shall be enclosed with a grouted anchorage enclosure device. After grouting the steel tube, the bearing plate surface shall be cleaned, silicon sealant placed, and the anchorage

enclosure bolted in place. After bolting the anchorage enclosure in place, the void in the anchorage enclosure shall be filled with grout by injecting grout at the low end of the void and venting at the high end. Any holes in the top of the anchorage enclosure used for grout placement shall be cleaned and sealed with silicon sealant.

3.10 WALL DRAINAGE

Geocomposite drainage and weep hole material will be installed as lagging is installed.

Weep hole drains shall be installed in accordance with the plans.

3.11 BACKFILL

Voids between the lagging and excavated bank shall be backfilled in 8-inch layers and compacted. Backfill material shall be pervious pea gravel backfill.

3.12 CLEANUP

Grout, stains and other construction materials shall be cleaned from the lagging and exposed face of the soldier pile flange.

Protective coating on the soldier pile shall be repaired.

-- End of Section --

SECTION 02921

SEEDING

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Surface Erosion Control Material
Chemical Treatment Material

Manufacturer's literature including physical characteristics, application and installation instructions for equipment, surface erosion control material and chemical treatment material.

Equipment

A listing of equipment to be used for the seeding operation.

Delivery

Delivery schedule.

Quantity Check

Bag count or bulk weight measurements of material used compared with area covered to determine the application rate and quantity installed.

Seed Establishment Period

Calendar time period for the seed establishment period. When there is more than one seed establishment period, the boundaries of the seeded area covered for each period shall be described.

Maintenance Record

Maintenance work performed, area repaired or reinstalled, diagnosis for unsatisfactory stand of grass plants.

SD-06 Test Reports

Equipment Calibration

Certification of calibration tests conducted on the equipment used in the seeding operation.

Soil Test

Certified reports of inspections and laboratory tests, prepared by an independent testing agency, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described.

SD-07 Certificates

Seed;
Fertilizer;
Mulch;
Asphalt Adhesive;

Prior to the delivery of materials, certificates of compliance attesting that materials meet the specified requirements. Certified copies of the material certificates shall include the following:

a. Seed. Classification, botanical name, common name, percent pure live seed, minimum percent germination and hard seed, maximum percent weed seed content, and date tested.

b. Fertilizer. Chemical analysis and composition percent.

c. Mulch: Composition and source.

d. Asphalt Adhesive: Composition

Temporary Erosion Control Plan; G

The Contractor shall submit a plan for controlling sedimentation and erosion during construction. The plan shall be specific as to the types (straw bales, filter fence, etc.), and locations of erosion control measures.

1.2 DELIVERY, INSPECTION, STORAGE, AND HANDLING

1.2.1 Delivery

A delivery schedule shall be provided at least 10 calendar days prior to the first day of delivery.

1.2.2 Inspection

Seed shall be inspected upon arrival at the job site for conformity to species and quality. Seed that is wet, moldy, or bears a test date five months or older, shall be rejected. Other materials shall be inspected for compliance with specified requirements. The following shall be rejected: open soil amendment containers or wet soil amendments; topsoil that contains slag, cinders, stones, lumps of soil, sticks, roots, trash or other material over a minimum 1-1/2 inch diameter; and topsoil that contains viable plants and plant parts. Unacceptable materials shall be removed from the job site.

1.2.3 Storage

Seed, fertilizer, and soil containers shall be stored in cool, dry

locations away from contaminants, rodents, and insects. Chemical treatment material shall be stored according to manufacturer's instructions and not with seeding operation materials. Soil sterilant shall be isolated from other landscape materials.

1.2.4 Handling

Except for bulk deliveries, materials shall not be dropped or dumped from vehicles.

1.2.5 Time Limitation

Hydroseeding time limitation for holding seed in the slurry shall be a maximum 24 hours.

PART 2 PRODUCTS

2.1 SEED

2.1.1 Seed

State-certified seed of the latest season's crop shall be provided in original sealed packages bearing the producer's guaranteed analysis for percentages of mixtures and pure live seed. Seed shall be labeled in conformance with U.S. Department of Agriculture rules and regulations under the Federal Seed Act and applicable state seed laws. Seed that has become wet, moldy, or otherwise damaged will not be acceptable. On-site seed mixing will not be allowed unless approved.

2.1.2 Permanent Mixtures

All seed mixtures shall be proportioned by weight as follows:

Botanical Name	Common Name	Mixture Percent by Weight	Percent Per Live Seed
Festuca rubra communtata	Chewings Fescue or Creeping Red Fescue	30	78
Lolium perenne	Turf Type Perenneal Ryegrass	30	88
Agrostis Tenuous	Bent Grass	10	86
Lolium multiflorum	Annual Ryegrass	20	85
Trifolium Repends	Dutch Withe Clover	10	86

2.1.3 Seed Mixing

The mixing of seed may be done by the seed supplier prior to delivery, or on site as directed.

2.1.4 Substitutions

Substitutions will not be allowed without written request and approval from the Contracting Officer.

2.2 SOIL AMENDMENTS

Soil amendments shall consist of fertilizer and organic material meeting the following requirements. Vermiculite shall not be used.

2.2.1 Fertilizer

It shall be as recommended by the soil test. Fertilizer shall be controlled release commercial grade, free flowing, uniform in composition, and consist of a nitrogen-phosphorus-potassium ratio. The fertilizer shall be derived from sulphur coated urea, urea formaldehyde, plastic or polymer coated pills, or isobutylenediurea (IBDU). Fertilizer shall be balanced with the inclusion of trace minerals and micro-nutrients.

2.2.2 Organic Material

Organic material shall consist of decomposed wood derivatives.

2.2.2.1 Decomposed Wood Derivatives

Decomposed wood derivatives shall be ground bark or sawdust that is free of stones, sticks, soil, and toxic substances harmful to plants, and is fully composted or stabilized with nitrogen.

2.3 MULCH

Mulch shall be free from weeds, mold, and other deleterious materials. Mulch materials shall be native to the region, and be one of the following:

2.3.1 Straw

Straw shall be stalks from oats, wheat, rye, barley, or rice, furnished in air-dry condition and with a consistency for placing with commercial mulch-blowing equipment.

2.3.2 Hay

Hay shall be native hay, sudan-grass hay, broomsedge hay, or other herbaceous mowings, furnished in an air-dry condition suitable for placing with commercial mulch-blowing equipment.

2.4 WATER

Water shall be the responsibility of the Contractor, unless otherwise noted. Water shall not contain elements toxic to plant life.

2.5 SURFACE EROSION CONTROL MATERIAL

Surface erosion control material shall conform to one of the following:

2.5.1 Surface Erosion Control Blanket

Blanket shall be machine produced mat of wood excelsior formed from a web of interlocking wood fibers; covered on one side with either knitted straw blanket-like mat construction; covered with biodegradable plastic mesh; or interwoven biodegradable thread, plastic netting, or twisted kraft paper cord netting.

2.5.2 Surface Erosion Control Fabric

Fabric shall be knitted construction of polypropylene yarn with uniform mesh openings 3/4 to 1 inch square with strips of biodegradable paper. Filler paper strips shall have a minimum life of 6 months.

2.5.3 Surface Erosion Control Net

Net shall be heavy, twisted jute mesh, weighing approximately 1.22 pounds per linear yard and 4 feet wide with mesh openings of approximately 1 inch square.

2.5.4 Erosion Control Material Anchors

Erosion control anchors shall be as recommended by the manufacturer.

PART 3 EXECUTION

Three general areas are to be seeded in accordance with these specifications:

1. The excavation area, including benches and any fill areas.
2. The on-site disposal area.
3. The off-site disposal area.

3.1 INSTALLING SEED TIME AND CONDITIONS

3.1.1 Seeding Time

Seed shall be installed from March 1 to May 15 for spring establishment; and from September 1 to October 15 for fall establishment. All exposed slopes shall be seeded with specified treatment by October 15.

The Contractor may seed later than the dates specified subject to approval of the Contracting Officer if weather conditions are anticipated to be suitable for seed germination

3.1.2 Seeding Conditions

Seeding operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to the seeding operations, proposed alternate times shall be submitted for approval.

3.1.3 Equipment Calibration

Immediately prior to the commencement of seeding operations, calibration tests shall be conducted on the equipment to be used. These tests shall confirm that the equipment is operating within the manufacturer's specifications and will meet the specified criteria. The equipment shall be calibrated a minimum of once every day during the operation. The calibration test results shall be provided within 1 week of testing.

3.2 SITE PREPARATION

3.2.1 Finished Grade

The Contractor shall verify that finished grades are as indicated on drawings prior to the commencement of the seeding operation.

3.2.2 Application of Soil Amendments

3.2.2 Applying Fertilizer

The fertilizer shall be applied as recommended by the soil test. Fertilizer shall be incorporated into the soil to a maximum 4 inch depth or may be incorporated as part of the tillage or hydroseeding operation.

3.3 INSTALLATION

Seeding operations shall not take place when the wind velocity will prevent uniform seed distribution.

3.3.1 Installing Seed

Seeding method shall be Hydroseeding. Seeding procedure shall ensure even coverage. Gravity feed applicators, which drop seed directly from a hopper onto the prepared soil, shall not be used because of the difficulty in achieving even coverage, unless otherwise approved. Absorbent polymer powder shall be mixed with the dry seed at the rate recommended by the manufacturer.

3.3.2 Hydroseeding

Seed shall be mixed to ensure broadcast at the rate of 175 pounds per acre. Seed and fertilizer shall be added to water and thoroughly mixed to meet the rates specified. The time period for the seed to be held in the slurry shall be a maximum 24 hours. Wood cellulose fiber mulch shall be added at the rates recommended by the manufacturer after the seed, fertilizer, and water have been thoroughly mixed to produce a homogeneous slurry. Slurry shall be uniformly applied under pressure over the entire area. The hydroseeded area shall not be rolled.

3.3.3 Mulching

3.3.3.1 Hay or Straw Mulch

Hay or straw mulch shall be spread uniformly on excavated slopes at the rate of 2 tons per acre. Mulch shall be spread by hand, blower-type mulch spreader, or other approved method. Mulching shall be started on the windward side of relatively flat areas or on the upper part of steep slopes, and continued uniformly until the area is covered. The mulch shall not be bunched or clumped. Sunlight shall not be completely excluded from penetrating to the ground surface. All areas installed with seed shall be mulched on the same day as the seeding.

3.3.4 Watering Seed

Watering shall be started immediately after completing the seeding of an area. Water shall be applied to supplement rainfall at a rate sufficient to ensure moist soil conditions to a minimum 1 inch depth. Run-off and puddling shall be prevented. Watering trucks shall not be driven over turf areas, unless otherwise directed. Watering of other adjacent areas or plant material shall be prevented.

3.4 SURFACE EROSION CONTROL

3.4.1 Surface Erosion Control Material

Where indicated on the approved Temporary Erosion Control Plan or as directed by the Contracting Officer, surface erosion control material shall be installed in accordance with manufacturer's instructions. Placement of the material shall be accomplished without damage to installed material or without deviation to finished grade. In addition to specific inline measures (straw, bales, filter fence, etc.), the Contractor should consider the following measures in their plan:

3.4.2 Temporary Seeding

The application rate shall be 175 pounds per acre. When directed during contract delays affecting the seeding operation or when a quick cover is required to prevent surface erosion, the areas designated shall be seeded in accordance with seed species listed under Paragraph SEED.

3.5 QUANTITY CHECK

For materials provided in bags, the empty bags shall be retained for recording the amount used. For materials provided in bulk, the weight certificates shall be retained as a record of the amount used. The amount of material used shall be compared with the total area covered to determine the rate of application used. Differences between the quantity applied and the quantity specified shall be adjusted as directed.

3.6 PROTECTION OF INSTALLED AREAS

Immediately upon completion of the seeding operation in an area, the area shall be protected against traffic or other use by erecting barricades and providing signage as required, or as directed.

3.7 SEED ESTABLISHMENT PERIOD

3.7.1 Commencement

The seed establishment period to obtain a healthy stand of grass plants shall begin on the first day of work under this contract and shall end 3 months after the last day of the seeding operation. Written calendar time period shall be furnished for the seed establishment period. When there is more than 1 seed establishment period, the boundaries of the seeded area covered for each period shall be described.

3.7.2 Satisfactory Stand of Grass Plants

Grass plants shall be evaluated for species and health when the grass plants are a minimum 1 inch high.

3.7.2.1 Field Area

A satisfactory stand of grass plants from the seeding operation shall be a minimum 10 grass plants per square foot. The total bare spots shall not exceed 2 percent of the total seeded area.

3.7.3 Maintenance During Establishment Period

Maintenance of the seeded areas shall include protecting embankments and ditches from surface erosion; maintaining erosion control materials and mulch; protecting installed areas from traffic and watering.

3.7.3.1 Repair or Reinstall

Unsatisfactory stand of grass plants and mulch shall be repaired or reinstalled, and eroded areas shall be repaired in accordance with paragraph SITE PREPARATION.

3.7.3.2 Maintenance Record

A record of each site visit shall be furnished, describing the maintenance work performed; areas repaired or reinstalled; and diagnosis for unsatisfactory stand of grass plants.

-- End of Section --

SECTION 03100

STRUCTURAL CONCRETE FORMWORK

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 117/117R	(1990) Tolerances for Concrete Construction and Materials
ACI 347R	(1994; R1999) Guide to Formwork for Concrete

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4	(1995) Basic Hardboard

U.S. DEPARTMENT OF COMMERCE (DOC)

PS-1	(1996) Voluntary Product Standard - Construction and Industrial Plywood

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Formwork

Drawings showing details of formwork, including dimensions of fiber voids, joints, supports, studding and shoring, and sequence of form and shoring removal, shall be provided prior to placing concrete. Permanent formwork for the tremie concrete north of the existing outlet works tower shall include sheet piling as specified in Section 02464, METAL SHEET PILING

SD-03 Product Data

Design

Design analysis and calculations for form design and methodology used in the design of the concrete formwork, including the permanent formwork for the tremie concrete north of the existing outlet works tower, shall be provided prior to placing concrete.

Form Materials

Manufacturer's data including literature describing form materials, accessories, and form releasing agents.

Form Releasing Agents

Manufacturer's recommendation on method and rate of application of form releasing agents.

SD-07 Certificates

Fiber Voids

Certificates attesting that fiber voids conform to the specified requirements.

1.3 DESIGN

Formwork shall be designed in accordance with methodology of ACI 347R for anticipated loads, lateral pressures, and stresses. Forms shall be capable of producing a surface which meets the requirements of the class of finish specified in Section 03301 CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS. Permanent sheet pile forms are not subject to the surface finish requirements. Forms shall be capable of withstanding the pressures resulting from placement and vibration of concrete.

1.4 STORAGE AND HANDLING

Fiber voids shall be stored above ground level in a dry location. Fiber voids shall be kept dry until installed and overlaid with concrete.

PART 2 PRODUCTS

2.1 FORM MATERIALS

2.1.1 Forms For Class A and Class B Finish

Forms for Class A and Class B finished surfaces shall be plywood panels conforming to PS-1, Grade B-B concrete form panels, Class I or II, or steel forms. Other form materials or liners may be used provided the smoothness and appearance of concrete produced will be equivalent to that produced by the plywood concrete form panels. Forms for round columns shall be the prefabricated seamless type.

2.1.2 Forms For Class C Finish

Forms for Class C finished surfaces shall be plywood conforming to PS-1, Grade B-B concrete form panels, Class I or II; tempered concrete form hardboard conforming to AHA A135.4; other approved concrete form material; or steel, except that steel lining on wood sheathing shall not be used. Forms for round columns may have two vertical seams.

2.1.3 Forms For Class D Finish

This class of finish, unless otherwise noted, shall apply to all surfaces that will be permanently concealed after construction. Forms for Class D finished surfaces, except where concrete is placed against earth, shall be

wood or steel or other approved concrete form material.

2.1.4 Form Ties

Form ties shall be factory-fabricated metal ties, shall be of the removable or internal disconnecting or snap-off type, and shall be of a design that will not permit form deflection and will not spall concrete upon removal. Solid backing shall be provided for each tie. Except where removable tie rods are used, ties shall not leave holes in the concrete surface less than 1/4 inch nor more than 1 inch deep and not more than 1 inch in diameter. Removable tie rods shall be not more than 1-1/2 inches in diameter.

2.1.5 Form Releasing Agents

Form releasing agents shall be commercial formulations that will not bond with, stain or adversely affect concrete surfaces. Agents shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds.

2.1.6 Fiber Voids

Fiber voids shall be the product of a reputable manufacturer regularly engaged in the commercial production of fiber voids. The voids shall be constructed of double faced, corrugated fiberboard. The corrugated fiberboard shall be fabricated of wet strength paper liners, impregnated with paraffin, and laminated with moisture resistant adhesive, and shall have a board strength of 275 psi. Voids which are impregnated with paraffin after construction, in lieu of being constructed with paraffin impregnated fiberboard, are acceptable. Voids shall be designed to support not less than 1000 psf. To prevent separation during concrete placement fiber voids shall be assembled with steel or plastic banding at 4 feet on center maximum, or by adequate stapling or gluing as recommended by the manufacturer.

2.1.7 Sheet Pile Forms

Sheet pile permanent forms shall conform to Section 02464, METAL SHEET PILING.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Formwork

Forms shall be mortar tight, properly aligned and adequately supported to produce concrete surfaces meeting the surface requirements specified in Section 03301 CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS and conforming to construction tolerance given in ACI 117/117R and in TABLE 1. The more stringent requirements between ACI 117/117R and Table 1 shall apply. Where concrete surfaces are to have a Class A or Class B finish, joints in form panels shall be arranged as approved. Where forms for continuous surfaces are placed in successive units, the forms shall fit over the completed surface to obtain accurate alignment of the surface and to prevent leakage of mortar. Forms shall not be reused if there is any evidence of surface wear and tear or defects which would impair the quality of the surface. Surfaces of forms to be reused shall be cleaned of mortar from previous concreting and of all other foreign material before reuse.

Form ties that are to be completely withdrawn shall be coated with a nonstaining bond breaker. Temporary openings shall be provided as necessary to facilitate cleaning and inspection prior to placement of concrete.

3.1.2 Fiber Voids

Voids shall be placed on a smooth firm dry bed of suitable material, to avoid being displaced vertically, and shall be set tight, with no buckled cartons, in order that horizontal displacement cannot take place. Each section of void shall have its ends sealed by dipping in paraffin, with any additional cutting of voids at the jobsite to be field dipped in the same type of sealer, unless liners and flutes are completely impregnated with paraffin. Prior to placing reinforcement, the entire formed area for slabs shall be covered with a 4 x 8 feet minimum flat sheets of fiber void corrugated fiberboard. Joints shall be sealed with a moisture resistant tape having a minimum width of 3 inches. If voids are destroyed or damaged and are not capable of supporting the design load, they shall be replaced prior to placing of concrete.

3.2 CHAMFERING

Except as otherwise shown, external corners that will be exposed shall be chamfered, beveled, or rounded by moldings placed in the forms.

3.3 COATING

Forms for Class A and Class B finished surfaces shall be coated with a form releasing agent before the form or reinforcement is placed in final position. The coating shall be used as recommended in the manufacturer's printed or written instructions. Forms for Class C and D finished surfaces may be wet with water in lieu of coating immediately before placing concrete, except that in cold weather with probable freezing temperatures, coating shall be mandatory. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be removed before placing concrete.

3.4 FINISHING FORMED SURFACES

3.4.1 General

Finishing of formed surfaces shall be as specified herein. Unless otherwise specified, surfaces shall be left with the texture imparted by the forms except that defective surfaces shall be repaired. Uniform color of the concrete shall be maintained by use of only one mixture without changes in materials or proportions for any structure or portion of structure. Surface defects shall be repaired as specified herein within 24 hours after forms are removed. Repairs of the so-called "plaster-type" will not be permitted in any location. Tolerances of formed surfaces shall conform to the requirements of ACI 117/117R and Table 1 of this section. The more stringent requirements between ACI 117/117R and Table 1 of this section shall apply. These tolerances apply to the finished concrete surface, not to the forms themselves; forms shall be set true to line and grade. Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter shall be repaired as specified in paragraph 3.5. Repairs shall be demonstrated to be acceptable and free form cracks or loose or drummy areas at the completion of the contract and shall be inconspicuous. Repairs not meeting these requirements will be rejected and shall be replaced.

3.4.2 Class A and Class B Finish

Class A finish, unless otherwise noted, is required for all concrete surfaces that will be exposed to flowing water or that will be exposed to view. Fins, ravelings, and loose material shall be removed, all surface defects over 1/2-inch in diameter or more than 1/2-inch deep, shall be repaired and except as otherwise indicated or as specified in paragraph 3.5, holes left by removal of form ties shall be reamed and filled. Defects more than 1/2-inch in diameter shall be cut back to sound concrete to a depth of at least 1 inch and repaired as indicated in paragraph 3.5. The Contractor shall prepare a sample panel for Contracting Officer approval before commencing repair, showing that the surface texture and color match will be attained. Metal tools shall not be used to finish repairs in Class A surfaces.

3.4.3 Class C and Class D Finish

Class C finish, unless otherwise noted, is required on all concrete surfaces not exposed to view. Concrete cast against rock does not have to meet this requirement at the concrete-to-rock interface. Fins, ravelings, and loose material shall be removed, and, except as otherwise indicated,holes left by removal of form ties and areas of honeycomb and other defects more than 2 inches in diameter or more than 1/2-inch deep shall be reamed and filled. Defects greater than 2 inches in diameter shall be cut back to sound concrete, but in all cases at least 1-inch deep and repaired in accordance with provisions of paragraph 3.5.

3.5 REPAIRS

Surface defects shall be repaired within 24 hours after the removal of forms. Honeycombed and other defective areas shall be cut back to solid concrete or to a depth of not less than 1 inch, whichever is greater. Edges shall be cut perpendicular to the surface of the concrete. The prepared areas shall be dampened and bush-coated with neat cement grout. The repair shall be made using mortar consisting of not more than 1 part cement to 2-1/2 parts sand. The mixed mortar shall be allowed to stand to stiffen (approximately 45 minutes), during which time the mortar shall be intermittently remixed without the addition of water. After the mortar has attained the stiffest consistency that will permit placing, the patching mix shall be thoroughly tamped into place by an approved means and finished slightly higher than the surrounding surface. For Class A and Class B finished surfaces the cement used in the patching mortar shall be a blend of job cement and white cement proportioned to produce a finish repair surface matching, after curing, the color of adjacent surfaces. Holes left after the removal of form ties shall be cleaned and filled with patching mortar. Holes left by the removal of tie rods shall be removed and filled by dry-packed. Repaired surfaces shall be cured as required for adjacent surfaces. The temperature of concrete mortar patching material, and ambient air shall be above 50 degrees Fahrenheit while making repairs and during the curing period. Concrete with defects that affect the strength of the member or with excessive honeycombs will be rejected, or the defects shall be corrected as directed.

3.6 REMOVAL OF FORMS

Forms shall be removed preventing injury to the concrete and ensuring the complete safety of the structure. Formwork for columns, walls, side of beams and other parts not supporting the weight of concrete may be removed

when the concrete has attained sufficient strength to resist damage from the removal operation but not before at least 24 hours has elapsed since concrete placement. Supporting forms and shores shall not be removed from beams, floors and walls until the structural units are strong enough to carry their own weight and any other construction or natural loads. Supporting forms or shores shall not be removed before the concrete strength has reached 70 percent of design strength, as determined by field cured cylinders or other approved methods. This strength shall be demonstrated by job-cured test specimens, and by a structural analysis considering the proposed loads in relation to these test strengths and the strength of forming and shoring system. The job-cured test specimens for form removal purposes shall be provided in numbers as directed and shall be in addition to those required for concrete quality control. The specimens shall be removed from molds at the age of 24 hours and shall receive, insofar as possible, the same curing and protection as the structures they represent.

TABLE 1

TOLERANCES FOR FORMED SURFACES

1.	Variations from the plumb:	In any 10 feet of length ---------- 1/4 inch
	a. In the lines and surfaces of columns, piers, walls and in arises	Maximum for entire length ---------- 1 inch
	b. For exposed corner columns,control-joint grooves, and other conspicuous lines	In any 20 feet of length ---------- ---- 1/4 inch Maximum for entire length---------- 1/2 inch
2.	Variation from the level or from the grades indicated on the drawings:	In any 10 feet of length ----------1/4 inch In any bay or in any 20 feet of length---------- 3/8 inch
	a. In slab soffits, ceilings, beam soffits, and in arises, measured before removal of supporting shores	Maximum for entire length ---------- 3/4 inch
	b. In exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines	In any bay or in any 20 feet of length ---------- ----- 1/4 inch Maximum for entire length---------- 1/2 inch
3.	Variation of the linear building lines from established position in plan	In any 20 feet --------- 1/2 inch Maximum ----------1 inch
4.	Variation of distance between walls, columns,	1/4 inch per 10 feet of distance, but not more than 1/2 inch in any

TABLE 1

TOLERANCES FOR FORMED SURFACES

	partitions	one bay,and not more than 1 inch total variation
5.	Variation in the sizes and locations of sleeves, floor openings, and wall opening	Minus ---------- 1/4 inch Plus ---------- 1/2 inch
6.	Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls	Minus ---------- 1/4 inch Plus ---------- 1/2 inch
7.	Footings:	
	a. Variation of dimensions in plan	Minus ---------- 1/2 inch Plus ---------- 2 inches when formed or plus 3 inches when placed against unformed excavation
	b. Misplacement of eccentricity	2 percent of the footing width in the direction of misplacement but not more than 2 inches
	c. Reduction in thickness of specified thickness	Minus ---------- 5 percent
8.	Variation in steps:	Riser ---------- 1/8 inch
	a. In a flight of stairs	Tread ---------- 1/4 inch
	b. In consecutive steps	Riser ---------- 1/16 inch Tread ---------- 1/8 inch

-- End of Section --

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SECTION 03151

EXPANSION, CONTRACTION AND CONSTRUCTION JOINTS IN CONCRETE FOR CIVIL WORKS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 920	(1998) Elastomeric Joint Sealants
ASTM D 1751	(1999) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
ASTM D 1752	(1984; R 1996el) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
ASTM D 2000	(1999) Rubber Products in Automotive Applications
ASTM D 2628	(1991; R 1998) Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements
ASTM D 2835	(1989; R 1998) Lubricant for Installation of Preformed Compression Seals in Concrete Pavements
ASTM D 3575	(2000) Flexible Cellular Materials Made From Olefin Polymers

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 513	(1974) Corps of Engineers Specifications for Rubber Waterstops
COE CRD-C 572	(1974) Corps of Engineers Specifications for Polyvinylchloride Waterstop

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Bladder Seals, Waterstops, and Neoprene Sheet Expansion Joint; G

Shop drawings and fabrication drawings provided by the Manufacturer or prepared by the Contractor.

SD-03 Product Data

Preformed Expansion Joint Filler, Polyethylene Joint Filler Foam, Sealant, Bladder Grouted Seals, and Waterstops; G

Manufacturer's literature, including safety data sheets, for joint fillers and the lubricants used in their installation; field-molded sealant and primers (when required by sealant manufacturer); preformed compression seals; bladder grouted seals; and waterstops, including bentonite strip waterstops.

SD-04 Samples

Preformed Compression Seals and Lubricants

Specimens identified to indicate the manufacturer, type of material, size and quantity of material, and shipment or lot represented. Each sample shall be a piece not less than 9 feet of 1-inch nominal width or wider seal or a piece not less than 12 feet of compression seal less than 1 inch nominal width. One quart of lubricant shall be provided.

Field-Molded Sealants and Primer

One gallon of field-molded sealant and one quart of primer (when primer is recommended by the sealant manufacturer) identified to indicate manufacturer, type of material, quantity, and shipment or lot represented.

Non-Metallic Waterstops and Splices

Specimens identified to indicate manufacturer, type of material, size, quantity of material, and shipment or lot represented. Each sample shall be a piece not less than 12 inches long cut from each 200 feet of unfinished waterstop furnished, but not less than a total of 4 feet of each type, size, and lot furnished. One splice sample of each size and type for every 50 splices made in the factory and every 10 splices made at the job site. The splice samples shall be made using straight run pieces with the splice located in the mid-length and finished as required for the installed waterstop. the total length of each splice shall be not less than 12 inches long.

Bladder Grouted Seals

Specimens identified to indicate the manufacturer, type of material, size and quantity of material, and shipment or lot represented. Each sample shall be a piece not less than 9 feet.

SD-07 Certificates

Preformed Expansion Joint Filler, Polyethylene Joint Filler Foam,

Sealant, Waterstops, and Neoprene

Certificates of compliance stating that the joint filler, sealant materials, waterstops, and neoprene conform to the requirements specified.

SD-08 Manufacturer's Instructions

Preformed Expansion Joint Filler, Polyethylene Joint Filler Foam, Sealant, Waterstops, and Neoprene

Manufacturer's recommended instructions for installing joint fillers, field-molded sealants; preformed compression seals; waterstops; and neoprene; and instructions for splicing non-metallic waterstops.

1.3 DELIVERY AND STORAGE

Material delivered and placed in storage shall be stored off the ground and protected form moisture, dirt, and other contaminants. Sealants shall be delivered in the manufacturer's original unopened containers. Sealants whose shelf life has expired shall be removed from the site.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Premolded Expansion Joint Filler Strips

Premolded expansion joint filler strips shall conform to ASTM D 1751 or ASTM D 1752, Type I, or resin impregnated fiberboard conforming to the physical requirements of ASTM D 1752, unless otherwise noted.

2.1.2 Joint Filler Foam

Joint filler foam shall be cross-lined, non-absorbent, semi-rigid, cellular polyethylene with a nominal density of 60 kg/m^3. It shall have a recover of 98% after 50% compression and a compressive strength of 0.15 N/mm^2 when tested in accordance with ASTM D 3575. It shall have a minimum water absorption of less than 0.05% by volume when tested in accordance with ASTM D 3575 and be resistant to weathering and chemical attack.

2.1.3 Bentonite Strip Waterstops

Bentonite strip waterstops shall be used where indicated on the drawings and they shall be Volclay WATERSTOP-RX 101 or approved equal.

2.1.4 Joint Seals and Sealants

2.1.4.1 Field-Molded Sealants and Primer

Field molded sealants and primer shall conform to ASTM C 920, Type M, Grade NS, Class 25, use NT for vertical joints and Type M, Grade P, Class 25, use T for horizontal joints. Bond breaker material shall be polyethylene tape, coated paper, metal foil or similar type materials. The back-up material shall be compressible, nonshrink, nonreactive with sealant, and nonabsorptive material type such as extruded butyl or polychloroprene foam rubber.

Sealant at the ends of the lower trashrack beams shall conform to ASTM C 920, Type M, Grade NS, Class 25, Use I.

2.1.4.2 Compression Seals and Lubricant

Compression seals shall conform to ASTM D 2628; lubricant for installation shall conform to ASTM D 2835.

2.1.5 Waterstops

2.1.5.1 Non-Metallic Waterstops

Non-metallic waterstops shall be manufactured from a prime virgin resin; reclaimed material is not acceptable. The compound shall contain plasticizers, stabilizers, and other additives to meet specified requirements.

Rubber waterstops shall conform to COE CRD-C 513 unless otherwise noted. Polyvinylchloride waterstops shall conform to COE CRD-C 572 unless otherwise noted. Intersection and change of direction waterstops shall be shop fabricated.

2.1.5.2 Metallic Waterstops

Metallic waterstops are **not allowed** on this project.

2.1.6 Bladder Grouted Seals

Bladder seals to be grouted shall be fabricated from natural or synthetic (neoprene) rubber and shall be of sufficient thickness and strength to support the grout pressures that will be applied without leakage or bursting. The bladder tube shall be capable of expanding at least 3 times its original diameter to be able to seal against irregular rock and concrete surfaces.

2.1.7 Neoprene Sheet Expansion Joint

The neoprene sheet expansion joint shall be fabricated from synthetic rubber (neoprene) sheeting and strips conforming to ASTM D 2000, durometer 50A. the neoprene shall be black in color and UV-stabilized. Stainless steel clamping bars and threaded bolts, nuts and washers used in attaching the joint shall be Type 304 stainless steel. Drilled-in epoxy resin shall meet the requirements of Section 03730, RESIN SYSTEMS FOR CONCRETE REPAIR AND BONDING; GROUTING ANCHOR BARS

2.2 TESTS, INSPECTIONS, AND VERIFICATIONS

2.2.1 Materials Tests

2.2.1.1 Field-Molded Sealants

Samples of sealant and primer, when use of primer is recommended by the manufacturer, as required in paragraph FIELD MOLDED SEALANTS AND PRIMER, shall be tested by and at the expense of the Government for compliance with paragraph FIELD MOLDED SEALANTS AND PRIMER. If the sample fails to meet specification requirements, new samples shall be provided and the cost of retesting will be the responsibility of the Contractor

2.2.1.2 Non-Metallic Waterstops

Samples of materials and splices as required in paragraph WATERSTOPS shall be visually inspected and tested by and at the expense of the Government for compliance with COE CRD-C 513 or COE CRD-C 572 as applicable. If a sample fails to meet the specification requirements, new samples shall be provided and the cost of retesting will be the responsibility of the Contractor.

2.2.2 Splicing Waterstops

2.2.2.1 Procedure and Performance Qualifications

Procedure and performance qualifications for splicing waterstops shall be demonstrated in the presence of the Contracting Officer.

2.2.2.2 Non-Metallic Waterstops

Procedure and performance qualifications for splicing non-metallic waterstops shall be demonstrated by the manufacturer at the factory and the Contractor at the job site by each making three spliced samples of each size and type of finished waterstop.

2.2.3 Splicing Bladder Grouted Seals

Splicing of bladder grouted seals shall be performed to develop the full capacity of the rubber bladders without leaking.

2.2.4 Splicing Neoprene Sheet Expansion Joints

Splicing of neoprene sheet expansion joint shall be performed to develop the full capacity of the rubber sheeting without leaking.

PART 3 EXECUTION

3.1 INSTALLATION

Joint locations and details, including materials and methods of installation of joint fillers and waterstops, shall be as specified, as shown, and as directed. In no case shall any fixed metal be continuous through an expansion joint.

3.1.1 Expansion Joints

3.1.1.1 Preformed Expansion Joint Filler

Preformed expansion joint filler shall be used in joints to the extent shown on the drawings.

3.1.1.2 Polyethylene Joint Filler Foam

Polyethylene joint filler foam shall be used in joints to the extent shown on the drawings. Polyethylene foam shall be glued to the concrete as indicated. Contractor shall use adhesive recommended by manufacturer.

3.1.1.3 Joint Sealant

Expansion joints indicated on the drawings shall be filled with joint sealant. Joint surfaces shall be clean, dry and free of oil or other foreign material which would adversely affect the bond between sealant and

concrete. Joint sealant shall be applied as recommended by the manufacturer of the sealant.

3.1.1.4 Joints With Field-Molded Sealant

Joints shall not be sealed when the sealant, air or concrete temperature is less than 40 degrees F. Immediately prior to installation of field molded sealants, the joint shall be cleaned of all debris and further cleaned using water, chemical solvents or other means as recommended by the sealant manufacturer. The joints shall be dry prior to filling with sealant. Bond breaker and back-up material shall be installed where required. Joints shall be primed and filled flush with joint sealant in accordance with the manufacturer's recommendations.

3.1.1.5 Joints With Preformed Compression Seals

The joint seals shall be installed with equipment which shall be capable of installing joint seals to the prescribed depth without cutting, nicking, twisting, or otherwise distorting or damaging the seal and with no more than five percent stretching of the seal. The sides of the joint and, if necessary, the sides of the compression seal shall be covered with a coating of lubricant, and the seal shall be installed to the depth indicated with joint installation equipment. Butt joints shall be coated with liberal applications of lubricant.

3.1.2 Contraction Joints

Joints requiring a bond breaker shall be coated with curing compound or with bituminous paint. Waterstops shall be protected during application of bond breaking material to prevent them from being coated.

3.1.3 Waterstops

Waterstops shall be carefully and correctly positioned during installation to eliminate faulty installation that may result in joint leakage. The bottom of each waterstop shall be embedded a minimum of approximately 6 inches in firm rock or sealed to other cut-off systems. All waterstops shall be installed so as to form a continuous watertight diaphragm in each joint. Adequate provision shall be made to support and protect the waterstops during the progress of work. Any waterstop punctured or damaged shall be replaced or repaired at the Contractor's expense. The concrete shall be thoroughly consolidated in the vicinity of the waterstop. Suitable guards shall be provided to protect exposed projecting edges and ends of partially embedded waterstops from damage when concrete placement has been discontinued.

3.1.3.1 Bentonite Strip Waterstops

The installation of the bentonite strip waterstops shall follow the manufacturer's instructions, recommendations, and procedures.

3.1.3.2 Splices

Joints in waterstops shall be spliced together by qualified splicers using the approved splicing procedures to form a continuous watertight diaphragm. Splices shall be as followed:

a. Non-Metallic Waterstops - All splices shall be made on a bench in a temporary shop provided at the site of the installation or at the

manufacturer's plant. A miter guide and portable power saw shall be used to cut the ends to be joined to insure good alignment and contact between joined surfaces. Continuity of the characteristic features of the cross section of the waterstop (ribs, tabular center axis, protrusions and the like) shall be maintained across the splice.

b. Rubber Waterstops - Splices shall be vulcanized in accordance with the approved procedure.

c. Polyvinylchloride Waterstops - Splices shall be made by heat sealing the adjacent surfaces in accordance with the approved procedure. A thermostatically controlled electrical heat source shall be used to make all splices. The correct temperature at which splices should be made will differ with the material concerned but the applied heat should be sufficient to melt but not char the plastic. Waterstops shall be reformed at splices with a remolding iron with ribs or corrugations to match the pattern of the waterstop. The spliced area, when cooled and bent by hand in as sharp an angle as possible, shall show no sign of separation.

3.1.4 Bladder Grouted Seals

Bladder grouted seals shall be installed between the elevations indicated on the drawings, between Precast Segments D and E and the existing outlet works structure and the rock face south of the existing outlet works structure, and between Precast Segment C and the excavated rock face south of the new cofferdam. The Contractor shall size the bladder grouted seals to fully seal the joints to prevent leakage from the future tremie concrete placements. The bladder grouted seals shall be installed and grouted with sufficient grout pressure to fully seal the joint.

3.1.5 Neoprene Sheet Expansion Joints

Neoprene sheet expansion joints shall be installed where indicated on the drawings. The clamp bars shall be installed to properly compress the neoprene backer strips to prevent leakage under constant water pressure.

3.2 CONSTRUCTION JOINTS

Construction joints are specified in Section 03301, CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS, except that construction joints coinciding with expansion and contraction joints shall be treated as expansion or contraction joints as applicable.

-- End of Section --

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SECTION 03201

STEEL BARS AND WELDED WIRE FABRIC FOR CONCRETE REINFORCEMENT FOR CIVIL WORKS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 117/117R	(1990) Tolerances for Concrete Construction and Materials
ACI 315	(1999) Details and Detailing of Concrete Reinforcement
ACI 318/318R	(1999) Building Code Requirements for Structural Concrete and Commentary

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 185	(1997) Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
ASTM A 370	(1997a) Mechanical Testing of Steel Products
ASTM A 497	(1999) Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
ASTM A 615/A 615M	(2000) Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A 706/A 706M	(2000 Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A 722	(1998) Uncoated High-Strength Steel Bar for Prestressing Concrete
ASTM E 94	(1993) Radiographic Testing

AMERICAN WELDING SOCIETY (AWS)

AWS D1.4	(1998) Structural Welding Code - Reinforcing Steel

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office

that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fabrication and Placement; G

The Contractor shall submit shop drawings which include: reinforcement steel placement drawings; reinforcement steel schedules showing quantity, size, shape, dimensions, weight per foot, total weights and bending details; and details of bar supports showing types, sizes, spacing and sequence.

SD-03 Product Data

Butt-Splices; G

The Contractor shall submit the proposed procedure for butt-splicing steel bars prior to making the test butt-splices for qualification of the procedure. Properties and analyses of steel bars and splicing materials shall be included in the submitted procedure. Physical properties of splicing sleeves shall include length, inside and outside diameters, and inside surface details.

Materials; G

A system of identification which shows the disposition of specific lots of approved materials in the work shall be established and submitted before completion of the contract.

SD-06 Test Reports

Material; G
Tests, Inspections, and Verifications; G

Certified tests reports of reinforcement steel showing that the steel complies with the applicable specifications shall be furnished for each steel shipment and identified with specific lots prior to placement. Three copies of the heat analyses shall be provided for each lot of steel furnished and the Contractor shall certify that the steel conforms to the heat analyses.

SD-07 Certificates

Qualification of Steel Bar Butt-Splicers; G

Certificates on the Qualifications of Steel Bar Butt-Splicers shall be submitted prior to commencing butt-splicing.

1.3 QUALIFICATIONS

Welders shall be qualified in accordance with AWS D1.4. Qualification tests shall be performed at the worksite and the Contractor shall notify the Contracting Officer 24 hours prior to conducting tests. special welding procedures and welders qualified by others may be accepted as permitted by AWS D1.4.

1.4 DELIVERY AND STORAGE

Reinforcement and accessories shall be stored off the ground on platforms, skids, or other supports.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall conform to the following requirements.

2.1.1 Steel Bars

Steel bars shall comply with the requirements of ASTM A 615/A 615M, Grade 60 ksi, including Supplementary Requirements, or ASTM A 706/A 706M, deformed, Grade 60 ksi, sizes and lengths shown. All welded reinforcing steel bars shall be ASTM A 706/A 706M steel.

2.1.2 Steel Threadbars and Threaded Bars

Steel threadbars and threaded bars shall conform to ASTM A 722, 150 ksi ultimate tensile strength, Type II (deformed).

2.1.3 Steel Welded Wire Fabric

Steel welded wire fabric shall comply with the requirements of ASTM A 185 or ASTM A 497 with the wire sizes and spacings as shown. For wire with a specified yield strength (fy) exceeding 60,000 psi, fy shall be the stress corresponding to a strain of 0.35 percent.

2.1.4 Accessories

2.1.4.1 Bar Supports

Bar supports shall comply with the requirements of ACI 315. Supports for bars in concrete with formed surfaces exposed to view or to be painted shall be plastic-coated wire, stainless steel or precast concrete supports. Precast concrete supports shall be wedged-shaped, not larger than 3-1/2 by 3-1/2 inches, of thickness equal to that indicated for concrete cover and have an embedded hooked tie-wire for anchorage. Bar supports used in precast concrete with formed surfaces exposed to view shall be the same quality, texture and color as the finish surfaces.

2.1.4.2 Wire Ties

Wire ties shall be 16 gage or heavier black annealed wire.

2.2 TESTS, INSPECTIONS, AND VERIFICATIONS

The Contractor shall have material tests required by applicable standards and specified performed by an approved laboratory and certified to demonstrate that the materials are in conformance with the specifications. Tests, inspections, and verifications shall be performed and certified at the Contractor's expense.

2.2.1 Reinforcement Steel Tests

Mechanical testing of steel shall be in accordance with ASTM A 370 except as otherwise specified or required by the material specifications. Tension tests shall be performed on full cross-section specimens using a gage length that spans the extremities of specimens with welds or sleeves

included. Chemical analyses of steel heats shall show the percentages of carbon, phosphorous, manganese, sulphur and silicon present in the steel.

2.2.2 Qualification of Steel Bar Butt-Splicers

Qualification of steel bar butt-splicers shall be certified to have satisfactorily completed a course of instruction in the proposed method of butt-splicing or have satisfactorily performed such work within the preceding year.

2.2.3 Qualification of Butt-Splicing Procedure

As a condition of approval of the butt-splicing procedure, the Contractor, in the presence of the Contracting Officer, shall make three test butt-splices of steel bars of each size to be spliced using the proposed butt-splicing method. These test butt-splices and unspliced bars of the same size shall be tension tested to destruction with stress-strain curves plotted for each test. Test results must show that the butt-splices meet the specified strength and deformation requirements in order for the splicing procedure to be approved.

2.2.4 Radiographic Examination of Welds

Radiographic examination of welds shall be in accordance with ASTM E 94 and shall be performed and evaluated by an approved testing agency adequately equipped to perform such services. Radiographs of welds and evaluations of the radiographs submitted for approval shall become the property of the Government.

PART 3 EXECUTION

3.1 GENERAL

Reinforcement shall be fabricated to shapes and dimensions shown and shall conform to the requirements of ACI 117/117R and ACI 318/318R. Requirements shall be cold bent unless otherwise authorized. Bending may be accomplished in the field or at the mill. Bars shall not be bent after embedment in concrete. Safety caps shall be placed on all exposed ends of vertical concrete reinforcement bars that pose a danger to life safety. wire tie ends shall face away from the forms.

3.2 FABRICATION AND PLACEMENT

Reinforcement steel and accessories shall be fabricated and placed as specified and shown and approved shop drawings. Fabrication and placement details of steel and accessories not specified or shown shall be in accordance with ACI 117/117R and ACI 315 and ACI 318/318R or as directed. Steel shall be fabricated to shapes and dimensions shown, placed where indicated within specified tolerances and adequately supported during concrete placement. At the time of concrete placement all steel shall be free from loose, flaky rust, scale (except tight mill scale), mud, oil, grease or any other coating that might reduce the bond with the concrete.

Reinforcement shall not be continuous through expansion joints and shall be as indicated through construction or contraction joints. Concrete coverage shall be as indicated or as required by ACI 318/318R. Tolerance on concrete cover shall conform to ACI 117/117R. IF bars are moved more than one bar diameter to avoid interference with other reinforcement, conduits or embedded items, the resulting arrangement of bars, including additional

bars required to meet structural requirements, shall be approved before concrete is place.

3.2.1 Hooks and Bends

Steel bars, except for zinc-coated or epoxy-coated, shall be mill or field-bent. Zinc-Coated and epoxy-coated bars shall be mill-bent prior to coating. All steel shall be bent cold unless authorized. No steel bars shall be bent after being partially embedded in concrete unless indicated or authorized. Hooks and bends shall conform to the ACI standard hooks and bends, unless otherwise noted.

3.2.2 Welding

Welding of steel bars will be permitted only where indicated or authorized. Welding shall be performed in accordance with AWS D1.4 except where otherwise specified or indicated.

3.2.3 Placing Tolerances

Reinforcement shall be placed in accordance with ACI 117/117R and ACI 318/318R.

3.2.3.1 Spacing

The spacing between adjacent bars and the distance between layers of bars may not vary from the indicated position by more than one bar diameter nor more than 1 inch.

3.2.3.2 Concrete Cover

The minimum concrete cover of main reinforcement steel bars shall be as shown. The allowable variation for minimum cover shall be as follows:

MINIMUM COVER	VARIATION
6 inch	plus 1/2 inch
4 inch	plus 3/8 inch
3 inch	plus 3/8 inch
2 inch	plus 1/4 inch
1-1/2 inch	plus 1/4 inch
1 inch	plus 1/8 inch
3/4 inch	plus 1/8 inch

3.2.4 Splicing

Splices in steel bars shall be made only as required. Bars may be spliced at alternate or additional locations at no additional cost to the Government subject to approval.

3.2.4.1 Lap Splices

Lap splices shall be used only for bars #11 and smaller, and welded wire fabric. Lapped bars may be placed in contact and securely tied or spaced transversely apart to permit the embedment of the entire surface of each bar in concrete. Lapped bars shall not be spaced farther apart than 1/5 the required length of lap or 6 inches.

3.2.4.2 Butt-Splices

Butt-splices shall be used only for splicing size 14 and 18 bars and for splicing #11 bars to larger bars except where otherwise shown or authorized. Butt-splices shall be made by a method which develops splices suitable for tension, compression and stress reversal applications. Welded butt-splices shall be full penetration butt welds. Butt-splices shall develop 90 percent of the specified minimum ultimate tensile strength of the smallest bar of each splice. Bars shall be cleaned of all oil, grease, dirt, rust, scale and other foreign substances and shall be flame dried before splicing. Adequate jigs and clamps or other devices shall be provided to support, align and hold the longitudinal centerline of the bars to be butt-spliced in a straight line. Butt-splices shall be as follows:

a. Thermit Welded Butt Splices - Bars to be thermit welded shall be restricted to steel shown by heat analysis to have a sulfur content not exceeding 0.05 percent. The ends of bars to be thermit welded shall be cut square and smooth. Flame cutting will be permitted provided grinding is employed to remove the resulting scale and to square and smooth the cut ends to a condition equivalent to a saw cut. No shearing will be permitted. Bars shall be cleaned and flame dried before splicing. The joint shall be properly aligned in the mold with a gap opening in accordance with the manufacturer's recommendations. Charging and firing shall conform to the manufacturer's recommendations. The end of bars and the welded mold shall be preheated before welding to a temperature of not less than 100 degrees F and the mold shall be left in place for at least 15 minutes after ignition. Risers shall be broken or burned off after removing the mold. Tension splices shall be staggered longitudinally a minimum of 5 feet so that no more than half of the bars are spliced at any one section or as otherwise indicated.

b. Mechanical Butt-Splices - Mechanical butt-splices shall be an approved exothermic, threaded coupling, swaged sleeve or other positive connecting type. Bars to be spliced by a mechanical butt-splicing process may be sawed, sheared or flame cut provided the ends of sheared bars are reshaped after shearing and all slag is removed from the ends of flame cut bars by chipping and wire brushing prior to splicing. Surfaces to be enclosed within a splice sleeve or coupling shall be cleaned by wire brushing or other approved method prior to splicing. Splices shall be made using manufacturer's standard jigs, clamps, ignition devices and other required accessories. In addition to the strength requirements specified paragraph BUTT-SPLICES the additional deformation of number 14 and smaller bars due to slippage or other movement within the splice sleeve shall not exceed 0.015 inches (unit strain 0.0015 inches/inch) beyond the elongation of an unspliced bar based upon a 10 inch gage length spanning the extremities of the sleeve at a stress of 30,000 psi. The additional deformation of number 18 bars shall not exceed 0.03 inches (unit strain 0.003 inches/inch) beyond the elongation of an unspliced bar based upon a 10 inch gage length spanning the extremities of the sleeve at a stress of 30,000 psi. The amount of the additional deformation shall be determined from the stress-strain curves of the unspliced and spliced bars tested as required paragraph QUALIFICATION OF BUTT-SPLICING PROCEDURE for qualification of the butt-splicing procedure. Tension splices of number 14 or smaller bar shall be staggered longitudinally a minimum of 5 feet or as otherwise indicated so that no more than half of the bars are spliced at any one section. Tension splices of number 18 bars shall be staggered longitudinally a minimum of 5 feet so that no more than 1/3 of the bars are spliced at any one section.

3.3 FIELD TESTS AND INSPECTIONS

3.3.1 Butt-Splices

3.3.1.1 Identification of Splices

The Contractor shall establish and maintain an approved method of identification of all field splices which will indicate the splicer and the number assigned each splice made by the splicer.

3.3.1.2 Examining, Testing, and Correcting

The Contractor shall perform the following during the butt-splicing operations as specified and as directed:

a. Visual Examination - All welded splices shall be visually examined for the presence of cracks, undercuts, inadequate size and other visible defects. Respliced connections resulting from correction of visual defects may be radiographically examined at the option of the Contracting Officer as specified in paragraph SUPPLEMENTAL EXAMINATION. Exothermic mechanical butt-splices shall be visually examined to determine if the filler metal is clearly visible at the tap holes and completely fills the sleeves at both ends except for spaces of not more than 3/8 inch occupied by packing.

b. Tension Tests - Tensions tests to 90 percent of the minimum specified ultimate tensile strength of the spliced bars or to destruction shall be performed on one test specimen made in the field for every 25 splices made. Test specimens shall be made by the splicers engaged in the work, using the approved splicing procedure and the same size bars placed in the same relative position, and under the same conditions as those in the groups represented by the specimens. Stress-strain curves shall be furnished for each butt-splice tested.

c. Radiographic Examination - Not less than one of each 25 welded splices selected at random by the Contracting Officer shall be examined radiographically and evaluated for defects. The greatest dimension of any porosity (gas pocket or similar void) or fusion-type defect (slag inclusion, incomplete fusion or similar generally elongated defect in weld fusion) shall not exceed 1/4 inch. The minimum clearance between edges of porosity or fusion-type defects shall not be less than 1 inch.

d. Correction of Deficiencies - No splice shall be embedded in concrete until satisfactory results of visual examination and the required tests or examinations have been obtained. All splices having visible defects or represented by test specimens which do not satisfy the tests or examinations shall be removed. If any of the tension test specimens fail to meet the strength requirements or deformation limitations two production splices from the same lot represented by the test specimens which failed shall be cut out and tension tested by the Contractor. If both of the retests pass the strength requirements and deformation limitations all of the splices in the lot will be accepted. If one or both of the retests fail to meet the strength requirements or deformation limitations all of the splices in the lot will be rejected. All costs of removal, testing and resplicing of the additional production splices shall be borne by the Contractor. The bars of rejected splices shall be cut off outside the splice zone of weld metal, filler metal contact, coupling or sleeve. The cut ends

shall be finished as specified and the joints shall be respliced and reinspected at no additional cost.

e. Supplemental Examination - The Contracting Officer may require additional or supplemental radiographic examination and/or tension test of any completed splice. If the tested splice passes, the Government pays for the supplemental examination of the splice, otherwise the Contractor incurs the supplemental examination cost for the splice.

-- End of Section --

SECTION 03301

CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 117/117R	(1990) Tolerances for Concrete Construction and Materials
ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 214	(1977; R 1997) Recommended Practice for Evaluation of Strength Test Results of Concrete
ACI 305R	(1999) Hot Weather Concreting

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 31/C 31M	(2000) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1999ae1) Concrete Aggregates
ASTM C 39/C 39M	(1999) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 42/C 42M	(1999) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 94/C 94M	(2000) Ready-Mixed Concrete
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 143/C 143M	(2000) Slump of Hydraulic Cement Concrete
ASTM C 150	(1999a) Portland Cement
ASTM C 172	(1999) Sampling Freshly Mixed Concrete
ASTM C 192/C 192M	(2000) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 231	(1997e1) Air Content of Freshly Mixed Concrete by the Pressure Method

ASTM C 260	(2000) Air-Entraining Admixtures for Concrete
ASTM C 309	(1998a) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494/C 494M	(1999a) Chemical Admixtures for Concrete
ASTM C 566	(1997) Total Evaporable Moisture Content of Aggregate by Drying
ASTM C 597	(1983; R 1997) Pulse Velocity Through Concrete
ASTM C 618	(1999) Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 803/C 803M	(1997e1) Penetration Resistance of Hardened Concrete
ASTM C 805	(1997) Rebound Number of Hardened Concrete
ASTM C 881	(1999) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 1017/C 1017M	(1998) Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C 1064/C 1064M	(1999) Temperature of Freshly Mixed Portland Cement Concrete
ASTM C 1077	(1998) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 1107	(1999) Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
ASTM D 75	(1987; R 1997) Sampling Aggregates

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 94	(1995) Surface Retarders
COE CRD-C 100	(1975) Method of Sampling Concrete Aggregate and Aggregate Sources, and Selection of Material for Testing
COE CRD-C 104	(1980) Method of Calculation of the Fineness Modulus of Aggregate
COE CRD-C 143	(1962) Specifications for Meters for Automatic Indication of Moisture in Fine Aggregate
COE CRD-C 400	(1963) Requirements for Water for Use in

	Mixing or Curing Concrete
COE CRD-C 521	(1981) Standard Test Method for Frequency and Amplitude of Vibrators for Concrete

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44	(1997) NIST Handbook 44: Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100	(1996) Concrete Plant Standards

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Concrete Placement Plan; G

Details and descriptions of concrete placement in, above and adjacent to water showing conformance to requirements of the Environmental Protection Plan in Section 01061, ENVIRONMENTAL PROTECTION, including preventative measures for spillage, containment and cleanup.

Construction Joint Treatment

The method and equipment proposed for joint cleanup and waste disposal shall be submitted for review and approval.

Curing and Protection

The curing medium and methods to be used shall be submitted for review and approval.

SD-03 Product Data

Concrete Mixture Proportioning, G

Concrete mixture proportions shall be determined by the Contractor and submitted for review. The concrete mixture quantities of all ingredients per cubic yard and nominal maximum coarse aggregate size that will be used in the manufacture of each quality of concrete shall be stated. Proportions shall indicate the mass of cement, pozzolan and ground granulated blast-furnace (GGBF) slag when used, and water; the mass of aggregates in a saturated surface-dry condition; and the quantities of admixtures. The submission shall be accompanied by test reports from a laboratory complying with ASTM C 1077 which show that proportions thus selected will produce concrete of the qualities indicated.

No substitution shall be made in the source or type of materials used in the work without additional tests to show that the quality of the new materials and concrete are satisfactory.

Batch Plant

The Contractor shall submit batch plant data to the Contracting Officer for review for conformance with applicable specifications.

Concrete Mixers
Capacity

The Contractor shall submit concrete mixer data which includes the make, type, and capacity of concrete mixers proposed for mixing concrete.

Conveying Equipment

The conveying equipment and methods for transporting, handling, and depositing the concrete shall be submitted for review by the Contracting Officer for conformance with paragraphs CAPACITY and CONVEYING EQUIPMENT.

Placing Equipment

All placing equipment and methods shall be submitted for review by the Contracting Officer for conformance with paragraph CAPACITY.

Cold-Weather Placing; G

If concrete is to be placed under cold-weather conditions, the proposed materials, methods, and protection shall be submitted for approval.

Hot-Weather Placing; G
Finishing; G

If concrete is to be placed under hot-weather conditions, the proposed materials and methods shall be submitted for review and approval.

SD-04 Samples

Aggregates; G
Cementitious Materials, Admixtures, and Curing Compound; G

Samples of materials for government testing and approval shall be submitted as required in paragraph PRECONSTRUCTION SAMPLING AND TESTING.

SD-06 Test Reports

Quality of Aggregates; G

Aggregate quality tests shall be submitted at least 30 days prior to start of concrete placement.

Mixer Uniformity.

The results of the initial mixer uniformity tests shall be submitted at least 5 days prior to the initiation of placing.

Tests and Inspections

Test results and inspection reports shall be submitted daily and weekly as required in paragraph REPORTS.

SD-07 Certificates

Tests and Inspections
Testing Technicians
Concrete Transportation Construction Inspector (CTCI)

The Contractor shall submit statements that the concrete testing technicians and the concrete inspectors meet the specified requirements.

Cementitious Materials; G

Cementitious Materials, including Cement and Pozzolan, will be accepted on the basis of the manufacturer's certification of compliance, accompanied by mill test reports that materials meet the requirements of the specification under which they are furnished. Certification and mill test reports shall be from samples taken from the particular lot furnished. No cementitious materials shall be used until notice of acceptance has been given by the Contracting Officer. Cementitious materials will be subject to check testing from samples obtained at the source, at transfer points, or at the project site, as scheduled by the Contracting Officer, and such sampling will be by or under the supervision of the Government at its expense. Material not meeting specifications shall be promptly removed from the site of work.

Impervious-Sheet Curing Materials; G

Impervious-Sheet Curing Materials shall be certified for compliance with all specification requirements.

Air-Entraining Admixture; G

Air-Entraining Admixture shall be certified for compliance with all specification requirements.

Other Chemical Admixtures; G

Other Chemical Admixtures shall be certified for compliance with all specification requirements.

Membrane-Forming Curing Compound; G

Membrane-Forming Curing Compound shall be certified for compliance with all specification requirements.

Epoxy Resin; G
Latex Bonding Compound; G

Epoxy Resin and Latex Bonding Compound shall be certified for

compliance with all specification requirements.

Nonshrink Grout; G

Descriptive literature of the Nonshrink Grout proposed for use shall be furnished together with a certificate from the manufacturer stating that it is suitable for the application or exposure for which it is being considered.

1.3 GOVERNMENT TESTING AND SAMPLING

The Government will sample and test aggregates and concrete to determine compliance with the specifications. The Contractor shall provide facilities and labor as may be necessary for procurement of representative test samples. Samples of aggregates will be obtained at the point of batching in accordance with ASTM D 75. Concrete will be sampled in accordance with ASTM C 172.

1.3.1 Preconstruction Sampling and Testing

1.3.1.1 Aggregates

Samples from any source of coarse aggregate and any source of fine aggregate selected by the Contractor, consisting of not less than 150 pounds of each size coarse aggregate and 75 pounds of fine aggregate taken under the supervision of the Contracting Officer in accordance with COE CRD-C 100 shall be delivered to the Contracting Officer within 15 days after notice to proceed. Sampling and shipment of samples shall be at the Contractor's expense. 30 days will be required to complete evaluation of the aggregates. Testing will be performed by and at the expense of the Government in accordance with the applicable COE CRD-C or ASTM test methods. The cost of testing one source for each size of aggregate will be borne by the Government. If the Contractor selects more than one source for each aggregate size or selects a substitute source for any size aggregate after the original source was tested, the cost of that additional testing will be borne by the Contractor. Tests to which aggregate may be subjected are listed in paragraph QUALITY. The material from the proposed source shall meet the quality requirements of this paragraph. Testing of aggregates by the Government does not relieve the Contractor of the requirements outlined in paragraph TESTS AND INSPECTIONS.

1.3.1.2 Cementitious Materials, Admixtures, and Curing Compound

At least 60 days in advance of concrete placement, the Contractor shall notify the Contracting Officer of the sources for cementitious materials, admixtures, and curing compound, along with sampling location, brand name, type, and quantity to be used in the manufacture and/or curing of the concrete.

1.3.2 Construction Testing by the Government

The Government will sample and test chemical admixtures, curing compounds, and cementitious materials.

1.3.2.1 Chemical Admixtures Storage

Chemical admixtures that have been in storage at the project site for longer than 6 months or that have been subjected to freezing shall be retested at the expense of the Contractor when directed by the Contracting

Officer and shall be rejected if test results are not satisfactory. Chemical admixtures will be accepted based on compliance with the requirements of paragraph CHEMICAL ADMIXTURES.

1.3.2.2 Cement and Pozzolan

If cement or pozzolan is to be obtained from more than one source, the initial notification shall state the estimated amount to be obtained from each source and the proposed schedule of shipments.

a. Prequalified Cement Sources - Cement shall be delivered and used directly from a mill of a producer designated as a qualified source. Samples of cement for check testing will be taken at the project site or concrete-producing plant by a representative of the Contracting Officer for testing at the expense of the Government. A list of prequalified cement sources is available from Director, U.S. Army Corps of Engineers, Engineer Research and Development Center - Structures Laboratory, 3909 Halls Ferry Road, Vicksburg, MS 39180-6199, ATTN: CEERD-SC.

b. Prequalified Pozzolan Sources - Pozzolan shall be delivered and used directly from a producer designated as a qualified source. Samples of pozzolan for check testing will be taken at the project site by a representative of the Contracting Officer for testing at the expense of the Government. A list of prequalified pozzolan sources is available from the Director, U.S. Army Corps of Engineers, Engineer Research and Development Center - Structures Laboratory, 3909 Halls Ferry Road, Vicksburg, MS 39180-6199, ATTN: CEERD-SC.

1.3.2.3 Concrete Strength

Compressive strength test specimens will be made by the Government and cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 39/C 39M. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified compressive strength f'c and no individual test result falls below the specified strength f'c by more than 500 psi. A "test" is defined as the average of two companion cylinders, or if only one cylinder is tested, the results of the single cylinder test. Additional analysis or testing, including nondestructive testing, taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the structure is considered potentially deficient.

a. Investigation of Low-Strength Test Results - When any strength test of standard-cured test cylinders falls below the specified strength requirement by more than 500 psi or if tests of field-cured cylinders indicate deficiencies in protection and curing, steps shall be taken to assure that the load-carrying capacity of the structure is not jeopardized. Nondestructive testing in accordance with ASTM C 597, ASTM C 803/C 803M, or ASTM C 805 may be permitted by the Contracting Officer to estimate the relative strengths at various locations in the structure as an aid in evaluating concrete strength in place or for selecting areas to be cored. Such tests shall not be used as a basis for acceptance or rejection.

b. Testing of Cores - When the strength of concrete in place is considered potentially deficient, cores shall be obtained and tested in accordance with ASTM C 42/C 42M. At least three representative cores shall be taken from each member or area of concrete in place that is

considered potentially deficient. The location of cores will be determined by the Contracting Officer to least impair the performance of the structure. Concrete in the area represented by the core testing will be considered adequate if the average strength of the cores is equal to at least 85 percent of the specified strength requirement and if no single core is less than 75 percent of the specified strength requirement.

1.4 DESIGN REQUIREMENTS

1.4.1 Concrete Strength

Specified compressive strength f'c shall be as follows:

COMPRESSIVE STRENGTH (PSI)	STRUCTURE OR PORTION OF STRUCTURE
4,000 @ 28 days	Precast Concrete
4,000 @ 28 days	Cast-in-Place Concrete
4,000 @ 28 days	Tremie Placed Concrete
5,000 @ 28 days	Non-Shrink Grout

1.4.2 Maximum Water-Cement (W/C) Ratio

Maximum W/C shall be as follows:

WATER-CEMENT RATIO, BY MASS	STRUCTURE OR PORTION OF STRUCTURE
0.40	Precast Concrete
0.40	Cast-in-Place Concrete
0.40	Tremie Placed Concrete
0.40	Non-Shrink Grout

These W/C's may cause higher strengths than that required by paragraph CONCRETE STRENGTH.

1.5 CONSTRUCTION TOLERANCES

Except as specified otherwise, a plus tolerance increases and a minus tolerance decreases the dimension to which it applies. A tolerance without sign means plus or minus. Where only one sign is specified, there is no limit in the other direction. Tolerances are not cumulative. The most restrictive tolerance will control. Tolerances shall not extend the structure beyond legal boundaries.

a. Level and grade tolerance measurements of slabs shall be made as soon as possible after finishing. When forms or shoring are used, the measurements shall be made prior to removal.

b. Construction tolerances shall meet the requirements of ACI 117/117R and any of the following requirements that are applicable.

1.5.1 Appearance

Permanently exposed surfaces shall be cleaned, if stained or otherwise discolored, by a method that does not harm the concrete and that is approved by the Contracting Officer.

1.6 STORAGE OF MATERIALS

All products shall be stored in such a manner as to avoid contamination and deterioration. Reinforcing steel bats and other products shall be stored above ground on platforms, pallets or other supports. All materials shall be capable of being easily identified on site.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Cementitious Materials

Cementitious materials shall be portland cement, or portland-pozzolan cement and shall conform to appropriate specifications listed below. Use of cementitious materials in architectural concrete shall be restricted to one color, one source, and one type.

2.1.1.1 Portland Cement

ASTM C 150, Type I or II, except that the maximum amount of C3A in Type I cement shall be 15 percent including the heat of hydration at 7 days and low alkali when used with aggregates listed at the end of this section which require it.

2.1.1.2 Pozzolan, Other than Silica Fume

Pozzolan shall conform to ASTM C 618, Class F, with the optional requirements for multiple factor, drying shrinkage, and uniformity of Table 2A. Table 1A requirement for maximum alkalies shall apply when used with aggregates listed at the end of this section to require low-alkali cement.

2.1.2 Aggregates

2.1.2.1 General

Concrete aggregates may be furnished from any source capable of meeting the quality requirements as stated in paragraph QUALITY. Fine and coarse aggregates shall conform to the grading requirements of ASTM C 33. The nominal maximum size shall be as listed in paragraph NOMINAL MAXIMUM-SIZE COARSE AGGREGATE. Where the use of highway department gradations are permitted, proposed gradations shall be submitted for approval.

2.1.2.2 Concrete Aggregate Sources

Selection of Source - After the award of the contract, the Contractor shall designate in writing only one source or combination of sources from which he proposes to furnish aggregates. The Contractor may designate only a single source or single combination of sources for aggregates. Regardless of the source, selected samples for acceptance testing shall be provided as required by paragraph GOVERNMENT TESTING AND SAMPLING. If a source for coarse or fine aggregates so designated by the Contractor does not meet the quality requirements stated in paragraph QUALITY, the Contractor may not submit for approval other non-listed sources but shall furnish the coarse or fine aggregate, as the case may be, from sources listed at the end of this section at no additional cost to the Government.

2.1.2.3 Quality

Concrete aggregates delivered to the mixer may be furnished from any source capable of meeting the quality requirements of ASTM C 33. The test results

and conclusions shall be considered valid only for the sample tested and shall not be taken as an indication of the quality of all material from a source nor for the amount of processing required. Fine and coarse aggregates shall conform to the grading requirements of ASTM C 33, Class 5S. The nominal maximum size shall be as listed in paragraph 2.2.2

2.1.3 Chemical Admixtures

Chemical admixtures to be used, when required or permitted, shall conform to the appropriate specification listed.

2.1.3.1 Air-Entraining Admixture

The air-entraining admixture shall conform to ASTM C 260 and shall consistently cause the concrete to have an air content in the specified ranges under field conditions.

2.1.3.2 Water-Reducing or Retarding Admixture

a. Water-Reducing or Retarding Admixtures: ASTM C 494/C 494M, Type A, B, or D, except that the 6-month and 1-year compressive strength tests are waived.

b. High-Range Water Reducing Admixture: ASTM C 494/C 494M, Type F or G except that the 6-month and 1-year strength requirements shall be waived. The admixture may be used only when approved by the Contracting Officer, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan.

2.1.3.3 Other Chemical Admixtures

Other chemical admixtures for use in producing flowing concrete shall comply with ASTM C 1017/C 1017M, Type 1 or 2. These admixture shall be used only for concrete listed in paragraph SLUMP.

Antiwash admixture agents shall be used in all concrete to be placed by the tremie method in flowing water. The amount of antiwash admixture used shall be adequate to prevent loss of cement and fines in the water flow velocities expected during construction.

2.1.4 Curing Materials

2.1.4.1 Membrane-Forming Curing Compound

The membrane-forming curing compound shall conform to ASTM C 309, Type 1-D or 2. The curing compound selected shall be compatible with any subsequent paint, roofing, coating, or flooring specified. Nonpigmented compound shall contain a fugitive dye and shall have the reflective requirements in ASTM C 309 waived.

2.1.5 Water

Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that nonpotable water may be used if it meets the requirements of COE CRD-C 400.

2.1.6 Nonshrink Grout

All grout shall be nonshrink grout. Nonshrink grout shall conform to ASTM

C 1107 and shall be a commercial formulation suitable for the application proposed, unless otherwise noted.

2.1.7 Epoxy Resin

Epoxy resin for use in repairs shall conform to ASTM C 881, Type III, Grade I or II. Reference Section 03730, RESIN SYSTEMS FOR CONCRETE REPAIR AND BONDING; GROUTING ANCHOR BARS.

2.2 CONCRETE MIXTURE PROPORTIONING

2.2.1 Quality of Mixture

For each portion of the structure, mixture proportions shall be selected so that the strength and W/C requirements listed in paragraph DESIGN REQUIREMENTS are met.

2.2.2 Nominal Maximum-Size Coarse Aggregate

Nominal maximum-size coarse aggregate shall be 1 inch except 3/4 inch nominal maximum-size coarse aggregate shall be used when any of the following conditions exist: the narrowest dimension between sides of forms is less than 7-1/2 inches, the depth of the slab is less than 4 inches, the minimum clear spacing between reinforcing is less than 2-1/4 inches, or the concrete is placed by the tremie method.

2.2.3 Air Content

Air content as delivered to the forms and as determined by ASTM C 231 shall be between 4 and 7 percent except that when the nominal maximum-size coarse aggregate is 3/4 inch, it shall be between 4-1/2 and 7-1/2 percent.

2.2.4 Slump

The slump shall be determined in accordance with ASTM C 143/C 143M and shall be within the range of 1 to 4 inch. Where placement by pump is approved, the slump shall not exceed 6 inches. Concrete to be placed by the tremie method may contain a chemical admixture for use in producing flowing concrete in accordance with ASTM C 1017/C 1017M, and the slump of the concrete shall range between 8 to 10 inches.

2.2.5 Concrete Proportioning

Trial batches and testing requirements for various qualities of concrete specified shall be the responsibility of the Contractor. Samples of aggregates shall be obtained in accordance with the requirements of ASTM D 75. Samples of materials other than aggregate shall be representative of those proposed for the project and shall be accompanied by the manufacturer's test reports indicating compliance with applicable specified requirements. Trial mixtures having proportions, consistencies, and air content suitable for the work shall be made based on methodology described in ACI 211.1, using at least three different water-cement ratios, which will produce a range of strength encompassing those required for the work. The maximum water-cement ratios required in paragraph MAXIMUM WATER-CEMENT RATIO will be converted to a weight ratio of water to cement plus pozzolan by mass, as described in ACI 211.1. If pozzolan is used in the concrete mixture, the minimum pozzolan content shall be 15 percent of the total cementitious material and the maximum shall be 35 percent. Trial mixtures shall be proportioned for maximum permitted slump and air content with due

consideration to the approved conveying and placement method. The temperature of concrete in each trial batch shall be reported. For each water-cement ratio, at least three test cylinders for each test age shall be made and cured in accordance with ASTM C 192/C 192M. They shall be tested at 7 days and at the design age specified in paragraph DESIGN REQUIREMENTS in accordance with ASTM C 39/C 39M. From these test results, a curve will be plotted showing the relationship between water-cement ratio and strength.

2.2.6 Required Average Compressive Strength

In meeting the strength requirements specified in paragraph CONCRETE STRENGTH, the selected mixture proportion shall produce a required average compressive strength f'cr exceeding the specified strength f'c by the amount indicated below.

2.2.6.1 Average Compressive Strength from Test Records

Where a concrete production facility has test records, a standard deviation shall be established in accordance with the applicable provisions of ACI 214. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected, shall represent concrete produced to meet a specified strength or strengths (f'c) within 1,000 psi of that specified for proposed work, and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days or at another test age designated for determination of f'c.

Required average compressive strength f'cr used as the basis for selection of concrete proportions shall be the larger of the equations that follow using the standard deviation as determined above:

$$f'cr = f'c + 1.34S$$
$$f'cr = f'c + 2.33S - 500$$

Where S = standard deviation

Where a concrete production facility does not have test records meeting the requirements above but does have a record based on 15 to 29 consecutive tests, a standard deviation shall be established as the product of the calculated standard deviation and a modification factor from the following table:

NUMBER OF TESTS*	MODIFICATION FACTOR FOR STANDARD DEVIATION Use tabulation in paragraph DETERMINING REQUIRED AVERAGE STRENGTH
less than 15	
15	1.16
20	1.08
25	1.03
30 or more	1.00

*Interpolate for intermediate numbers of tests.

2.2.6.2 Average Compressive Strength without Previous Test Records

When a concrete production facility does not have sufficient field strength

test records for calculation of the standard deviation, the required average strength fcr shall be determined as follows:

If the specified compressive strength f'c is less than 3,000 psi,

f'cr = f'c + 1,000

If the specified compressive strength f'c is 3,000 to 5,000 psi,

f'cr = f'c + 1,200

If the specified compressive strength f'c is over 5,000 psi,

f'cr = f'c + 1,400

PART 3 EXECUTION

3.1 EQUIPMENT

3.1.1 Capacity

The batching, mixing, conveying, and placing equipment shall have a capacity of at least 50 cubic yards per hour.

3.1.2 Batch Plant

Batch plant shall conform to the requirements of NRMCA CPMB 100and as specified; however, rating plates attached to batch plant equipment are not required.

3.1.2.1 Batching Equipment

The batching controls shall be semiautomatic or automatic. The semiautomatic batching system shall be provided with interlocks such that the discharge device cannot be actuated until the indicated material is within the applicable tolerance. The batching system shall be equipped with an accurate recorder or recorders that meet the requirements of NRMCA CPMB 100. Separate bins or compartments shall be provided for each size group of aggregate, cement and pozzolan. Aggregates shall be weighed either in separate weigh batchers with individual scales or cumulatively in one weigh batcher on one scale. Aggregate shall not be weighed in the same batcher with cement and pozzolan. If both cement and pozzolan are used, they may be batched cumulatively provided that the portland cement is batched first. If measured by mass, the mass of the water shall not be weighed cumulatively with another ingredient. Water batcher filling and discharging valves shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed. An accurate mechanical device for measuring and dispensing each admixture shall be provided. Each dispenser shall be interlocked with the batching and discharging operation of the water so that each admixture is separately batched and discharged automatically in a manner to obtain uniform distribution throughout the batch in the specified mixing period. Admixtures shall not be combined prior to introduction in water. The plant shall be arranged so as to facilitate the inspection of all operations at all times. Suitable facilities shall be provided for obtaining representative samples of aggregates from each bin or compartment. All filling ports for cementitious materials bins or silos shall be clearly marked with a permanent sign stating the contents.

3.1.2.2 Scales

The equipment for batching by mass shall conform to the applicable requirements of NIST HB 44, except that the accuracy shall be plus or minus 0.2 percent of scale capacity. The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring devices. Tests shall be made at the frequency required in paragraph TESTS AND INSPECTIONS, and in the presence of a government inspector.

3.1.2.3 Batching Tolerances

a. Weighing Tolerances

MATERIAL	PERCENT OF REQUIRED MASS
Cementitious materials	0 to plus 2
Aggregate	plus or minus 2
Water	plus or minus 1
Chemical admixture	0 to plus 6

b. Volumetric Tolerances - For volumetric batching equipment, the following tolerances shall apply to the required volume of material being batched:

Water: ..... Plus or minus 1 percent.
Chemical admixtures: ..... Zero to plus 6 percent.

3.1.2.4 Moisture Control

The plant shall be capable of ready adjustment to compensate for the varying moisture content of the aggregates and to change the masses of the materials being batched. An electric moisture meter complying with the provisions of COE CRD-C 143 shall be provided for measuring moisture in the fine aggregate. The sensing element shall be arranged so that the measurement is made near the batcher charging gate of the sand bin or in the sand batcher.

3.1.3 Concrete Mixers

The concrete mixers shall not be charged in excess of the capacity recommended by the manufacturer. The mixers shall be operated at the drum or mixing blade speed designated by the manufacturer. The mixers shall be maintained in satisfactory operating condition, and the mixer drums shall be kept free of hardened concrete. Should any mixer at any time produce unsatisfactory results, its use shall be promptly discontinued until it is repaired.

3.1.3.1 Stationary Mixers

Concrete plant mixers shall be tilting, nontilting, horizontal-shaft, vertical-shaft, or pugmill and shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed. The mixing time and uniformity shall conform to all the requirements in ASTM C 94/C 94M applicable to central-mixed concrete.

3.1.3.2 Truck Mixers

Truck mixers, the mixing of concrete therein, and concrete uniformity shall conform to the requirements of ASTM C 94/C 94M. A truck mixer may be used either for complete mixing (transit-mixed) or to finish the partial mixing done in a stationary mixer (shrink-mixed). Each truck shall be equipped with two counters from which it will be possible to determine the number of revolutions at mixing speed and the number of revolutions at agitating speed.

3.1.4 Conveying Equipment

The conveying equipment shall conform to the following requirements.

3.1.4.1 Buckets

The interior hopper slope shall be not less than 58 degrees from the horizontal, the minimum dimension of the clear gate opening shall be at least five times the nominal maximum-size aggregate, and the area of the gate opening shall not be less than 2 square feet. The maximum dimension of the gate opening shall not be greater than twice the minimum dimension. The bucket gates shall be essentially grout tight when closed and may be manually, pneumatically, or hydraulically operated except that buckets larger than 2 cubic yards shall not be manually operated. The design of the bucket shall provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

3.1.4.2 Transfer Hoppers

Concrete may be charged into nonagitating hoppers for transfer to other conveying devices. Transfer hoppers shall be capable of receiving concrete directly from delivery vehicles and have conical-shaped discharge features. The transfer hopper shall be equipped with a hydraulically operated gate and with a means of external vibration to effect complete discharge. Concrete shall not be held in nonagitating transfer hoppers more than 30 minutes.

3.1.4.3 Trucks

Truck mixers operating at agitating speed or truck agitators used for transporting plant-mixed concrete shall conform to the requirements of ASTM C 94/C 94M. Nonagitating equipment may be used for transporting plant-mixed concrete over a smooth road when the hauling time is less than 15 minutes. Bodies of nonagitating equipment shall be smooth, watertight, metal containers specifically designed to transport concrete, shaped with rounded corners to minimize segregation, and equipped with gates that will permit positive control of the discharge of the concrete.

3.1.4.4 Chutes

When concrete can be placed directly from a truck mixer, agitator, or nonagitating equipment, the chutes attached to this equipment by the manufacturer may be used. A discharge deflector shall be used when required by the Contracting Officer. Separate chutes and other similar equipment will not be permitted for conveying concrete.

3.1.4.5 Belt Conveyors

Belt conveyors shall be designed and operated to assure a uniform flow of concrete from mixer to final place of deposit without segregation of ingredients or loss of mortar and shall be provided with positive means for

preventing segregation of the concrete at the transfer points and the point of placing. Belt conveyors shall be constructed such that the idler spacing shall not exceed 36 inches. The belt speed shall be a minimum of 300 feet per minute and a maximum of 750 feet per minute. If concrete is to be placed through installed horizontal or sloping reinforcing bars, the conveyor shall discharge concrete into a pipe or elephant trunk that is long enough to extend through the reinforcing bars.

3.1.4.6 Concrete Pumps

Concrete may be conveyed by positive displacement pump when approved. The pumping equipment shall be piston or squeeze pressure. The pipeline shall be rigid steel pipe or heavy-duty flexible hose. The inside diameter of the pipe shall be at least three times the nominal maximum-size coarse aggregate in the concrete mixture to be pumped but not less than 4 inches. Aluminum pipe shall not be used.

3.1.5 Vibrators

Vibrators of the proper size, frequency, and amplitude shall be used for the type of work being performed in conformance with the following requirements:

APPLICATION	HEAD DIAMETER INCHES	FREQUENCY VPM	AMPLITUDE INCHES
Thin walls, beams, etc.	1-1/4 to 2-1/2	9,000 to 13,500	0.02 to 0.04
General construction	2 to 3-1/2	8,000 to 12,000	0.025 to 0.05

The frequency and amplitude shall be determined in accordance with COE CRD-C 521.

3.2 PREPARATION FOR PLACING

3.2.1 Embedded Items

Before placement of concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as indicated on the drawings, or required. Embedded items shall be free of oil and other foreign matter such as loose coatings or rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable materials to prevent the entry of concrete into voids. Welding, including tack welding, will not be permitted on embedded metals within 2 feet of the surface of the concrete.

3.2.2 Concrete on Rock Foundations

Rock surfaces upon which concrete is to be placed shall be clean, free from oil, standing or running water, ice, mud, drummy rock, coating, debris, and loose, semidetached, or unsound fragments. Joints in rock shall be cleaned to a satisfactory depth, as determined by the Contracting Officer, and to firm rock on the sides. Cleanup and foundation preparation, both in-the-dry and underwater as applicable, are described in Section 02217 FOUNDATION PREPARATION and shall be performed prior to concrete placement. All rock surfaces shall be kept continuously wet for at least 24 hours immediately prior to placing concrete thereon.

3.2.3 Construction Joint Treatment

Construction joint treatment shall conform to the following requirements.

3.2.3.1 Joint Preparation

Construction joints shall be roughened to 1/4 inch amplitude minimum roughness per ACI 318/318R, unless noted otherwise. Concrete surfaces to which additional concrete is to be bonded shall be prepared for receiving the next lift or adjacent concrete by cleaning with either air-water cutting, high-pressure water jet, or other approved method. Under **no** conditions shall the cleaning of roughened construction joints reduce the minimum 1/4 inch amplitude roughness. Air-water cutting will not be permitted on formed surfaces or surfaces congested with reinforcing steel. Regardless of the method used, the resulting surfaces shall be free from all laitance and inferior concrete so that clean, well bonded coarse aggregate is exposed uniformly throughout the lift surface. The edges of the coarse aggregate shall not be undercut. The surface shall be washed clean again as the last operation prior to placing the next lift. There shall be no standing water on the surface upon which concrete is placed.

3.2.3.2 Air-Water Cutting

Air-water cutting of a construction joint shall be performed at the proper time and only on horizontal construction joints. The air pressure used in the jet shall be 90 to 110 psi, and the water pressure shall be just sufficient to bring the water into effective influence of the air pressure. When approved by the Contracting Officer, a retarder complying with the requirements of COE CRD-C 94 may be applied to the surface of the lift to prolong the period of time during which air-water cutting is effective. Prior to receiving approval, the Contractor shall furnish samples of the material to be used and shall demonstrate the method to be used in applications. After cutting, the surface shall be washed and rinsed as long as there is any trace of cloudiness of the wash water. Where necessary to remove accumulated laitance, coatings, stains, debris, and other foreign material, high-pressure water jet or sandblasting will be required as the last operation before placing the next lift.

3.2.3.3 High-Pressure Water Jet

A stream of water under a pressure of not less than 3,000 psi may be used for cleaning. Its use shall be delayed until the concrete is sufficiently hard so that only the surface skin or mortar is removed and there is no undercutting of coarse-aggregate particles. If the water jet is incapable of a satisfactory cleaning, the surface shall be cleaned by sandblasting.

3.2.3.4 Application of Epoxy Adhesive

Epoxy components shall be blended, mixed and applied in accordance with the requirements of Section 03730, RESIN SYSTEMS FOR CONCRETE REPAIR AND BONDING; GROUTING ANCHOR BARS.

3.2.3.5 Waste Disposal

The method used in disposing of waste water employed in cutting, washing, and rinsing of concrete surfaces shall be such that the waste water does not stain, discolor, or affect exposed surfaces of the structures, or damage the environment of the project area. The method of disposal shall be subject to approval.

3.3 PLACING

3.3.1 Placing Procedures

Concrete surfaces shall be prepared as described in paragraph 3.2. Concrete placement will not be permitted when, in the opinion of the Contracting Officer, weather conditions prevent proper placement and consolidation. Concrete shall be deposited as close as possible to its final position in the forms and, in so depositing, there shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it may be effectively consolidated in horizontal layers 2.0 feet or less in thickness with a minimum of lateral movement. The amount deposited in each location shall be that which can be readily and thoroughly consolidated. Sufficient placing capacity shall be provided so that concrete placement can be kept plastic and free of cold joints while concrete is being placed. Concrete shall be placed by methods that will prevent segregation or loss of ingredients. Any concrete transferred from one conveying device to another shall be passed through a hopper that is conical in shape. The concrete shall not be dropped vertically more than 5 feet, except where a properly designed and sized elephant truck with rigid drop chute bottom section is provided to prevent segregation and where specifically authorized. In no case will concrete be discharged to free-fall through reinforcing bars.

3.3.2 Placement by Pump

When concrete is to be placed by pump, the nominal maximum-size coarse aggregate shall not be reduced to accommodate the pumps. The distance to be pumped shall not exceed limits recommended by the pump manufacturer. The concrete shall be supplied to the concrete pump continuously. When pumping is completed, concrete remaining in the pipeline shall be ejected without contamination of concrete in place. After each operation, equipment shall be thoroughly cleaned, and flushing water shall be wasted outside of the forms. Grout used to lubricate the pumping equipment at the beginning of the placement will not be incorporated into the placement.

3.3.3 Time Interval Between Mixing and Placing

Concrete shall be placed within 30 minutes after discharge into nonagitating equipment. When concrete is truck-mixed or when a truck mixer or agitator is used for transporting concrete mixed by a concrete plant mixer, the concrete shall be delivered to the site of the work, and discharge shall be completed within 1-1/2 hours after introduction of the cement to the aggregates. When the length of haul makes it impossible to deliver truck-mixed concrete within these time limits, batching of cement and a portion of the mixing water shall be delayed until the truck mixer is at or near the construction site.

3.3.4 Cold-Weather Placing

When cold-weather placing of concrete is likely to be subjected to freezing temperatures before the expiration of the curing period, it shall be placed in accordance with procedures previously submitted in accordance with paragraph SUBMITTALS. The ambient temperature of the space adjacent to the concrete placement and surfaces to receive concrete shall be above 32 degrees F. The placing temperature of the concrete having a minimum dimension less than 12 inches shall be between 55 and 75 degrees F when

measured in accordance with ASTM C 1064/C 1064M. The placing temperature of the concrete having a minimum dimension greater than 12 inches shall be between 50 and 70 degrees F. Heating of the mixing water or aggregates will be required to regulate the concrete-placing temperatures. Materials entering the mixer shall be free from ice, snow, or frozen lumps. Salt, chemicals, or other materials shall not be mixed with the concrete to prevent freezing.

3.3.5 Hot-Weather Placing

Concrete shall be properly placed and finished with procedures previously submitted in accordance with paragraph SUBMITTALS. The concrete-placing temperature shall not exceed 75 degrees F when measured in accordance with ASTM C 1064/C 1064M. Cooling of the mixing water and aggregates, or both, may be required to obtain an adequate placing temperature. A retarder meeting the requirements of paragraph WATER-REDUCING OR RETARDING ADMIXTURES may be used to facilitate placing and finishing. Steel forms and reinforcement shall be cooled prior to concrete placement when steel temperatures are greater than 100 degrees F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature.

3.3.6 Consolidation

Immediately after placement, each layer of concrete, including flowing concrete, shall be consolidated by internal vibrating equipment. Vibrators shall not be used to transport concrete within the forms. Hand spading may be required, if necessary, with internal vibrating along formed surfaces permanently exposed to view. Form or surface vibrators shall not be used unless specifically approved. The vibrator shall be inserted vertically at uniform spacing over the entire area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding unhardened layer if such exists. It shall be held stationary until the concrete is consolidated and then withdrawn slowly.

3.3.7 Placing Concrete in Congested Areas

Special care shall be used to ensure complete filling of the forms, elimination of all voids, and complete consolidation of the concrete when placing concrete in areas congested with reinforcing bars, embedded items, waterstops and other tight spacing. An appropriate concrete mixture shall be used, and the nominal maximum size of aggregate (NMSA) shall meet the specified criteria when evaluated for the congested area. Vibrators with heads of a size appropriate for the clearances available shall be used, and the consolidation operation shall be closely supervised to ensure complete and thorough consolidation at all points. Where necessary, splices of reinforcing bars shall be alternated to reduce congestion. Where two mats of closely spaced reinforcing are required, the bars in each mat shall be placed in matching alignment to reduce congestion.

3.3.8 Placing Concrete Underwater

Placing concrete underwater shall be in accordance with Section 03400, TREMIE CONCRETE.

3.4 FINISHING

The ambient temperature of spaces adjacent to surfaces being finished shall be not less than 40 degrees F. In hot weather when the rate of evaporation of surface moisture, as determined by use of Figure 2.1.5 of ACI 305R, may reasonably be expected to exceed 0.2 pounds per square foot per hour. Provisions for windbreaks, shading, fog spraying, or wet covering with a light-colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as finishing operations will allow. All unformed surfaces that are not to be covered by additional concrete or backfill shall have a float finish. Additional finishing shall be as specified below and shall be true to the elevation shown in the drawings. Surfaces to receive additional concrete or backfill shall be brought to the elevation shown on the drawings and left true and regular. Exterior surfaces shall be sloped for drainage unless otherwise shown in the drawing or as directed. Joints shall be carefully made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions. Grate tampers or jitterbugs shall not be used.

3.4.1 Unformed Surfaces

3.4.1.1 Float Finish

Surfaces shall be screeded and darbied or bullfloated to bring the surface to the required finish level with no coarse aggregate visible. No water, cement, or mortar shall be added to the surface during the finishing operation. The concrete, while still green but sufficiently hardened to bear a man's weight without deep imprint, shall be floated to a true and even plane. Floating may be performed by use of suitable hand floats or power-driven equipment. Hand floats shall be made of magnesium or aluminum.

3.4.1.2 Trowel Finish

A trowel finish shall be applied to the following surfaces: cofferdam slab. Concrete surfaces shall be finished with a float finish, and after surface moisture has disappeared, the surface shall be troweled to a smooth, even, dense finish free from blemishes including trowel marks.

3.4.1.3 Broom Finish

A broom finish shall be applied to the following surfaces: top of beams and top of walls at elevation 1180 and 1181. The concrete surface shall be finished with a float finish. The floated surface shall be broomed with a fiber-bristle brush in a direction transverse to that of the main traffic.

3.4.2 Formed Surfaces

Unless another finish is specified, surfaces shall be left with the texture imparted by the forms except that defective surfaces shall be repaired as described in paragraph FORMED SURFACE REPAIR.

Unless painting of surfaces is required, uniform color of the concrete shall be maintained by use of only one mixture without changes in materials or proportions for any structure or portion of structure that is exposed to view or on which a special finish is required. The form panels used to produce the finish shall be orderly in arrangement, with joints between panels planned in approved relation to openings, building corners, and other architectural features. Forms shall not be reused if there is any evidence of surface wear or defects that would impair the quality of the surface.

3.4.3 Formed Surface Repair

After removal of forms, all ridges, lips, and bulges on surfaces permanently exposed shall be removed. All repairs shall be completed within 48 hours after form removal.

3.4.3.1 Classes A, & B Finishes

Surfaces listed in Section 03100 STURCTURAL CONCRETE FORMWORK and as shown to have classes A, and B finishes shall have surface defects repaired as follows: defective areas, voids, and honeycombs smaller than 16 square inches in area and less than 1/2 inch deep and bug holes exceeding 1/2 inch in diameter shall be chipped and filled with dry-packed mortar. Holes left by removal of tie rods shall be reamed and filled with dry-packed mortar as specified in paragraph MATERIAL AND PROCEDURE FOR REPAIRS. Defective and unsound concrete areas larger than described shall be defined by 1/2 inch deep dovetailed saw cuts in a rectangular pattern with lines parallel to the formwork, the defective concrete removed by chipping, and the void repaired with replacement concrete. The prepared area shall be brush-coated with an epoxy resin meeting the requirements of paragraph EPOXY RESIN, or a neat cement grout after dampening the area with water. The void shall be filled with replacement concrete in accordance with paragraph MATERIAL AND PROCEDURE FOR REPAIRS.

3.4.3.2 Class C Finish

Surfaces listed in Section 03100 STURCTURAL CONCRETE FORMWORK and as shown shall have defects repaired as follows: defective areas, voids, and honeycombs smaller than 24 square inchesand less than 2 inches deep; bug holes exceeding 1-1/2 inches in diameter shall be chipped and filled with dry-packed mortar; and holes left by removal of the tie rods shall be chipped and filled with dry-packed mortar. Defective and unsound concrete areas larger than 24 square inches and deeper than 1-1/2 inches shall be defined by 1/2 inch deep dovetailed saw cuts in a rectangular pattern, the defective concrete removed by chipping, and the void repaired with replacement concrete. The prepared area shall be brush-coated with an epoxy resin meeting the requirements of paragraph EPOXY RESIN, or a neat cement grout after dampening the area with water. The void shall be filled with replacement concrete in accordance with paragraph MATERIAL AND PROCEDURE FOR REPAIRS.

3.4.3.3 Class D Finish

Surfaces listed in Section 03100 STURCTURAL CONCRETE FORMWORK and as shown to have class D finish shall have surface defects repaired as follows: defective areas, voids, and honeycombs greater than 48 square inches in area or more than 2 inches deep shall be defined by 1/2 inch deep dovetailed saw cuts in a rectangular pattern, the defective concrete removed by chipping and the void repaired with replacement concrete. The prepared area shall be brush-coated with an epoxy resin meeting the requirements of paragraph EPOXY RESIN, or a neat cement grout after dampening the area with water. The void shall be filled with replacement concrete in accordance with paragraph MATERIAL AND PROCEDURE FOR REPAIRS.

3.4.3.4 Material and Procedure for Repairs

The cement used in the dry-packed mortar or replacement concrete shall be a blend of the cement used for production of project concrete and white portland cement properly proportioned so that the final color of the mortar

or concrete will match adjacent concrete. Trial batches shall be used to determine the proportions required to match colors. Dry-packed mortar shall consist of one part cement to two and one-half parts fine aggregate. The fine aggregate shall be that used for production of project concrete. The mortar shall be remixed over a period of at least 30 minutes without addition of water until it obtains the stiffest consistency that will permit placing. Mortar shall be thoroughly compacted into the prepared void by tamping, rodding, ramming, etc. and struck off to match adjacent concrete. Replacement concrete shall be produced using project materials and shall be proportioned by the Contracting Officer. It shall be thoroughly compacted into the prepared void by internal vibration, tamping, rodding, ramming, etc. and shall be struck off and finished to match adjacent concrete. Forms shall be used to confine the concrete. If an expanding agent is used in the repair concrete, the repair shall be thoroughly confined on all sides including the top surface. Metal tools shall not be used to finish permanently exposed surfaces. The repaired areas shall be cured for 7 days. The temperature of the in situ concrete, adjacent air, and replacement mortar or concrete shall be above 40 degrees F during placement, finishing, and curing. Other methods and materials for repair may be used only when approved in writing by the Contracting Officer. Repairs of the so called "plaster-type" will not be permitted.

3.5 CURING AND PROTECTION

3.5.1 Duration

Concrete shall be moist cured for a period of not less than 14 days. Concrete shall be cured by an approved method.

Immediately after placement, concrete shall be protected from premature drying, extremes in temperatures, rapid temperature change, and mechanical damage. All materials and equipment needed for adequate curing and protection shall be available and at the placement site prior to the start of concrete placement. Concrete shall be protected from the damaging effects of rain for 12 hours and from flowing water for 14 days. No fire or excessive heat including welding shall be permitted near or in direct contact with concrete or concrete embedments at any time.

3.5.2 Moist Curing

Moist-cured concrete shall be maintained continuously, not periodically, wet for the entire curing period. Water or curing materials that stain or discolor concrete surfaces shall not be used. Where wooden form sheathing is left in place during curing, the sheathing shall be kept wet at all times. Where steel forms are left in place during curing, the forms shall be carefully broken loose from the hardened concrete and curing water continuously applied into the void so as to continuously saturate the entire concrete surface. Horizontal surfaces may be moist cured by ponding, by covering with a minimum uniform thickness of 2 inches of continuously saturated sand, or by covering with saturated nonstaining burlap or cotton mats.

3.5.3 Membrane-Forming Curing Compound

Concrete may be cured with an approved membrane-forming curing compound in lieu of moist curing except that membrane curing will not be permitted on any surface to which other concrete is to be bonded, on any surface containing protruding steel reinforcement, on an abrasive aggregate finish, or any surface maintained at curing temperature by use of free steam. The

curing compound selected shall be compatible with any subsequent paint, roofing, waterproofing, or flooring specified. Also, the curing compound selected shall not be injurious to fish if used on concrete elements that will be ultimately exposed to flowing water. The curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. The surfaces shall be thoroughly moistened with water, and the curing compound applied as son as free water disappears. The curing compound shall be applied to unformed surfaces as soon as free water has disappeared and bleeding has topped. The curing compound shall be applied in a two-coat continuous operation by approved motorized power-spraying equipment operating at a minimum pressure of 75 psi, at a uniform coverage of not more than 400 square feet per gallon for each coat, and the second coat shall be applied perpendicular to the first coat. concrete surfaces that have been subjected to rainfall within 3 hours after curing compound has been applied shall be resprayed by the method and at the coverage specified. All concrete surfaces on which the curing compound has been applied shall be adequately protected for the duration of the entire curing period from pedestrian and vehicular traffic and from any other cause that will disrupt the continuity of the curing membrane.

3.5.4 Cold-Weather Curing and Protection

When the daily outdoor low temperature is less than 32 degrees F, the temperature of the concrete shall be maintained above 40 degrees F for the first 7 days after placing. In addition, during the period of protection removal, the air temperature adjacent to the concrete surfaces shall be controlled so that concrete near the surface will not be subjected to a temperature differential of more than 25 degrees F as determined by observation of ambient and concrete temperatures indicated by suitable temperatures measuring devices furnished by the Government as required and installed adjacent to the concrete surface and 2 inches inside the surface of the concrete. The installation of the thermometers shall be made by the Contractor at such locations as may be directed.

3.6 PLACING NONSHRINK GROUT

3.6.1 Nonshrink Grout Application

Nonshrink grout shall conform to the requirements of paragraph NONSHRINK GROUT. Water content shall be the minimum that will provide a flowable mixture and fill the space to be grouted without segregation, bleeding, or reduction of strength.

3.6.1.1 Mixing and Placing of Nonshrink Grout

Mixing and placing shall be in conformance with the material manufacturer's instructions and as specified. Ingredients shall be thoroughly dry-mixed before adding water. After adding water, the batch shall be mixed for 3 minutes. Batches shall be of size to allow continuous placement of freshly mixed grout. Grout not used within 30 minutes after mixing shall be discarded. Forms shall be of wood or other equally suitable material for retaining the grout and shall be removed after the grout has set. If grade "A" grout as specified in ASTM C 1107 is used, all surfaces shall be formed to provide restraint. The placed grout shall be worked to eliminate voids; however, overworking and breakdown of the initial set shall be avoided. Grout shall not be retempered or subjected to vibration from any source. Where clearances are unusually small, placement shall be under pressure

with a grout pump. Temperature of the grout, and of surfaces receiving the grout, shall be maintained at 65 to 85 degrees F until after setting.

3.6.1.2 Treatment of Exposed Surfaces

After the grout has set, those types containing metallic aggregate shall have the exposed surfaces cut back 1 inch and immediately covered with a parge coat of mortar proportioned by mass of one part portland cement, two parts sand, and sufficient water to make the mixture placeable. The parge coat shall have a smooth, dense finish. The exposed surface of other types of nonshrink grout shall have a smooth, dense finish.

3.6.1.3 Curing

Grout and parge coats shall be cured in conformance with paragraph CURING AND PROTECTION.

3.7 TESTS AND INSPECTIONS

Tests and inspections shall conform to the following requirements.

3.7.1 General

The Contractor shall perform the inspections and tests described below, and, based upon the results of these inspections and tests, he shall take the action required and submit reports as required. When, in the opinion of the Contracting Officer, the concreting operation is out of control, concrete placement shall cease. The laboratory performing the tests shall be on site and shall conform with ASTM C 1077. The individuals who sample and test concrete or the constituents of concrete as required in this specification shall have demonstrated a knowledge and ability to perform the necessary test procedures equivalent to the ACI minimum guidelines for certification of Concrete Field Testing Technicians, Grade I. The individuals who perform the inspection of concrete construction shall have demonstrated a knowledge and ability equivalent to the ACI minimum guidelines for certification of Concrete Transportation Construction Inspector (CTCI). The Government will inspect the laboratory, equipment, and test procedures prior to start of concreting operations and at least once per year thereafter for conformance with ASTM C 1077.

3.7.2 Testing and Inspection Requirements

3.7.2.1 Fine Aggregate

a. Grading - At least once during each shift when the concrete plant is operating, there shall be one sieve analysis and fineness modulus determination in accordance with ASTM C 136 and COE CRD-C 104 for the fine aggregate or for each size range of fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits.

b. Corrective Action for Fine Aggregate Grading - When the amount passing on any sieve is outside the specification limits, the fine aggregate shall be immediately resampled and retested. If there is another failure on any sieve, the fact shall immediately be reported to the Contracting Officer.

c. Moisture Content Testing - When in the opinion of the Contracting Officer the electric moisture meter is not operating satisfactorily, there shall be at least four tests for moisture content in accordance with ASTM C 566 during each 8-hour period of mixing plant operation. The times for the tests shall be selected randomly within the 8-hour period. An additional test shall be made whenever the slump is shown to be out of control or excessive variation in workability is reported by the placing foreman. When the electric moisture meter is operating satisfactorily, at least two direct measurements of moisture content shall be made per week to check the calibration of the meter. The results of tests for moisture content shall be used to adjust the added water in the control of the batch plant.

d. Moisture Content Corrective Action - Whenever the moisture content of the fine aggregate changes by 0.5 percent or more, the scale settings for the fine-aggregate batcher and water batcher shall be adjusted (directly or by means of a moisture compensation device) if necessary to maintain the specified slump.

3.7.2.2 Coarse Aggregate

a. Grading - At least once during each shift in which the concrete plant is operating, there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt limits for control which are coarser than the specification limits for samples taken at locations other than as delivered to the mixer to allow for degradation during handling.

b. Corrective Action for Grading - When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Contracting Officer. Where two consecutive averages of five tests are outside specification limits, the operation shall be considered out of control and shall be reported to the Contracting Officer. Concreting shall be stopped and immediate steps shall be taken to correct the grading.

c. Coarse Aggregate Moisture Content - A test for moisture content of each size group of coarse aggregate shall be made at least twice per week. When two consecutive readings for smallest size coarse aggregate differ by more than 1.0 percent, frequency of testing shall be increased to that specified above for fine aggregate, until the difference falls below 1.0 percent.

d. Coarse Aggregate Moisture Corrective Action - Whenever the moisture content of any size of coarse aggregate changes by 0.5 percent or more, the scale setting for the coarse aggregate batcher and the water batcher shall be adjusted if necessary to maintain the specified slump.

3.7.2.3 Quality of Aggregates

a. Frequency of Quality Tests - Thirty days prior to the start of

concrete placement the Contractor shall perform all tests for aggregate quality as required by ASTM C 33. In addition, after the start of concrete placement, the Contractor shall perform tests for aggregate quality at least every 3 months, and when the source of aggregate or aggregate quality changes. Samples tested after the start of concrete placement shall be taken immediately prior to entering the concrete mixer.

b. Corrective Action for Aggregate Quality - After concrete placement commences, whenever the result of a test for quality fails the requirements, the test shall be rerun immediately. If the second test fails the quality requirement, the fact shall be reported to the Contracting Officer and immediate steps taken to rectify the situation.

3.7.2.4 Scales

a. Weighing Accuracy - The accuracy of the scales shall be checked by test weights prior to start of concrete operations and at least once every 3 months for conformance with the applicable requirements of paragraph BATCHING EQUIPMENT. Such tests shall also be made as directed whenever there are variations in properties of the fresh concrete that could result from batching errors.

b. Batching and Recording Accuracy - Once a week the accuracy of each batching and recording device shall be checked during a weighing operation by noting and recording the required weight, recorded weight, and the actual weight batched. The Contractor shall confirm that the calibration devices described in paragraph BATCH PLANT for checking the accuracy of dispensed admixtures are operating properly.

c. Scales Corrective Action - When either the weighing accuracy or batching accuracy does not comply with specification requirements, the plant shall not be operated until necessary adjustments or repairs have been made. Discrepancies in recording accuracies shall be corrected immediately.

3.7.2.5 Batch-Plant Control

The measurement of all constituent materials including cementitious materials, each size of aggregate, water, and admixtures shall be continuously controlled. The aggregate weights and amount of added water shall be adjusted as necessary to compensate for free moisture in the aggregates. The amount of air-entraining agent shall be adjusted to control air content within specified limits. A report shall be prepared indicating type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic yard, amount of water as free moisture in each size of aggregate, and the batch aggregate and water weights per cubic yard for each class of concrete batched during plant operation.

3.7.2.6 Concrete Mixture

a. Air Content Testing - Air content tests shall be made when test specimens are fabricated. In addition, at least two tests for air content shall be made on randomly selected batches of each separate concrete mixture produced during each 8-hour period of concrete production. Additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government quality

assurance representative. Tests shall be made in accordance with ASTM C 231. Test results shall be plotted on control charts which shall at all times be readily available to the Government. Copies of the current control charts shall be kept in the field by the Contractor's quality control representatives and results plotted as tests are made. When a single test result reaches either the upper or lower action limit a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the air content of the batch to plot on both the control chart for air content and the control chart for range, and for determining the need for any remedial action. The result of each test, or average as noted in the previous sentence, shall be plotted on a separate chart for each mixture on which an "average line" is set at the midpoint of the specified air content range from paragraph AIR CONTENT. An upper warning limit and a lower warning limit line shall be set 1.0 percentage point above and below the average line. An upper action limit and a lower action limit line shall be set 1.5 percentage points above and below the average line, respectively. The range between each two consecutive tests shall be plotted on a control chart for range where an upper warning limit is set at 2.0 percentage points and up upper action limit is set at 3.0 percentage points. Samples for air content may be taken at the mixer, however, the Contractor is responsible for delivering the concrete to the placement site at the stipulated air content. If the Contractor's materials or transportation methods cause air content loss between the mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer and the air content at the mixer controlled as directed.

b. Air Content Corrective Action - Whenever points on the control chart for percent air reach either warning limit, an adjustment shall immediately be made in the amount of air-entraining admixture batched. As soon as is practical after each adjustment, another test shall be made to verify the result of the adjustment. Whenever a point on the control chart range reaches the warning limit, the admixture dispenser shall be recalibrated to ensure that it is operating accurately and with good reproducibility. Whenever a point on either control chart reaches an action limit line, the air content shall be considered out of control and the concreting operation shall immediately be halted until the air content is under control. Additional air content tests shall be made when concreting is restarted. All this shall be at no extra cost to the Government.

c. Slump Testing - In addition to slump tests which shall be made when test specimens are fabricated, at least four slump tests shall be made on randomly selected batches in accordance with ASTM C 143/C 143M for each separate concrete mixture produced during each 8-hour or less period of concrete production each day. Also, additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government's quality assurance representative. Test results shall be plotted on control charts which shall at all times be readily available to the Government. Copies of the current control charts shall be kept in the field by the Contractor's quality control representatives and results plotted as tests are made. When a single slump test reaches or goes beyond either the upper or lower action limit, a second test shall immediately be made on the same batch of concrete. The results of the two tests shall be averaged and this average used as the slump of the batch to plot on both the control chart for percent air and the chart for range, and for determining the need for any remedial action. An upper warning limit shall be set at

1/2 inch below the maximum allowable slump on separate control charts for percent air used for each type of mixture as specified in paragraph SLUMP, and an upper action limit line and lower action limit line shall be set at the maximum and minimum allowable slumps, respectively, as specified in the same paragraph. The range between each consecutive slump test for each type of mixture shall be plotted on a single control chart for range on which an upper action limit is set at 2 inches. Samples for slump shall be taken at the mixer, however, the Contractor is responsible for delivering the concrete to the placement site at the stipulated slump. If the Contractor's materials or transportation methods cause slump loss between mixer and the placement, correlation samples shall be taken at the placement site as required by the Contracting Officer and the slump at the mixer controlled as directed.

d. Slump Corrective Action - Whenever points on the control chart for slump reach the upper warning limit, an adjustment shall be immediately made in the batch weights of water and fine aggregate. The adjustments are to be made so that the total water content does not exceed that amount allowed by the maximum W/C specified, based upon aggregates which are in a saturated surface-dry condition. When a single slump reaches the upper or lower action limit, no further concrete shall be delivered to the placing site until proper adjustments have been made. Immediately after each adjustment, another test shall be made to verify the correctness of the adjustment. Whenever two consecutive slump tests, made during a period when there was no adjustment of batch weights, produce a point on the control chart for range at or above the upper action limit, the concreting operation shall immediately be halted and the Contractor shall take appropriate steps to bring the slump under control. Also, additional slump tests shall be made as directed. All this shall be at no additional cost to the Government.

e. Temperature - The temperature of the concrete shall be measured when compressive strength specimens are fabricated. Measurement shall be in accordance with ASTM C 1064/C 1064M. The temperature shall be reported along with the compressive strength data.

f. Compressive-Strength Specimens - At least one set of test specimens shall be made each day on each different concrete mixture placed during the day. Additional sets of test cylinders shall be made, as directed by the Contracting Officer, when the mixture proportions are changed or when low strengths have been detected. A random sampling plan shall be developed by the Contractor and approved by the Contracting Officer prior to the start of construction. The plan shall assure that sampling is done in a completely random and unbiased manner. A set of test specimens for concrete with a 28-day specified strength per paragraph DESIGN REQUIREMENTS shall consist of four cylinders, two to be tested at 7 days and two at 28 days. Test specimens shall be molded and cured in accordance with ASTM C 31/C 31M and tested in accordance with ASTM C 39/C 39M. All compressive-strength tests shall be reported immediately to the Contracting Officer. Quality control charts shall be kept for individual strength tests, moving average for strength, and moving average for range for each mixture. The charts shall be similar to those found in ACI 214.

3.7.2.7 Inspection Before Placing

Foundation or construction joints, forms, and embedded items shall be inspected for quality by the Contractor in sufficient time prior to each

concrete placement to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

3.7.2.8 Placing

a. Placing Inspection - The placing foreman shall supervise all placing operations, shall determine that the correct quality of concrete or grout is placed in each location as directed and shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, yardage placed, and method of placement.

b. Placing Corrective Action - The placing foreman shall not permit batching and placing to begin until he has verified that an adequate number of vibrators in working order and with competent operators are available. Placing shall not be continued if any pile of concrete is inadequately consolidated. If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to improve temperature controls.

3.7.2.9 Vibrators

a. Vibrator Testing and Use - The frequency and amplitude of each vibrator shall be determined in accordance with COE CRD-C 521prior to initial use and at least once a month when concrete is being placed. Additional tests shall be made as directed when a vibrator does not appear to be adequately consolidating the concrete. The frequency shall be determined at the same time the vibrator is operating in concrete with the tachometer held against the upper end of the vibrator head while almost submerged and just before the vibrator is withdrawn from the concrete. The amplitude shall be determined with the head vibrating in air. Two measurements shall be taken, one near the tip and another near the upper end of the vibrator head and these results averaged. The make, model, type, and size of the vibrator and frequency and amplitude results shall be reported in writing.

b. Vibrator Corrective Action - Any vibrator not meeting the requirements of paragraph VIBRATORS shall be immediately removed from service and repaired or replaced.

3.7.2.10 Curing

a. Moist-Curing Inspections - At least once each shift, and once per day on nonwork days an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.

b. Moist-Curing Corrective Action - When a daily inspection report lists an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for such areas shall be extended by one (1) day.

c. Membrane-Curing Inspection - No curing compound shall be applied until the Contractor's authorized representative has verified that the compound is properly mixed and ready for spraying. At the end of each operation, he shall estimate the quantity of compound used by measurement of the container and the area of concrete surface covered and compute the rate of coverage in square feet per gallon. He shall

note whether or not coverage is uniform.

d. Membrane-Curing Corrective Action - When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.

3.7.2.11 Cold-Weather Protection and Sealed Insulation Curing

At least once each shift and once per day on nonwork days, an inspection shall be made of all areas subject to cold-weather protection. The protection system shall be inspected for holes, tears, unsealed joints, or other deficiencies that could result in damage to the concrete. Special attention shall be taken at edges, corners, and thin sections. Any deficiencies shall be noted, corrected, and reported.

3.7.2.12 Cold-Weather Protection Corrective Action

When a daily inspection report lists any holes, tears, unsealed joints, or other deficiencies, the deficiency shall be corrected immediately and the period of protection extended 1 day.

3.7.2.13 Mixer Uniformity

a. Stationary Mixers - Prior to the start of concrete placing and once every 6 months when concrete is being placed, or once for every 75,000 cubic yards of concrete placed, whichever results in the longest time interval, uniformity of concrete mixing shall be determined in accordance with ASTM C 94/C 94M.

b. Truck Mixers - Prior to the start of concrete placing and at least once every 6 months when concrete is being placed, uniformity of concrete shall be determined in accordance with ASTM C 94/C 94M. The truck mixers shall be selected randomly for testing. When satisfactory performance is found in one truck mixer, the performance of mixers of substantially the same design and condition of the blades may be regarded as satisfactory.

3.7.2.14 Mixer Uniformity Corrective Action

When a mixer fails to meet mixer uniformity requirements, either the mixer shall be removed from service on the work, the mixing time shall be increased, batching sequence changed, batch size reduced, or adjustments shall be made to the mixer until compliance is achieved.

3.7.3 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report shall be prepared for the updating of control charts covering the entire period from the start of the construction season through the current week. During periods of cold-weather protection, reports of pertinent temperatures shall be made daily. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failures and the action taken shall be confirmed in writing in the routine reports. The Contracting Officer has the right to examine all test and inspection records.

-- End of Section --

SECTION 03371

SHOTCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 506.3R	(1991) Guide to Certification of Shotcrete Nozzlemen

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 820	(1996) Steel Fibers for Fiber-Reinforced Concrete
ASTM C 33	(1999ae1) Concrete Aggregates
ASTM C 42/C 42M	(1999) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 94/C 94M	(2000) Ready-Mixed Concrete
ASTM C 136	(1996a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 150	(1999a) Portland Cement
ASTM C 171	(1997a) Sheet Materials for Curing Concrete
ASTM C 231	(1997e1) Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C 266	(1989; R 1999) Time of Setting of Hydraulic-Cement Paste by Gillmore Needles
ASTM C 309	(1998a) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 566	(1997) Total Evaporable Moisture Content of Aggregate by Drying
ASTM C 685	(2000) Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C 881	(1999) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 1077	(1998) Laboratories Testing Concrete and Concrete Aggregates for Use in

	Construction and Criteria for Laboratory Evaluation
ASTM C 1140	(1998) Preparing and Testing Specimens from Shotcrete Test Panels
ASTM C 1141	(1995) Admixtures for Shotcrete
ASTM C 1240	(2000) Silica Fume for Use as a Mineral Admixture in Hydraulic-Cement Concrete, Mortar and Grout

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 400	(1963) Requirements for Water for Use in Mixing or Curing Concrete

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Mixture Proportions; G

The recommended mixture proportions, sources of materials, and all test results shall be submitted for approval.

Aggregates; G

Supplier's test reports for aggregates showing the materials meet the requirements of this specification.

Accelerator Compatibility; G

The Contractor shall establish the compatibility of the job cement and the proposed accelerators.

Preconstruction Test Panels; G

Cores and sawed concrete beams shall be taken from test panels and tested.

SD-07 Certificates

Portland Cement; G

Portland cement shall be certified for compliance with all specification requirements.

Pozzolans; G

Fly ash and other pozzolans shall be certified for compliance with all specification requirements.

Silica Fume; G

Silica fume shall be certified for compliance with all specification requirements.

Accelerating Admixtures; G

Accelerating admixtures shall be certified for compliance with all specification requirements.

Curing Materials; G

Curing materials shall be certified for compliance with all specification requirements.

Steel Fiber Reinforcement; G

Fiber reinforcement shall be certified for compliance with all specification requirements.

Qualifications; G

Qualifications of each nozzleman shall be certified.

1.3 QUALITY ASSURANCE

The Contractor shall provide facilities and labor as may be necessary for obtaining and testing representative test samples. Shotcrete shall be sampled and tested by the method given in paragraph STRENGTH TESTING.

1.4 MIXTURE PROPORTIONS

Mixture proportions and test data from prior experience within 5 years, if available, may be submitted for approval. If test data from experience are not available or accepted, specimens shall be made and tested from mixtures having three or more different proportions. The recommended mixture proportions, sources of materials, and all test results shall be submitted for acceptance. The shotcrete shall contain a minimum of seven and a half (7.5) sacks of cement, one hundred (100) pounds of fiber, and eighty (80) pounds of microsilica per cubic yard, with a coarse aggregate/total aggregate ratio of no more than 0.4. Approved water reducing agents shall be used to maintain the water-cement and microsilica ratio below 0.4 while still obtaining a pumpable and sprayable mix. Mixture proportions for fiber-reinforced shotcrete shall be selected on the basis of compressive strength tests of cores obtained from test panels fabricated in accordance with ASTM C 1140 and having minimum dimensions of 18 by 18 by 4 inches. Cores shall be continuously moist cured until testing at 28 days age. For mixture acceptance purposes, the average compressive strength of at least three cores shall be at least equal to 1.2 times the required compressive strength specified in paragraph COMPRESSIVE STRENGTH.

1.5 EVALUATION AND ACCEPTANCE

1.5.1 Strength

Final acceptance of the shotcrete will be based on compressive strength results obtained from cores.

1.5.1.1 Compressive Strength

The required compressive strength of cores shall not be less than 6,000 psi at 28 days age when tested in accordance with ASTM C 42/C 42M. The average compressive strength of cores taken from the structure, representing a shift or not more than 50 cubic yards of shotcrete tested at 28 days of age, shall equal or exceed the required compressive strength specified with no individual core less than 85 percent of the required compressive strength. When the length of a core is less than 1.94 times the diameter, the correction factors given in ASTM C 42/C 42M will be applied to obtain the compressive strength of individual cores.

1.6 QUALIFICATIONS

The Contractor shall submit a resume for each nozzleman certifying that each has not less than 1 year's experience for the particular type of shotcrete (dry mix or wet mix) and the type of application (vertical and/or overhead). The resume shall include company name, address, and telephone number, name of supervisor, and detailed description of work performed. All nozzlemen shall be certified in accordance with ACI 506.3R for wet mix shotcrete and horizontal and vertical panels. Qualifications of additional nozzlemen throughout the job shall be similarly submitted for approval.

1.7 PRECONSTRUCTION TEST PANELS

Specimens of the preconstruction test panels shall be made by each application crew using the equipment, materials, mixture proportions, and procedures for each mixture being considered, and for each shooting position to be encountered in the job. The test panels shall be fabricated to the same thickness as the structure, but not less than 4 inches. At least five 2-inch diameter cores from each panel shall be taken for testing for compressive strength in accordance with ASTM C 1140. The compressive strength of the cores shall meet the requirements specified in paragraph COMPRESSIVE STRENGTH.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Cementitious Materials

Cementitious materials shall be portland cement, and shall conform to appropriate specifications listed below.

2.1.1.1 Portland Cement

Portland cement shall meet the requirements of ASTM C 150 Type II low alkali.

2.1.1.2 Silica Fume

Silica may be furnished as a dry, densified material or as a slurry. Silica fume, unprocessed, or before processing into a slurry or a densified material, shall conform to ASTM C 1240.

2.1.2 Aggregates

Aggregates shall conform to ASTM C 33 with the combined grading of coarse and fine aggregates conforming to the grading shown below.

SIEVE SIZE	PERCENT BY MASS PASSING INDIVIDUAL SIEVES GRADING *
19.0 mm (3/4 in.)	--
12.5 mm (1/2 in.)	100
9.5 mm (3/8 in.)	90-100
4.75 mm (No. 4)	75-85
2.36 mm (No. 8)	50-70
1.18 mm (No. 16)	35-55
600 µm (No. 30)	20-35
300 µm (No. 50)	8-20
150 µm (No. 100)	2-10

* Fine and coarse aggregates shall be batched separately to avoid segregation.

2.1.3 Water

Fresh, clean, potable mixing water or nonpotable water which meets the requirements of COE CRD-C 400 shall be used.

2.1.4 Admixtures

Admixtures to be used, when required or approved, shall comply with the appropriate sections of ASTM C 1141. Except as otherwise accepted, soluble admixtures shall be dissolved in water before introduction into the shotcrete mixture.

2.1.4.1 Accelerators

When accelerating admixtures complying with ASTM C 1141, Type II, Grade 1, are to be used, the Contractor shall establish the accelerator compatibility of the job cement and the proposed accelerators using ASTM C 266, except as modified herein. The powdered accelerator shall be blended with 50 grams of cement until uniform and 15 milliliters of water shall then be added. The liquid accelerator shall first be mixed with 15 milliliters of water and then added to 50 grams of cement. Three percent of the proposed accelerator by mass of cement shall be used as a starting point. Mixing shall be accomplished within 15 seconds. The specimen shall be molded within 1 minute of adding the mixing water. If initial set is 2 minutes or less and a final set is 10 minutes or less, the accelerator is considered compatible. If these values are not achieved in the first test, additional tests shall be run using 2 percent and 4 percent of accelerator.

2.1.5 Curing Materials

Curing materials shall meet the following requirements.

2.1.5.1 Impervious Sheet Materials

ASTM C 171, type optional except polyethylene film, if used, shall be white opaque.

2.1.5.2 Membrane-Forming Curing Compound

ASTM C 309, Type 1-D or Type 2.

2.1.6 Reinforcement

2.1.6.1 Steel Fiber Reinforcement

Steel fiber reinforcement shall meet the requirements of ASTM A 820. Fibers shall have a tensile yield strength of at least 170,000 psi, shall have a cross-sectional area of approximately 0.0003 square inches, shall have a length between 1 and 1-1/2 inches, and shall have a length to diameter ratio of less than 80. Fibers shall be of the end deformed type. Straight or continuously corrugated fibers shall not be used.

PART 3 EXECUTION

3.1 PRODUCTION OF SHOTCRETE

The shotcrete shall be produced by wet-mix process.

3.1.1 Wet Mix Process

3.1.1.1 Batching and Mixing

Batching and mixing shall be accomplished in accordance with the applicable provisions of ASTM C 94/C 94M. If volumetric batching and mixing are used, the materials shall be batched and mixed in accordance with the applicable provisions of ASTM C 685. The mixing equipment shall be capable of thoroughly mixing the specified materials in sufficient quantity to maintain continuous placing. Ready-mix shotcrete complying with ASTM C 94/C 94M may be used.

3.1.1.2 Delivery Equipment

The equipment shall be capable of delivering the premixed materials accurately, uniformly, and continuously through the delivery hose. Recommendations of the equipment manufacturer shall be followed on the type and size of nozzle to be used and on cleaning, inspection, and maintenance of the equipment.

3.1.1.3 Air Content

Air-entraining admixture shall be used in such proportion that the air content of the shotcrete prior to pumping shall be 10 percent plus or minus (±) 1.0 percent as determined by ASTM C 231.

3.1.2 Air Supply

The Contractor shall provide a supply of clean, oil free, dry air adequate for maintaining sufficient nozzle velocity for all parts of the work and, if required, for simultaneous operation of a suitable blowpipe for clearing away rebound.

3.2 PREPARATION OF SURFACES

3.2.1 Earth

Earth shall be compacted and trimmed to line and graded before placement of shotcrete. Surfaces to receive shotcrete shall be dampened immediately prior to placing shotcrete.

3.2.2 Existing Concrete

All unsound and loose materials shall be removed by sandblasting, or high-pressure water jets before applying shotcrete. Any area to be repaired shall be chipped off or scarified to remove offsets which would cause an abrupt change in thickness without suitable reinforcement. Edges of a patch shall be squared to a saw-cut depth of at least 1/2 inch to leave no feathered shoulders at the perimeter of a cavity. The surface shall be dampened but without visible free water immediately prior to application of shotcrete.

3.2.3 Rock

Rock surfaces shall be cleaned to remove loose or drummy material, mud, running water, and other foreign matter that will prevent bond of the shotcrete. The rock surface shall be dampened immediately prior to placement of shotcrete.

3.2.4 Shotcrete

When a layer of shotcrete is to be covered by a succeeding layer at a later time, it shall first be allowed to develop its initial set. Then at this time, all laitance, loose material, and rebound shall be removed by brooming or scraping. Hardened laitance set shall be removed by sandblasting and the surface thoroughly cleaned.

3.2.5 Construction Joints

Unless otherwise specified, construction joints shall be tapered to a shallow edge form, about 1 inch thick. If nontapered joints are specified, special care shall be taken to avoid or remove trapped rebound at the joint. The entire joint shall be thoroughly cleaned and dampened prior to the application of additional shotcrete.

3.3 PLACEMENT OF SHOTCRETE

3.3.1 General

Shotcrete shall be placed using suitable delivery equipment and procedures. The area to which shotcrete is to be applied shall be clean and free of rebound or overspray.

3.3.2 Placement Techniques

3.3.2.1 Placement Control

Thickness, method of support, air pressure, and water content of shotcrete shall be controlled to preclude sagging or sloughing off. Shotcreting shall be discontinued or suitable means shall be provided to screen the nozzle stream if wind or air currents cause separation of the nozzle stream during placement. Shotcreting shall be avoided during windy conditions to avoid drying the surface too quickly and causing plastic shrinkage cracking.

3.3.2.2 Corners

Horizontal and vertical corners and any area where rebound cannot escape or be blown free shall be filled first.

3.3.3 Placement Around Reinforcement

The nozzle shall be held at such distance and angle to place shotcrete

material behind reinforcement before any material is allowed to accumulate on the face of the reinforcement. Shotcrete shall not be placed through more than one layer of reinforcing steel rods or mesh in one application unless demonstrated by preconstruction tests that steel is properly encased.

3.3.4 Cover of Reinforcement

The following minimum cover shall be provided.

a. For shotcrete used as linings, coatings, slab, or wall: 1-1/2 inches.

b. For required structural reinforcement in beams, girders, and columns: 1-1/2 inches.

3.3.5 Placement Precautions

The following precautions shall be taken during placement.

a. Placement shall be stopped if drying or stiffening of the mixture takes place at any time prior to delivery to the nozzle.

b. Rebound or previously expended material shall not be used in the shotcrete mixture.

3.4 REPAIR OF DEFECTS

3.4.1 Defects

Defective areas larger than 48 square inches or 2 inches deep shall be removed and replaced with fresh shotcrete. These defects include honeycombing, lamination, dry patches, voids, or sand pockets. Defective areas shall be removed in accordance with the procedures described in paragraph EXISTING CONCRETE and replaced with fresh shotcrete.

3.4.1.1 Repairs

All repairs shall be made within 1 week of the time the deficiency is discovered. All unacceptable materials shall be removed and repaired by the procedures described in the following two paragraphs. Voids and holes left by the removal of tie rods in all permanently exposed surfaces not to be backfilled and in surfaces to be exposed to water shall be reamed and completely filled with dry-patching mortar as specified below.

3.4.1.2 Minor Patching

Minor patching may be accomplished with a dry-pack mixture, or with materials as approved by the Contracting Officer. Patches that exceed 0.1 cubic foot in volume shall receive a brush coat of approved epoxy resin meeting ASTM C 881, Type II, as a prime coat. Care shall be taken not to spill epoxy or overcoat the repair surface so that the epoxy runs or is squeezed out onto the surface which will remain exposed to view. Epoxy resin shall be used in strict conformance with manufacturer's recommendations with special attention paid to pot life, safety, and thin film tack time.

3.4.2 Core Holes

Core holes shall not be repaired with shotcrete. Instead, they shall be

filled solid with a dry-pack mixture after being cleaned and thoroughly dampened.

3.5 FINISHING

3.5.1 Natural Gun Finish

Unless otherwise specified, undisturbed final layer of shotcrete as applied from nozzle without hand finishing shall be provided.

3.6 CURING AND PROTECTION

3.6.1 Initial Curing

Immediately after finishing, shotcrete shall be kept continuously moist for at least 3 days. One of the following materials or methods shall be used:

a. Ponding or continuous sprinkling.

b. Absorptive mat or fabric, sand, or other covering kept continuously wet.

c. Curing Compounds. On natural gun or flash finishes, use the coverage application requirement of 100 square feet per gallon or twice the manufacturer's requirement, whichever is less. Curing compounds shall not be used on any surfaces against which additional shotcrete or other cementitious finishing materials are to be bonded unless positive measures, such as sandblasting, are taken to completely remove curing compounds prior to the application of such additional materials.

3.6.2 Final Curing

Additional curing shall be provided immediately following the initial curing and before the shotcrete has dried. One of the following materials or methods shall be used:

a. Continue the method used in initial curing.

b. Application of impervious sheet material conforming to ASTM C 171.

3.6.3 Formed Surface

If forms are to be removed during curing period, one of the curing materials or methods listed in paragraph INITIAL CURING shall be used immediately. Such curing shall be continued for the remainder of the curing period.

3.6.4 Duration of Curing

Curing shall be continued for the first 7 days after shotcreting or until the specified compressive strength of the in-place shotcrete as determined by specimens obtained and tested in accordance with ASTM C 42/C 42M is achieved.

3.6.5 Temperature Considerations

The air temperature in contact with the shotcrete shall be continuously maintained at a temperature above 40 degrees F for at least 3 days after placement. No shotcrete shall be applied when the concrete surface or air in contact with the concrete surface is below 40 degrees F.

3.7 TESTS

3.7.1 Strength Testing

Test specimens shall be initially cured onsite, then shall be transported in an approved manner to an approved testing laboratory meeting the requirements of ASTM C 1077 within 48 hours of scheduled testing time.

3.7.1.1 Test Panel

One test panel shall be made for every 50 cubic yards of shotcrete placed but not less than one per each shift during which any shotcrete is placed. Panels shall have minimum dimensions of 18 by 18 by 4 inches and shall be gunned in the same positions as the work represented during the course of the work by the Contractor's regular nozzleman. Panels shall be field cured in the same manner as the placed shotcrete Two inch diameter cores shall be drilled from each panel at least 40 hours prior to testing area and tested in accordance with ASTM C 1140 If the quality of shotcrete is questionable, the Government may saw or core additional panel specimens to determine the shotcrete quality and if remedial action is necessary.

3.7.1.2 Test Cores

Test cores shall be drilled from the structure at least 40 hours prior to testing and tested in accordance with ASTM C 1140. A set of three cores shall be taken not less than once each shift that shotcrete is placed nor less than once for each 50 cubic yards of shotcrete placed through the nozzle. The diameter of core specimens shall be determined in accordance with ASTM C 42/C 42M.

3.7.1.3 Compressive Strength

The compressive strength of the shotcrete shall be determined from the average of three cores obtained from a test panel representing a specific volume of shotcrete and tested on the 7th day after panel fabrication.

3.7.2 Aggregate Moisture

Prior to batching the shotcrete and at least once during a shift in which shotcrete is being batched, the coarse and fine aggregate moisture content shall be determined in accordance with ASTM C 566. The batch weights of both the aggregates and mixing water shall be appropriately adjusted to account for the available free moisture in the aggregates. The amount of free moisture in the aggregates, expressed as pounds of water per cubic yard, shall be recorded on the batching ticket and delivered to the Contracting Officer prior to placement during the shift. The Contracting Officer will have the option to request additional aggregate moisture content tests for each of the required tests.

3.7.3 Grading

The grading of the coarse and fine aggregate shall be determined in accordance with ASTM C 136. The fine and coarse aggregate grading shall be determined prior to batching the shotcrete and at least once every other shift in which shotcrete is being batched. The Contracting Officer will have the option to require one additional sieve analysis test for aggregate type.

3.7.4 Thickness

The minimum shotcrete thickness shall be as shown in the drawings. The unhardened shotcrete shall be checked for thickness using a probe by the nozzleman or laborer at the time of placement. These thickness checks shall be at 15-minute intervals and all low or thin areas shall be corrected by applying additional shotcrete.

3.7.5 Mixture Proportions

Record and check mixture proportions at least once per shift for weigh batching. Record and check mixture proportions as recommended by ASTM C 685 at least once per shift for volumetric batching and continuous mixing plants.

3.7.6 Preparations

Prior to each placement of shotcrete, the Contractor's inspector shall certify in writing or by an approved checkout form that cleanup and surface preparations are in accordance with the plans and specifications.

3.7.7 Air Content

Air content tests shall be conducted on wet-mix shotcrete according to ASTM C 231 with a frequency of not less than once each shift nor less than once for each 50 cubic yards of shotcrete placed through the nozzle. Tests shall be conducted on samples taken as the wet shotcrete mixture is placed in the delivery equipment.

-- End of Section --

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SECTION 03400

TREMIE CONCRETE

PART 1 GENERAL

1.1 SCOPE

The work covered by this specification includes all activities for the preparation, production, and placement of underwater concrete for this project . The work includes diver inspection, debris removal, concrete formwork, and tremie concrete placement.

Concrete that shall be deposited under water shall be placed by the tremie method. An antiwash agent shall be used in underwater placed (tremie) concrete and grout around the steel support frame under Precast Segments A, B, and C. All other tremie concrete does not require antiwash agents. The methods and equipment used shall be subject to approval. Concrete buckets will not be permitted for underwater placement of concrete except to deliver concrete to the tremie. the tremie shall be watertight and sufficiently large to permit a free flow of concrete. The discharge end of the pump line or tremie shaft shall be kept continuously submerged in the concrete. The underwater seal shall be effected in a manner that will not produce undue turbulence in the water. The tremie shaft shall be kept full of concrete to a point well above the water surface. Placement shall proceed without interruption until the concrete has been brought to the required height. The tremie shall not be moved horizontally during a placing operation, and a sufficient number of tremies shall be provided so that the maximum horizontal flow will be limited to 15 feet.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ACI INTERNATIONAL (ACI)

ACI 304R	(2000) Guide for Measuring, Mixing, Transporting, and Placing Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 94	(1998c) Ready-Mixed Concrete

1.3 CONSTRUCTION TOLERANCES

Variation in alignment, grade, and dimensions of the tremie concrete structures from the established alignment, grade, and dimensions shown on the drawings shall be within the tolerances specified in Table 1. Variations from the specified dimensions but within the required tolerances shall not relieve the Contractor from proper field fitting of components.

TABLE 1
CONSTRUCTION TOLERANCES FOR TREMIE CONCRETE PLACEMENT

(1) Concrete plan view outline variations from the design location	No greater than No less than	+2 feet -2 feet
(2) Concrete top surface variations from design elevation at cofferdam	No greater than No less than	+3 inches -3 inches
(3) Concrete top surface variations from design elevation at north of existing intake structure	No greater than No less than	+12 inches -12 inches

1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Concrete Materials; G

All concrete and grout shall meet the materials and mix proportioning requirements of Section 03301, CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS.

Concrete and Grout Placement; G

This submittal shall consist of drawings, narrative, sketches, schedules and other methods to fully describe the delivery and placement of tremie concrete. The items to address in the submittal include:

a) Concrete batching plant (include type, layout, production rate).

b) Concrete delivery equipment from plant to tremie pipe (include trucks, pumps, drops).

c) Tremie pipe system and supporting equipment (include barges, platforms, layout, diagrams, details).

d) Surface preparation of underwater surfaces (include methods and equipment).

e) Formwork (include layout, materials, methods, diver support).

f) Concrete placement (sequence, rates, equipment, methods, diving support).

g) Grout placement under Precast Segments A, B, C (include grout tubes and vent tubes locations and details, equipment , and methods).

h) Proposed sonic testing procedures that will be used to verify that there are no void spaces under the Precast Segments A, B, and C.

i) Adverse weather provisions.

j) Stationkeeping for the floating plant.

k) Diver Utilization (equipment, personnel, tasks).

Pre & Post Survey; G

Surveys shall be conducted prior to and after completion of the underwater tremie concrete placement.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

Concrete placed underwater shall have compressive strength (f'c) of 4,000 psi after 28 days. Grout placed underwater shall have a compressive strength (f'c) of 5,000 psi after 28 days. All grout placed underwater shall contain an antiwash agent.

All concrete and grout shall meet the requirements of Section 03301, CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS.

PART 3 EXECUTION

3.1 PREPARATIONS

3.1.1 General

The Contractor shall take all necessary precautions to insure against damage to the property of the Government, and any damage shall be repaired or replaced at the expense of the Contractor and as directed by the Contracting Officer. The rock and concrete surfaces upon which concrete or grout is to be placed shall be shaped and cleaned in accordance with the contract provisions and be approved by the Contracting Officer.

The horizontal construction joint interface surface between the tremie concrete and the grout below Segments A, B, and C shall be cleaned and prepared as specified in Section 03301, CAST-IN-PLACE CONCRETE FOR CIVIL WORKS, paragraph 3.2.3.1, except that the last sentence of this paragraph shall not apply for underwater joints. The resulting surfaces shall be free from laitance and inferior concrete. The Contractor shall provide an underwater video tape recording of the prepared construction joint surface to the Contracting Officer prior to setting the Precast Concrete Segments A, B and C.

3.1.2 Work Area

The tremie concrete area plans are shown in the contract drawings.

3.1.3 Underwater Surveys

The Contractor shall perform two (2) hydrographic condition surveys of each tremie area. The first survey shall be accomplished prior to the start of

underwater tremie concrete placement in order to verify the rock foundation elevation. The second survey shall be performed following completion of the tremie concrete placements. The Contractor shall provide the Contracting Officer with scheduled survey dates 28 calendar days prior to execution.

3.1.4 Diver Inspection

Prior to tremie concrete placement, the Contractor shall perform a diver inspection of the tremie area. The purpose of the dive is to identify the presence of debris in the tremie areas so that an evaluation can be done and a determination made whether debris removal is necessary. The divers shall inspect the entire area and a video recording shall be made of the base area where the tremie concrete will be placed on the existing rock.

3.1.5 Debris Removal

All material that is not an integral part of the foundation rock shall be removed from the tremie area and disposed in the designated disposal area. The limits of removal areas correspond with the tremie concrete areas shown on the drawings. Excavation of existing intact concrete and foundation rock below the correct elevation is not required.

3.2 CONVEYING TO THE TREMIE

3.2.1 General

Concrete shall be conveyed from mixer to the placement area as rapidly as practicable and within the time interval as specified by methods that will prevent segregation or loss of ingredients. Any concrete transferred from one conveying device to another shall be passed through a hopper which is conical in shape and shall not be dropped vertically more than 5 feet, except where suitable equipment is provided to prevent segregation and where specifically authorized by the Contracting Officer.

3.2.2 Trucks

Truck mixers operating at agitating speed or truck agitators used for transporting plant-mixed concrete shall conform to the requirements of ASTM C 94. Trucks shall be used to convey the concrete from the plant to the placement staging area.

3.2.3 Buckets

The interior hopper slope shall be not less than 50 degrees from the horizontal, the minimum dimension of the clear gate opening shall be at least five times the nominal maximum size aggregate and the area of the gate opening shall be not less than 2-square feet. The maximum dimension of the gate opening shall not be greater than twice the minimum dimension. The bucket gates shall be essentially grout tight when closed and shall be hydraulically operated. No manually or pneumatically operated bucket gates are permitted. The design of the bucket shall provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

3.2.4 Pump Placement

Concrete shall be conveyed by positive displacement. The pumping equipment shall be piston or squeeze pressure type. The pipeline shall be rigid

steel pipe or heavy -duty flexible hose. The inside diameter of the pipe shall be at least three times the nominal maximum size coarse aggregate in the concrete mixture to be pumped, but not less than 4 inches.

The maximum size coarse aggregate will not be reduced to accommodate the pumps. The distance to be pumped shall not exceed limits recommended by the pump manufacturer. When pumping is completed, concrete remaining in the pipeline shall be ejected without contamination of concrete in place or the reservoir. After each operation, equipment shall be thoroughly cleaned, and flushing water shall be wasted outside of the forms in the designated waste area. Except as modified in this specification, all quality control testing shall be done at the discharge end of the pumpline.

Two independent and equal pump systems shall be provided capable of a combined rated capacity of 120 cubic yards per hour. The minimum pumping rate into the tremie pipes shall be 90 cy/hr. The concrete shall be supplied to the placement area continuously such that no cold joints occur in the placement.

3.2.5 Staging Area Requirements

Concrete shall be pumped or bucketed to the tremie hoppers.

3.3 PLACING TREMIE CONCRETE

3.3.1 General

The delivery and placing of tremie concrete shall be configured to produce a continuous flow of concrete of at least 50 cubic yards per hour. No concrete shall be placed until all the concrete materials, placing plan and inspection plan submittals have been approved by the Contracting Officer. The concrete shall be delivered to the site of the work and discharge shall be completed within 60 minutes after introduction of the cement to the aggregates. The Contractor shall supply a floating plant that provides access for personnel and material to the placement area.

3.3.2 Requirements for Adverse Conditions

Concrete placement will not be permitted when, in the opinion of the Contracting Officer, weather conditions prevent proper placement. This includes hot weather, cold weather, excessive precipitation, excessive wind, and excessive wave action.

3.3.2.1 Cold-Weather Placing

Concrete shall not be placed without a procedure, implementing the recommendations of ACI 304R and approved by the Contracting Officer when the concrete is likely to be subjected to ambient air temperatures below 40 degrees F. Cold weather procedures are to be implemented when ambient air temperatures are 35 degrees F or lower. The placing temperature of the concrete shall be between 40 degrees and 60 degrees F. Heating of the mixing water may be allowed to regulate the concrete placing temperatures if approved by the Contracting Officer to raise and maintain concrete temperatures to the minimum 40 degree limit. Materials entering the mixer shall be free from ice, snow, or frozen lumps.

3.3.2.2 Hot-Weather Placing

Concrete shall not be placed without a procedure approved by the

Contracting Officer when the concrete is likely to be subjected to ambient air temperature above 85 degrees F (30C). Hot weather conditions exist when the ambient air temperatures exceed 85 degrees F (30C). However, when the combination of air temperature, relative humidity, temperature of the concrete, and the wind velocity at the point of placement produces an evaporation rate of 0.20 pounds per square foot of surface per hour or greater, the Contractor shall cease production and placement or construct adequate protection to reduce the evaporation rate below 0.20 pounds per square foot of surface per hour.

3.3.2.3 Wave Action

The reservoir occasionally may have wave conditions that are unacceptable. The Contractor shall coordinate placement activities to prevent damage to the tremie concrete placement due to wave action.

3.3.3 Placing Configuration

A stable platform shall be provided to support the tremie pipes, hoppers, operating personnel, inspectors and other equipment. All tremie pipes required for full coverage of the placement area shall be installed in a manner that prevents vertical or horizontal movement during placement. The sequence of charging tremie pipes shall first fill the basin depressions beginning at the lowest elevations in a manner that prevents flowing concrete from moving in a downward direction. Continued charging of tremie pipes shall raise the concrete surface in a uniform horizontal level.

3.3.4 Alternate Placing Configuration

In lieu of providing tremie pipes for full coverage of the tremie area. A row or rows of tremie pipes shall be provided that cover a portion of the placement area. The placement shall progress to full depth at each location. When one placement area is complete, the placement shall be stopped, the tremie pipes removed as specified, and reinserted into fresh concrete as specified at the next line location. A lateral progression from deepest location in the area to shallowest shall be done. The Contractor shall develop an acceptable mooring layout configuration, and apply adequate pretension to the mooring lines (thru winches) to eliminate or minimize the catenary line profile.

3.3.5 Tremie Platform

The platform on which the tremie pipes and hoppers are supported shall be a stable platform that holds the tremie pipes in a fixed location during the period of placement. The system shall be configured so that horizontal movement of the tremie pipe is limited to 2 inches and vertical movement of the tremie pipe is limited to 3 inches. If barges are used for the work platform shall be moored to prevent this range of movement. Factors effecting water surface variations include weather, crane activity and reservoir operations.

3.3.6 Tremie System

The delivery tube system shall consist of watertight tubes with sufficient rigidity to keep the ends always in the mass of concrete placed. Internal bracing for formwork shall accommodate the delivery tube system. A hopper of at least 2 cubic yard capacity shall be provided on top of each tremie pipe to facilitate transfer of concrete from a bucket or pumpline to the tremie. A crane or other lifting device shall be available to place,

remove, and reposition the tremie and hopper.

3.3.7 Delivery Tubes

Delivery tubes (tremie pipes) shall be at least 10 inches in diameter. Joints shall be watertight and the underwater end of the tube capped with a watertight cap. Integral seals shall be provided at underwater joints as well as an external seal. The system shall provide an interior free of accumulated water when installed in to the full depth in the placement position. The cap shall be designed to be released as the tube is charged. Caps lost in the tremie concrete may be left in place. The tremie pipe shall extend to the bottom of the placement before charging the pipe with concrete. For the applicable range of readings, each tremie pipe will be marked to display the length of pipe underwater. Mark intervals shall be at least every 6 inches with the length value for each foot interval.

3.3.8 Initial Charging

The delivery tube shall initially rest on the concrete or rock surface. After charging the delivery tube system with concrete, the flow of concrete through a tube shall be induced by slightly raising the discharge end. During concrete placement, the tip of the delivery tube shall be continuously embedded in fresh concrete to prevent reentry of the water into the tube. Until at least a depth of 3 feet of concrete has been placed, the tip of the delivery tube shall be within 6 inches of the bottom of the placement, and then the embedment of the tip shall be maintained at least three feet below the top surface of the concrete. Rapid raising or lowering of the delivery tube shall not be permitted. Horizontal movement of the tube is not permitted during tremie placement.

3.3.9 Tremie Withdrawal

The following procedure shall be used if it is necessary to remove the tremie pipe from the concrete placement. Placement shall be suspended and the concrete shall be allowed to flow until static condition exists in the pipe. The pipe shall be removed in a manner that does not introduce a flow of water into the placement area. The tremie pipe shall be withdrawn while removing the concrete from the interior of the tremie pipe. This shall be done by bailing methods. An alternate method is to pressurize the tremie in a manner that forces the concrete elevation down the tremie to an elevation equal to the elevation of the new concrete surface.

3.3.10 Lost Seal

If the seal is lost or the delivery tube becomes plugged and must be removed or if the placement of concrete is interrupted more than 30 minutes, the tube shall be withdrawn, the tube cleaned, the tip of the tube capped to prevent entrance of the water, and the operation restarted by pushing the capped tube five feet (or to the bottom of the placement, which ever is less) into the concrete and then re-starting the flow of concrete. Sealed end caps shall be used to seal the tube for the re-start. "Go-devil" plugs shall not be used to restart the concrete placement.

3.3.11 Normal Placement

Concrete shall be delivered to the tremie system in a continuous flow, uniformly flowing down the tremie pipe preventing the entrapment of air in the tremie pipe or in the placement. The concrete deposited under water shall be placed in a compact, monolithic mass in a manner that will prevent

washing of the concrete. Except as otherwise specified, placing concrete shall be a continuous operation in near-horizontal layers from start to finish. This requires that the concrete be discharged through the tubes in such a predetermined order that the differential head of the concrete will not be more than 3 feet at any time during the placement. Tremie pipes shall not be relocated during the placement, unless approved in the placement plan or by the Contracting Officer. The maximum spacing of adjacent tremie tubes shall not exceed 25 feet. The maximum spacing of tremie tubes from the form, existing concrete or rock wall surfaces shall not exceed 15 feet.

3.3.12 Placing Controls

During placement of tremie concrete, the top surface of the tremie concrete shall be continuously monitored. The depth from the water surface to the top of the concrete shall be determined accurately and in a manner that does not disturb or encourage the flow of the tremie concrete. One acceptable device is a neutrally buoyant rod, marked with graduations of 0.1 feet, and equipped with a broad foot. The progress of placement shall be recorded and continuously for each station on at least 15 minute intervals. The data shall be recorded in a manner that the placing and inspection personnel can monitor the progress.

3.3.13 Underwater Inspection

A diving crew shall be available during placement of underwater concrete. Inspection of the tremie placement and related activities shall be done using divers. Unless specifically directed by the Contracting Officer, divers shall not contact the surface of the tremie concrete during placement.

3.4 GROUT PLACEMENT UNDER PRECAST SEGMENTS A, B, AND C

3.4.1 General

The grouting of the 6-inch ± void space under the Precast Segments A, B, and C must be performed with an adequate series of grout tubes and vent tubes such that the grouting proceeds from one side to the other side of the cofferdam. The grouting procedure shall be designed to eliminate all void spaces under the precast concrete segments without the grout mixing with the water it is displacing. Grout and vent tubes shall be placed in the precast segments or in the web of the steel support frame or in both. Grout tubes in the concrete shall be plastic to prevent corrosion.

The grout must be adequately pressurized to displace the water under the precast. Antiwash agents shall be added to the grout to prevent mixing of the grout with the water. Grout and vent tubes in the concrete shall be cut off flush with the concrete surface so the surface of the precast segment meets its specified finish requirements.

The Contractor's Concrete and Grout Placement Submittal must adequately describe all of his grouting procedures, details, and equipment.

3.4.2 Sonic Testing Procedure

The Contractor must provide sonic testing of the grout using divers to operate the equipment to verify that all voids below the Precast Cofferdam Segments A, B, and C have been grouted solid. Details of the proposed testing procedures and equipment must be submitted for approval prior to

grouting.

3.5 CURING AND PROTECTION

3.5.1 Curing

No specific measures are required to cure underwater concrete.

3.5.2 Protection

Concrete shall be protected from damage from flowing water and subsequent construction operations. Underwater operations near the concrete placements shall be suspended until the concrete has achieved a field-cured compressive strength of 2,000 psi.

3.6 FORMWORK

3.6.1 Design

The design and engineering of the formwork, as well as its construction, shall be the responsibility of the Contractor. The formwork shall be designed for loads, lateral pressure, and allowable stresses in accordance with standard engineering practices and the American Concrete Institute. Forms shall have sufficient strength to withstand the pressure resulting from placement of the concrete and shall have sufficient rigidity to maintain specified tolerances. Forms shall prevent the flow of concrete beyond the perimeter of the placement area.

3.6.2 Materials

Forms shall be of steel, or other approved material. The type, size, shape, quality, and strength of all materials of which the forms are made shall be the Contractor's responsibility. Forms may also be non-traditional materials such as sandbags, pillows, or other form system the contains the concrete and does not inhibit the function of the intake structures and cofferdam, damage the structures, or compromises the long-term performance of the final concrete.

3.6.3 Construction

The top surface of the forms shall be true to line and grade, and sufficiently rigid to prevent excessive deformation under load.

3.6.4 Coating

No form release agent shall be used.

3.6.5 Placement Authorization

Prior to batching any of concrete for any placement, the Contracting Officer will authorize the placement of concrete.

3.6.6 Removal

Forms that are not permanent shall not be removed until the concrete has attained a compressive strength of at least 2,000 psi as determined by testing of field cast and cured cylinders.

3.7 CONTRACTOR QUALITY CONTROL

The Contractor shall establish and maintain a quality control program to show compliance with contract requirements and to maintain records of his quality control operations. Unless otherwise stated in this Technical Specification, all test results and computations for Contractor Quality Control performed prior to placement of the concrete shall be reported and delivered to a designated representative of the Contracting Officer prior to beginning placement of the concrete. Unless otherwise stated in this Technical Specification, all test results and computations for Contractor Quality Control performed during concrete placement or after placement of the concrete shall be reported and delivered within 24 hours to a designated representative of the Contracting Officer.

3.8 Placement Soundings

The Contractor shall maintain a log of the concrete elevations for each placement area when concrete is deposited under water. Soundings of the concrete level shall be taken continuously at a time interval less than 1 hour during placement and a distance interval of 5 feet using methods described in 3.3.12, paragraph: Placing Controls. Sounding shall be spaced to cover the entire area, plus corners and at the discharges of tremie pipes or pump lines. At completion of the concrete placement, a post placement sounding inspection shall be made to establish the final surface elevation of the concrete.

-- End of Section --

SECTION 03440

PRECAST CONCRETE FOR COFFERDAM SEGMENTS

PART 1 GENERAL

1.1 General Information

The work covered by this section consists of furnishing all equipment, labor, materials, and performing all operations to construct and install the precast concrete segments for the cofferdam and structure as specified herein and shown on the contract drawings.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ACI INTERNATIONAL (ACI)

ACI 117/117R	(1990) Tolerances for Concrete Construction and Materials
ACI 315	(1999) Details and Detailing of Concrete Reinforcement
ACI 318	(2002) Requirements for Structural Concrete (318-02) and Commentary (318R-02)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 494	(1999ael) Chemical Admixtures for Concrete
ASTM C 1017	(1998) Chemical Admixtures for Use in Producing Flowing Concrete

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	(1998) Structural Welding Code - Steel
AWS D1.6	(1999) Structural Welding Code - Stainless Steel

PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI)

PCI MNL-116	(1999) Manual for Quality Control for Plants and Production of Structural Precast Concrete Products, 4th edition
PCI MNL-117	(1996) Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products, Third Edition

PCI MNL-122 (1989) Architectural Precast Concrete, Second Edition

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawings; G

Detail drawings showing details in accordance with ACI 315 and ACI 318, including installation details shall be submitted for approval. Detail drawings shall indicate separate identification marks for each different precast unit, location of units in the work, elevations, fabrication details, welding details, reinforcement, connections, dimensions, interface with adjacent members, blocking points for units stored at the precast concrete plant or at the jobsite, lifting points and special handling instructions in sufficient detail to cover manufacture, handling, and erection, and bracing. The steel bracing frame design and details for the stoplog slots shall be included in this submittal.

SD-06 Test Reports

Test Reports; G

Certified copies of test reports including all test data and all test results shall be submitted. Tests for compressive strength of concrete shall be performed by an approved independent commercial testing laboratory, except that compressive strength tests for initial prestress may be performed in the manufacturer's plant laboratory.

SD-07 Certificates

Mix Design; G

A statement giving the maximum nominal coarse aggregate size, the proportions of all ingredients and the type and amount of any admixtures that will be used in the manufacture of each strength and type of concrete, shall be submitted for approval prior to commencing operations. The statement shall be accompanied by test results from an approved testing laboratory, certifying that the proportions selected will produce concrete of the properties required. No substitutions shall be made without additional tests to verify that the concrete properties are satisfactory.

Manufacturer's Qualifications; G

A statement giving the qualifications of the precast concrete manufacturer and of the installers shall be submitted prior to commencing operations.

Certificates

The precast concrete manufacturing plant shall be certified by the Prestressed Concrete Institute, Plant Certification Program, prior to the start of production, or the manufacturer shall, at his expense, meet the following requirements:

(1) Retain an independent testing or consulting firm approved by the Government.

(2) The basis of inspection shall be the Prestressed Concrete Institute Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products, PCI MNL-116 and Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products, PCI MNL-117.

(3) This firm shall inspect the precast facility at two-week intervals during production and issue a report, certified by a registered engineer verifying that materials, methods, products and quality control meet all the requirements of the specifications, drawings, and PCI MNL-116 and/or PCI MNL-117. If the report indicates to the contrary, the Contracting Officer, at the contractor's expense, will inspect and may reject any or all products produced during the period of non-compliance with the above requirements.

1.4 DESIGN

1.4.1 Standards and Loads

Precast unit design shall conform to ACI 318 and PCI MNL-122. Stresses due to restrained volume change caused by shrinkage and temperature differential, handling, transportation and erection shall be accounted for during fabrication.

1.4.2 Connections

The Contractor has the option to fabricate each precast segment in its full size prior to transporting it to the site, or the Contractor may fabricate each precast segment at the site.

Connection of units to other members, or to other units shall be of the type and configuration indicated on the contract drawings. The design and sizing of connections for all design loads shall be as shown.

Refer to Section 03730, RESIN SYSTEMS FOR CONCRETE REPAIR AND BONDING; GROUTING ANCHOR BARS, for epoxy bonding of precast concrete segments to cast-in-place concrete.

1.4.3 Concrete Strength

Post-tensioned precast concrete girders shall have a 28-day compression strength (f'c) of 4,000 psi and the concrete for the girders shall be structural concrete in conformance to Section 03301, CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS.

1.4.4 Concrete Proportion

Selection of proportions for concrete shall be based on Section 03301,

CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS, for structural concrete. The concrete proportion shall be developed using the same type and brand of cement, the same type and gradation of aggregates, and the same type and brand of admixture that will be used in the manufacture of precast concrete units for the project. Calcium chloride shall not be used in precast concrete and admixtures containing chloride ions, nitrates, or other substances that are corrosive shall not be used in prestressed concrete.

1.5 STORAGE AND INSPECTION AT MANUFACTURER'S PLANT

Precast units temporarily stored at the manufacturer's plant shall be protected from damage and inspected in accordance with PCI MNL-117 and PCI MNL-122. Immediately prior to shipment to all jobsite, all precast concrete units shall be inspected for quality to insure all precast units conform to the requirements specified. Inspection for quality will include but not necessarily be limited to the following elements; color, texture, dimensional tolerances, chipping, cracking, staining, warping and honeycombing. All defective precast concrete units shall be replaced or repaired as approved.

1.6 HANDLING AND STORAGE

Precast units shall be delivered to the site with delivery scheduled to avoid excessive build-up of units in storage at the site. Segments A, B, and C vertical walls shall be braced rigidly during lifting. Upon delivery to the jobsite all precast units shall be inspected for quality as specified in paragraph 1.5 STORAGE AND INSPECTION AT MANUFACTURER'S PLANT. If the precast units cannot be unloaded and placed directly into the work, they shall be stored on site, off the ground and protection from weather, marring, or overload. Precast units shall be handled in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Plates, Angles, Anchors and Embedments

Steel items, including items embedded in concrete, shall be either stainless steel or hot-dip galvanized steel as indicated an the contract documents.

2.1.2 Form Release Agent

Release agent shall be manufacturer's standard nonstaining type.

2.1.3 Admixtures

Admixtures shall conform to ASTM C 494. Plasticizing admixture, if used, shall conform to ASTM C 1017.

2.2 PRECAST CONCRETE UNITS

2.2.1 General

Precast concrete unit shall be manufactured and cured in accordance with the applicable provisions of PCI MNL-117. Units shall be manufactured within the allowable tolerances given in PCI MNL-117, PCI MNL-122, and ACI 117/117R, unless noted otherwise. The more restrictive tolerance governs

if there is a difference between references.

2.2.2 Formwork

Forms shall be steel or sealed wood of adequate thickness, braced, stiffened, anchored and aligned to produce precast architectural concrete units within required dimensional tolerances and surface finishes. Forms shall be sufficiently rigid to provide dimensional stability during handling and concrete placement and consolidation. Fiberglass-reinforced plastic, plastic coated wood, elastomeric or other nonabsorptive material shall be used for making tight joints and rustification pieces.

2.2.3 Reinforcement

Fabrication and placement of reinforcement shall conform to the details shown on the approved detail drawings, and PCI MNL-117, and ACI 117/117R, and shall also conform to Section 03201, STEEL BARS AND WELDED WIRE FABRIC FOR CONCRETE REINFORCEMENT FOR CIVIL WORKS, requirements.

2.2.4 Embedded Accessories

Anchors, inserts, lifting devices, and other accessories which are to be embedded in the precast units shall be furnished and installed in accordance with the approved detail drawings. Embedded items shall be accurately positioned in their designed location, and shall have sufficient anchorage and embedment to satisfy design requirements.

2.2.5 Stripping

Precast concrete units shall not be removed from forms until units develop sufficient strength to safely strip the formwork and to remove the precast concrete units from the forms to prevent damage to the units from overstress or chipping.

2.2.6 Identification

Each precast concrete unit shall be marked to correspond to the identification marks for each different precast unit shown on the detail drawings.

2.3 FINISHES

2.3.1 Formed Surfaces

Surfaces of precast units shall be finished as follows: Smooth as cast-produced using smooth, nonporous forms, unless otherwise noted. Formwork shall produce a Class "A" finish on all exposed to view surfaces in accordance with Section 03100, STRUCTURAL CONCRETE FORMWORK and Section 03301, CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS. Class "C" finish shall be used on surfaces not exposed to view.

2.3.2 Non-Formed Surfaces

Non-formed surfaces of precast units shall be finished in accordance with Section 03301, CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS, to a minimum surface flatness number, F_f, of 32.

PART 3 EXECUTION

3.1 ERECTION

Precast units shall be erected in accordance with the detail drawings and without damage to other units or to adjacent members. Units shall be set true to alignment and level, with joints properly spaced and aligned both vertically and horizontally. Erection tolerances shall be in accordance with the drawings, specifications, and with the requirements of PCI MNL-117, PCI MNL-122, and ACI 117/117R. The more restrictive tolerance governs if there is a difference between references. As units are being erected, shims and wedges shall be placed as required to maintain correct alignment. Precast units erected in-the-wet shall be allowed erection tolerances 125% of those specified for in the dry erection. After final attachment, precast units shall be grouted as shown. Horizontal joints between precast units are shimmed and sealed at the exposed face with closed-cell sponge rubber strip seals to prevent grout leakage. After erection, welds and abraded surfaces of steel shall be cleaned and touched-up with zinc-rich paint. Welds shall be made by a certified welder in accordance with the manufacturer's erection drawings. Pickup points, boxouts, inserts, and the like shall be finished to match adjacent areas after erection. Erection of precast units shall be supervised and performed by workmen skilled in this type of work. Welding and the qualifications of welders shall be in accordance with AWS D1.1, and AWS D1.6.

3.2 STOPLOG SLOT BRACING FRAME

The stoplog slots in the precast concrete members shall be held securely in position during erection by a temporary steel bracing frame. This bracing frame shall hold the stoplog slots to within +/- 1/4 inch of the indicated clear distance between the north slot and the south slot at each elevation along the height of the slot.

The face of the embedded plate bearing and seal surface shall be held by the frame at alignment STA 3+47.000 within a tolerance of +/- 1/8 inch at each elevation.

The maximum allowable abrupt offset misalignment at each slot surface, at each elevation along the height of the slot shall be not greater than +/- 1/8 inch. The bracing frame shall hold the segments to within these tolerances considering all construction loading.

All slot surfaces shall be braced and constructed to the planes indicated with all abrupt offsets in segments ground to a maximum transition slope of 1/8 inch horizontal in 6 inch vertical.

The design and details for this steel bracing frame shall be submitted with the shop drawings. Holding these slot alignment positions is required for proper operation of the stoplogs. Reference "Cofferdam Segment Alignment Tolerances" shown on Plate S2.18.

3.3 CLEANING

Horizontal bedding joints shall be cleaned with a suction pump of all loose material prior to the grouting of the joints. Not sooner than 72 hours after joints are sealed, faces and other exposed surfaces of precast concrete discolored during erection shall be cleaned to remove dirt and stains by dry scrubbing with a stiff fiber brush, wetting the surface and vigorous scrubbing of the finish with a stiff fiber brush followed by additional washing, or by chemical cleaning compounds such as accordance with the manufacturer's recommendations. Cleaning procedure shall be

performed on a designated test area and shall be approved prior to proceeding with cleaning work. Discolorations which cannot be removed by these procedures, temperature and humidity conditions are such that surfaces dry rapidly. Care shall be taken during cleaning operations to protect adjacent surfaces from damage.

3.4 PROTECTION OF WORK

Precast units shall be protected against damage from subsequent operations.

3.5 DEFECTIVE WORK

Precast concrete units damaged during erection shall be repaired as soon after occurrence as possible or replaced, as directed, using approved procedures. All repairs to precast concrete units shall match the adjacent surfaces in durability, strength, color and texture and shall be as approved. Unless otherwise approved, repair procedures shall conform to PCI MNL-117, Section 03100, STRUCTURAL CONCRETE FORMWORK , Section 03301, CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS, and Section 03730, RESIN SYSTEMS FOR CONCRETE REPAIR AND BONDING; GROUTING ANCHOR BARS. Underwater repairs shall be made with grout and concrete containing antiwash agents to prevent loss of cement and fines. Also underwater repair of precast concrete will be allowed tolerances 125% of those specified for in-the-dry construction.

-- End of Section --

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SECTION 03730

RESIN SYSTEMS FOR CONCRETE REPAIR AND BONDING; GROUTING ANCHOR BARS

PART 1 GENERAL

1.1 GENERAL INFORMATION

(1) This specification covers repairing and patching of defects in hardened Portland cement concrete using sanded resin mortars, and the bonding of plastic Portland cement concrete to hardened concrete using an epoxy system as a bonding agent. Also covered in this specification is the drilling and grouting of anchor bolts and reinforcing bars using a resin grout system. Concrete repair work using a Portland cement type damp-pack mortar (often referred to as dry-packing) is covered in SECTION 03301, CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS.

(2) The work shall be in accordance with ACI 318/318R part entitled Construction Requirements, ACI 503.2, Standard Specification for Bonding Plastic Concrete to Hardened Concrete with a Multi-Component Epoxy Adhesive, and ACI 530.4, Standard Specifications for Repairing Concrete with Epoxy Mortars, except as specified herein. Epoxy resin shall conform to ASTM C 881, except as modified hereinafter.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO T 237	Testing Epoxy Resin Adhesive

ACI INTERNATIONAL (ACI)

ACI 503.2	(1992) Bonding Plastic Concrete to Hardened Concrete with a Multi-Component Epoxy Adhesive
ACI 530.4	(1992) Repairing Concrete with Epoxy Mortars
ACI 318/318R	(1999) Building Code Requirements for Structural Concrete and Commentary

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B94.12	Carbide-Tipped Masonry Drills & Blanks for Carbide

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33	(1999ae1) Concrete Aggregates
ASTM C 144	(1999) Aggregate for Masonry Mortar

ASTM C 150	(1999a) Portland Cement
ASTM C 881	(1999) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM D 638	(1992) Tensile Properties of Plastics
ASTM D 648	Deflection Temperature of Plastics Under Flexural Load
ASTM D 695	(1991) Compressive Properties of Rigid Plastics

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-05 Design Data

Mix Proportions; G

Mix proportions for Resin Mortars for use in concrete patching shall be submitted for compliance with this specification section. Prior to commencing operations, the Contractor shall submit epoxy mortar mix and polymer modified cement mortar mix designs and a statement giving the maximum nominal coarse aggregate size and gradations and the proportions of all ingredients that will be used in the manufacture of epoxy mortar and polymer modified cement mortar proposed for use. Proportions of materials for mortar shall be as recommended by the manufacturer. Aggregate weights for the epoxy mortar shall be based on the dry condition. The mortar can be based on volumetric measurements. The statement shall be accompanied by test results from an independent commercial laboratory attesting that the proportions selected will produce mortar of the qualities indicated. No substitutes shall be made in the materials used in the work without additional tests to show that the quality of the mortar is satisfactory.

SD-07 Certificates

Epoxy Resin for Drilled-In Reinforcing Bars and Anchor Bolts; G

Descriptive literature and a certificate from the manufacturer stating that the material is suitable for the application for which it is to be used and that the full specified yield strength of the reinforcing steel is developed by the material placed in a drill hole of length equal to the embedment length as required by ACI 318/318R.

Environmental Control

Prior to commencement of Contractor operations, a copy of the manufacturer's recommendations as to the environmental conditions

under which the resin compounds may be used shall be submitted to the Contracting Officer. Also included shall be the proposed method of temperature, humidity, and ventilation control procedures.

Handling of Materials

A copy of the manufacturer's recommendations for handling, storage and workman safety equipment and procedures shall be submitted for approval prior to delivery of the material to the project site.

Certificates of Compliance

Manufacturer's certificates of compliance attesting that aggregate, epoxy resin system, latex admixture, and polymer modified cement meet the requirements specified shall be furnished in accordance with Section 01330, SUBMITTAL PROCEDURES. Certified copies of laboratory test reports, including all test data, shall be submitted for aggregate and resin systems. These tests shall be made by an approved commercial laboratory or by a laboratory maintained by the manufacturers of the material. The manufacturer's certificate shall clearly state that the material proposed for use is suitable for the intended application.

SD-08 Manufacturer's Instructions

Application Control; G

Mixing and application procedures and manufacturer's safety instructions shall be submitted for approval prior to use.

1.4 MATERIAL STORAGE AND HANDLING

1.4.1 Storage of Materials

Epoxy and other resin materials shall be stored in accordance with manufacturer's recommendations. Other materials shall be stored in such a manner as to avoid contamination and deterioration. Resin containers shall be clearly labeled with the following information:

(1) Name of Manufacturer.
(2) Manufacturer's product identification.
(3) Manufacturer's instructions for mixing.
(4) Warning for handling and toxicity.
(5) Manufacturing date and shelf life.

1.4.2 Protection of River and Reservoir

No material of any kind, under the control of the Contractor or his representatives, shall be allowed to fall into the river or reservoir for the duration of this contract.

PART 2 PRODUCTS

2.1 MATERIALS

Materials shall conform to the requirements specified below:

(1) Composition. Mortar shall consist of an approved binder and aggregate proportioned in accordance with the mix design submittals and mixed in accordance with the manufacturer's recommendations.

(2) Epoxy Bonding Resin. Epoxy bonding resin shall be a two-component, solventless, non-shrink, 100 percent solids, moisture insensitive, bonding agent suitable for bonding epoxy mortars and Portland cement concrete to Portland cement concrete or steel substrates and shall conform to Type II, Grades 1 or 2, Class A, B, or C as defined in ASTM C 881 with class selected as determined by ambient and concrete surface temperature at the location of application and approved by the Contracting Officer. The epoxy resin shall have a minimum compressive strength of 5,000 psi as determined by ASTM D 695, a minimum tensile strength 4,000 psi as determined by ASTM D 638. a minimum slant shear strength of 5,000 psi as determined by AASHTO T 237, and a minimum heat deflection temperature of 127 degrees F as determined by ASTM D 648. Epoxy bonding resin shall be concrete gray in color.

(3) Epoxy Resin. Epoxy resin for use in mortar shall be a two-component paste, 100 percent solids, non-shrink, moisture insensitive structural adhesive conforming to Type III, Grades 2 or 3, Class A, B, or C as defined in ASTM C 881 with class selected as determined by ambient and concrete surface temperatures at the location of application and approved by the Contracting Officer. The epoxy resin shall have a minimum tensile strength of 1,100 psi as determined by ASTM D 638, a minimum slant shear strength of 5,000 psi as determined by AASHTO T 237, a minimum compressive strength of 4,000 psi as determined by ASTM D 695 after 3 days when cured at 73 degrees F, and a minimum heat deflecting temperature of 118 degrees F as determined by ASTM D 648. Color of mixed resin shall be concrete gray.

(4) Polymer Modified Cement. The modified cement shall have a minimum compressive strength of 5,000 psi as determined by ASTM D 695, a minimum tensile strength of 4,000 psi as determined by ASTM D 638 a minimum slant shear strength of 5,000 psi as determined by AASHTO T 237, and a minimum heat deflection temperature of 127 degrees F as determined by ASTM D 648. Polymer modified cement mortars shall be concrete gray in color.

(5) Portland Cement. Portland cement shall conform to ASTM C 150, Type I or II low alkali, including the false set requirement.

(6) Aggregates. The aggregates used for epoxy mortar and polymer modified cement mortars shall be clean, dry, natural or crushed stone with maximum aggregate size of 3/8 inch or less and uniformly graded. The aggregate gradation and quality shall be in accordance with the epoxy manufacturer's recommendations. The maximum size of aggregate shall not exceed one-third of the thickness of the layer being placed or the width of the opening being filled. Aggregate quality shall meet the epoxy manufacturer's requirements but not less than the quality requirement in ASTM C 33 and ASTM C 144.

(7) Form Coating. Form release agents shall be as recommended by the resin manufacturer and approved by the Contracting Officer.

(8) Curing Materials. Curing conditions including use of curing material shall be in accordance with the resin manufacturer's recommendations.

(9) Epoxy Resin for Drilled-In Reinforcing Bars and Anchor Bolts. The adhesive used shall be a two-component, structural grade epoxy material which meets the requirements of ASTM C 881 Types IV, and V, Grade 3, Classes B and C. The epoxy shall be an odorless amine based resin supplied in a two-component dispensing system which keeps the resin and hardener separated until they are dispensed. The epoxy based resin and hardener shall be mixed in a 1 to 1 ratio through a motionless static mixing nozzle approved by the manufacturer of the system. Cartridge type systems shall have pushers containing an "o" ring to prevent leakage during dispensing. Sausage pack type systems shall be supplied with a reusable manifold that automatically opens the packs. The epoxy used shall have a minimum shelf life of two years. Anchor holes shall be drilled with a bit meeting the requirements of ANSI B94.12 and shall be approved by the manufacturer. The epoxy and anchor hardware components shall be installed according to the manufacturers instructions.

(10) Epoxy Bonding Agent for Joining Freshly Mixed Concrete to Hardened Concrete. Hardened concrete surfaces to be bonded to freshly mixed concrete shall be coated with a two-component structural grade epoxy conforming to ASTM C 881, Type V, Grade 1 or 2, Classes B and C before the new concrete is placed. The contact surface shall be prepared and primed with the epoxy resin system in accordance with ACI 503.2.

PART 3 EXECUTION

3.1 MORTAR PLACEMENT FOR CONCRETE REPAIRS

3.1.1 Mortar Mixing

The epoxy resin or polymer modified cement shall be combined with the aggregate and mixed in accordance with the manufacturer's recommendations to the required consistency and quantity for the intended application.

3.1.2 Mixing Equipment

The equipment shall be of the type and quality as recommended by the resin manufacturer and approved by the Contracting Officer. Equipment shall be clean and in good working condition at all times.

3.1.3 Bonding Agent

Prior to epoxy mortar or polymer modified cement mortar placement, the concrete contact surfaces where the mortar is required to bond shall be prepared in accordance with ACI 530.4. The contact surface shall then be primed with an epoxy resin system to function as a bonding agent applied in accordance with ACI 503.2.

3.1.4 Mortar Placement

Placement shall be done in such a manner as to insure that all voids will be filled with mortar. Mortar for concrete repair shall be mixed to a consistency suitable for adequate compaction but stiff enough to not sag away from designated finished surfaces. Mortar shall be applied at a thickness not less than, nor more than, that recommended by the manufacturer and compacted with hand tools in a manner assuring bond and lack of voids The placement shall not be considered complete until, in the

opinion of the Contracting Officer, all voids have been filled to the maximum extent practicable. Placement shall be done at temperatures not exceeding the ranges specified. Proportions of materials for mortar shall be as recommended by the manufacturer and approved by the Contracting Officer. All mortar not placed within the time limitations recommended by the manufacturer after mixing or start to set shall be wasted.

3.1.5 Cold and Warm Weather Requirements

Cold and warm weather requirements for epoxy resin and polymer modified cement mortars, special protection measures for mixing, placing, and curing of epoxy resin and polymer modified cement mortars shall be in accordance with the manufacturer's recommendations and the approved submittals.

3.2 BONDING OF CONCRETE

Concrete surfaces to receive freshly mixed concrete shall be prepared by chipping concrete to the required lines and grades shown on the drawings followed by sandblasting to produce a surface free of any deleterious materials such as laitance, dust, dirt or oil. The epoxy compounds to be used as a bonding agent shall be mixed and applied, and the fresh plastic concrete placed in accordance with ACI 503.2.

3.3 DRILLING AND GROUTING ANCHOR BOLTS AND REINFORCEMENT BARS

3.3.1 Drilling

Holes are to be drilled into existing concrete for the installation of reinforcing bars. The equipment and methods employed shall be capable of performing these operations, as well as drilling through miscellaneous tramp metal and reinforcing steel that may be encountered, without damaging surrounding concrete. Tailings and slurry resulting from the drilling operation shall be confined to the immediate area and removed from the site. Holes shall be flushed with clean water to remove residue, then blown out using oil-free compressed air, and allowed to dry.

3.3.2 Adhesive Resin

All horizontal drilled-in reinforcing bars and threaded anchors shall be grouted in place with a two-component epoxy resin system in accordance with the manufacturer's instructions as specified in paragraph 2.1.(9). Vertical drilled-in reinforcing bars and threaded anchors shall be grouted in place with a two-component resin system as specified in paragraph 2.1.(9). All drilled-in reinforcing bars adhesive anchors shall be grouted in accordance with paragraph 2.1.(9). Run-out of any grout materials during the grouting operation shall be confined to the immediate area and removed from the site.

3.4 FINISHING

3.4.1 General

Unformed surfaces shall be float finished to a smooth, dense, non-granular surface. After floating, surfaces shall be steel trowel finished if shown on the drawings. Fins and mortar projections on formed surfaces shall be removed. Surface voids, including form tie holes, and any area not completely filled with mortar, shall be repaired by reaming and cleaning of unsound material and patch with hand placed mortar. Defective areas shall be repaired by outlining the entire patch area with sawcuts normal to sound

concrete and patched as outlined herein before for hand placed mortar.

3.4.2 Patch Surface Tolerance

Exposed patch surfaces shall be finished flush to match adjacent surface elevations and contours. Finished surfaces shall be plane with no deviation greater than 1/8 inch when tested with a 10-foot straightedge.

3.4.3 Patching Surface Finish

The surfaces of patches exposed to view shall match adjacent surfaces, in color and texture, and joint alignment.

3.5 CURING AND PROTECTION

3.5.1 General

Beginning immediately after placement and continuing for at least the time duration recommended by the manufacturer, all mortar repairs shall be cured and protected from extremes in temperature, rapid temperature change, freezing, and mechanical damage. During the curing period air temperatures and humidity shall be maintained around the placement within the range recommended by the manufacturer. All materials and equipment needed for adequate curing and protection shall be available and at the site of the placement prior to the start of epoxy resin placement.

3.5.2 Cure Duration

Resin mortar repairs shall be cured for the time duration and by using methods as recommended by the resin manufacturer.

3.5.3 Cold Weather

Minimum temperatures for resin mortar and grouts, and epoxy bonding systems shall be in accordance with the manufacturer's recommendations.

3.5.4 Protection from Running Water

All mortar patch surfaces shall be protected from running water for the entire cure period by the use of dams and pumps or other methods as approved by the Contracting Officer.

3.6 CLEAN UP

Resin mortar spillage shall be cleaned from the surface immediately. Leakage of mortar around the edge of the form during placing shall be plugged immediately and the leakage area repaired.

3.7 SAFETY

Resins and cleaning solvents may be skin irritants. Section No. 6 of EM 385-1-1, "Safety and Health Requirements Manual" shall be strictly adhered to and workers shall be equipped with eye and skin protection. The manufacturer's recommended safety equipment and instructions shall be used. Ventilation shall be provided in areas where mixing and placing of mortar will be accomplished and other project areas where fumes concentration may occur. The Contractor shall provide respirators to all personnel required to enter work areas when in the opinion of the Contracting Officer such equipment is necessary for personal safety due to inadequate ventilation.

-- End of Section --

SECTION 05055

METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

AA SAS-30	(1986) Aluminum Structures Construction Manual Series - Section 1 Specifications for Aluminum Structures

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 123	(1989a) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 325	(1997) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 380	(1994a) Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems
ASTM A 490	(1997) Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
ASTM A 514/A 514M	(1994a) High-Yield-Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding
ASTM A 780	(1993a) Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM D 962	(1981; R 1999) Aluminum Powder and Paste Pigments for Paints
ASTM E 165	(1995) Liquid Penetrant Examination Inspection Method
ASTM E 709	(1995) Magnetic Particle Examination

ASME INTERNATIONAL (ASME)

ASME B4.1	(1967; R 1994) Preferred Limits and Fits for Cylindrical Parts
ASME B46.1	(1995) Surface Texture (Surface Roughness, Waviness, and Lay)

ASME BPV IX (1995) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (1998) Structural Welding Code - Steel

AWS D1.2 (1990) Structural Welding Code - Aluminum

SOCIETY OF AUTOMOTIVE ENGINEERS INTERNATIONAL (SAE)

SAE AMS 3110 (1992; Rev G) Primer Zinc Chromate

SAE AMS 3132 (1994; Rev F) Varnish, Phenolic Resin Corrosion-Preventive

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

Detail drawings for metalwork and machine work shall be submitted and approved prior to fabrication.

SD-03 Product Data

Welding of Structural Steel; G

Copies of welding procedure specifications, procedure qualification test records , and schedules of welding procedures for steel structures shall be submitted and approved prior to commencing fabrication.

Welding of Aluminum; G

Schedules of welding processes for aluminum fabrications shall be submitted and approved prior to commencing fabrication.

Structural Steel Welding Repairs; G

Welding repair plans for steel shall be submitted and approved prior to making repairs.

Materials Orders

Copies of purchase orders, mill orders, shop orders and work orders for materials shall be submitted prior to the use of the materials in the work.

Materials List

Materials list for fabricated items shall be submitted at the time of submittal of detail drawings.

Shipping Bill

Shipping bill shall be submitted with the delivery of finished pieces to the site.

SD-06 Test Reports

Tests, Inspections, and Verifications

Certified test reports for materials shall be submitted with all materials delivered to the site.

SD-07 Certificates

Qualification of Welders and Welding Operators

Certifications for welders and welding operators shall be submitted prior to commencing fabrication.

Application Qualification for Steel Studs; G

Certified reports for the application qualification for steel studs shall be submitted and approved prior to commencing fabrication.

Welding of Aluminum

Certified report for aluminum welding qualification tests shall be submitted and approved prior to commencing welding.

1.3 DETAIL DRAWINGS

Detail drawings for metalwork and machine work shall include catalog cuts, templates, fabrication and assembly details and type, grade and class of material as appropriate. Elements of fabricated items inadvertently omitted on contract drawings shall be detailed by the fabricator and indicated on the detail drawings.

1.4 QUALIFICATION OF WELDERS AND WELDING OPERATORS

The Contractor shall certify that the qualification of welders and welding operators and tack welders who will perform structural steel welding have been qualified for the particular type of work to be done in accordance with the requirements of AWS D1.1, Section 5, or prior to commencing fabrication. The certificate shall list the qualified welders by name and shall specify the code and procedures under which qualified and the date of qualification. Prior qualification will be accepted if welders have performed satisfactory work under the code for which qualified within the preceding three months. The Contractor shall require welders to repeat the qualifying tests when their work indicates a reasonable doubt as to proficiency. Those passing the requalification tests will be recertified. Those not passing will be disqualified until passing. All expenses in connection with qualification and requalification shall be borne by the Contractor.

1.5 WELDING PROCEDURE QUALIFICATIONS

1. General. Except for prequalified (per AWS D1.1) and previously qualified procedures, each Contractor performing welding shall record in detail and shall qualify the welding procedure specification for any welding procedure followed in the fabrication of weldments. Qualification of welding procedures shall conform to AWS D1.1 and to the specifications in this section. Copies of the welding procedure specification and the results of the procedure qualification test for each type of welding which requires procedure qualification shall be submitted for approval. Approval of any procedure, however, will not relieve the Contractor of the sole responsibility for producing a finished structure meeting all the requirements of these specifications. This information shall be submitted on the forms in Annex E of AWS D1.1. Welding procedure specifications shall be individually identified and shall be referenced on the detail drawings and erection drawings, or shall be suitably keyed to the contract drawings. In case of conflict between this specification and AWS D1.1, this specification governs.

2. Previous Qualifications. Welding procedures previously qualified by test may be accepted for this contract without requalification if the following conditions are met:

a. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.

b. The qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.

c. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

3. Prequalified Procedures. Accepted without further qualification. The Contractor shall submit for approval a listing or an annotated drawing to indicate the joints not prequalified. Procedure qualification shall be required for these joints.

4. Retests. If welding procedure fails to meet the requirements of AWS D1.1, the procedure specification shall be revised and requalified, or at the Contractor's option, welding procedure may be retested in accordance with AWS D1.1. If the welding procedure is qualified through retesting, all test results, including those of test welds that failed to meet the requirements, shall be submitted with the welding procedure.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Materials Orders

The Contractor shall furnish 5 copies of purchase orders, mill orders, shop orders and work orders for all materials orders and items used in the work. Where mill tests are required purchase orders shall contain the test site address and the name of the testing agency.

2.1.2 Materials List

The Contractor shall furnish a materials list of the materials to be used

in the fabrication of each item.

2.1.3 Shipping Bill

The Contractor shall furnish a shipping bill or memorandum of each shipment of finished pieces or members to the project site giving the designation mark and weight of each item, the number of items, the total weight, and the car initial and number if shipped by rail in carload lots.

2.2 FABRICATION

2.2.1 Structural Fabrication

Material must be straight before being laid off or worked. If straightening is necessary it shall be done by methods that will not impair the metal. Sharp kinks or bends shall be cause for rejection of the material. Material with welds will not be accepted except where welding is definitely specified, indicated or otherwise approved. Bends shall be made by approved dies, press brakes or bending rolls. Where heating is required, precautions shall be taken to avoid overheating the metal and it shall be allowed to cool in a manner that will not impair the original properties of the metal. Proposed flame cutting of material other than structural steel shall be subject to approval and shall be indicated on detail drawings. Shearing shall be accurate and all portions of the work shall be neatly finished. Corners shall be square and true unless otherwise shown. Re-entrant cuts shall be filleted to a minimum radius of 3/4 inch unless otherwise approved. Finished members shall be free of twists, bends and open joints. Bolts, nuts and screws shall be tight.

2.2.1.1 Dimensional Tolerances for Structural Work

Dimensions shall be measured by an approved calibrated steel tape of approximately the same temperature as the material being measured. The overall dimensions of an assembled structural unit shall be within the tolerances indicated on the drawings or as specified in the particular section of these specifications for the item of work. Where tolerances are not specified in other sections of these specifications or shown, an allowable variation of 1/32 inch is permissible in the overall length of component members with both ends milled and component members without milled ends shall not deviate from the dimensions shown by not more than 1/16 inch for members 30 feet or less in length and by more than 1/8 inch for members over 30 feet in length.

2.2.1.2 Structural Steel Fabrication

Structural steel may be cut by mechanically guided or hand-guided torches, provided an accurate profile with a surface that is smooth and free from cracks and notches is obtained. Surfaces and edges to be welded shall be prepared in accordance with AWS D1.1, Subsection 3.2. Where structural steel is not to be welded, chipping or grinding will not be required except as necessary to remove slag and sharp edges of mechanically guided or hand-guided cuts not exposed to view. Hand-guided cuts which are to be exposed or visible shall be chipped, ground or machined to sound metal.

2.2.1.3 Structural Aluminum Fabrication

Laying out and cutting of aluminum shall be in accordance with the AA SAS-30, Section 6.

2.2.2 Welding

2.2.2.1 Welding of Structural Steel

a. Welding Procedures for Structural Steel - Welding procedures for structural steel shall be prequalified as described in AWS D1.1, Subsection 5.1 or shall be qualified by tests as prescribed in AWS D1.1, Section 5. Properly documented evidence of compliance with all requirements of these specifications for previous qualification tests shall establish a welding procedure as prequalified. For welding procedures qualified by tests, the test welding and specimen testing must be witnessed and the test report document signed by the Contracting Officer. Approval of any welding procedure will not relieve the Contractor of the responsibility for producing a finished structure meeting all requirements of these specifications. The Contractor will be directed or authorized to make any changes in previously approved welding procedures that are deemed necessary or desirable by the Contractor Officer. The Contractor shall submit a complete schedule of welding procedures for each steel structure to be welded. The schedule shall conform to the requirements specified in the provisions AWS D1.1, Sections 2, 3, 4, 7 and 9 and applicable provisions of Section 10. The schedule shall provide detailed procedure specifications and tables or diagrams showing the procedures to be used for each required joint. Welding procedures must include filler metal, preheat, interpass temperature and stress-relief heat treatment requirements. Each welding procedure shall be clearly identified as being prequalified or required to be qualified by tests. Welding procedures must show types and locations of welds designated or in the specifications to receive nondestructive examination.

b. Welding Process - Welding of structural steel shall be by an electric arc welding process using a method which excludes the atmosphere from the molten metal and shall conform to the applicable provisions of AWS D1.1, Sections 1 thru 7, 9, 10 and 11. Welding shall be such as to minimize residual stresses, distortion and shrinkage.

c. Welding Technique

(1) Filler Metal - The electrode, electrode-flux combination and grade of weld metal shall conform to the appropriate AWS specification for the base metal and welding process being used or shall be as shown where a specific choice of AWS specification allowables is required. The AWS designation of the electrodes to be used shall be included in the schedule of welding procedures. Only low hydrogen electrodes shall be used for manual shielded metal-arc welding regardless of the thickness of the steel. A controlled temperature storage oven shall be used at the job site as prescribed by AWS D1.1, Subsection 4.5 to maintain low moisture of low hydrogen electrodes.

(2) Preheat and Interpass Temperature - Preheating shall be performed as required by AWS D1.1, Subsection 4.2 and 4.3 or as otherwise specified except that the temperature of the base metal shall be at least 70 degrees F. The weldments to be preheated shall be slowly and uniformly heated by approved means to the prescribed temperature, held at that temperature until the welding is completed and then permitted to cool slowly in still air.

(3) Stress-Relief Heat Treatment - Where stress relief heat

treatment is specified or shown, it shall be in accordance with the requirements of AWS D1.1, Subsection 4.4 unless otherwise authorized or directed.

d. Workmanship - Workmanship for welding shall be in accordance with AWS D1.1, Section 3 and other applicable requirements of these specifications.

(1) Preparation of Base Metal - Prior to welding the Contractor shall inspect surfaces to be welded to assure compliance with AWS D1.1, Subsection 3.2.

(2) Temporary Welds - Temporary welds required for fabrication and erection shall be made under the controlled conditions prescribed for permanent work. Temporary welds shall be made using low-hydrogen welding electrodes and by welders qualified for permanent work as specified in these specifications. Preheating for temporary welds shall be as required by AWS D1.1 for permanent welds except that the minimum temperature shall be 120 degrees F in any case. In making temporary welds arcs shall not be struck in other than weld locations. Each temporary weld shall be removed and ground flush with adjacent surfaces after serving its purpose.

(3) Tack Welds - Tacks welds that are to be incorporated into the permanent work shall be subject to the same quality requirements as the permanent welds and shall be cleaned and thoroughly fused with permanent welds. Preheating shall be performed as specified above for temporary welds. Multiple-pass tack welds shall have cascaded ends. Defective tack welds shall be removed before permanent welding.

2.2.2.2 Welding of Steel Castings

Unsound material shall be removed from the surfaces of steel castings to be incorporated into welded connections by chipping, machining, air-arc gouging or grinding. Major connections designed for transfer of stresses shall not be welded if the temperature of the casting is lower than 100 degrees F. Castings containing over 0.35 percent carbon or over 0.75 percent manganese shall be preheated to a temperature not to exceed 450 degrees F and welding shall be accomplished while the castings are maintained at a temperature above 350 degrees F. Welding will not be permitted on castings containing carbon in excess of 0.45 percent except on written authorization. Castings requiring welding repairs after the first annealing and castings involving welding fabrication shall be stress-relieved annealed prior to receiving final machining unless otherwise permitted.

2.2.2.3 Welding of Aluminum

Welding of aluminum shall conform to AA SAS-30 or AWS D1.2, Sections 1 through 7, 9 and 10. The welding process and welding operators shall be prequalified as required by AWS D1.2, Section 5 or AA SAS-30, Subsection 7.2.4 in accordance with the methods described in ASME BPV IX, Section IX. A certified report giving the results of the qualifying tests shall be furnished for approval. A complete schedule of the welding process for each aluminum fabrication to be welded shall be furnished for approval.

2.2.2.4 Welding of Steel Studs

The procedures for welding steel studs to structural steel, including mechanical, workmanship, technique, stud application qualification, production quality control and fabrication and verification inspection procedures shall conform to the requirements of AWS D1.1, Section 7, except as otherwise specified.

a. Application Qualification for Steel Studs - As a condition of approval of the stud application process, the Contractor shall furnish certified test reports and certification that the studs conform to the requirements of AWS D1.1, Subsections 7.2 and 7.3, certified results of the stud manufacturer's stud base qualification test, and certified results of the stud application qualification test as required by AWS D1.1, Subsection 7.6, except as otherwise specified.

b. Production Quality Control - Quality control for production welding of studs shall conform to the requirements of AWS D1.1, Subsection 7.7, except as otherwise specified. Studs on which pre-production testing is to be performed shall be welded in the same general position as required on production studs (flat, vertical, overhead or sloping). If the reduction of the length of studs becomes less than normal as they are welded, welding shall be stopped immediately and not resumed until the cause has been corrected.

2.2.3 Bolted Connections

2.2.3.1 Bolted Structural Steel Connections

Bolts, nuts and washers shall be of the type specified or indicated. All nuts shall be equipped with washers except for high strength bolts. Beveled washers shall be used where bearing faces have a slope of more than 1:20 with respect to a plane normal to the bolt axis. Where the use of high strength bolts is specified or indicated the materials, workmanship and installation shall conform to the applicable provisions of ASTM A 325 or ASTM A 490.

a. Bolt Holes - Bolt holes shall be accurately located, smooth, perpendicular to the member and cylindrical.

(1) Holes for regular bolts shall be drilled or subdrilled and reamed in the shop and shall not be more than 1/16 inch larger than the diameter of the bolt.

(2) Holes for fitted bolts shall be match-reamed or drilled in the shop. Burrs resulting from reaming shall be removed. The threads of bolts shall be entirely outside of the holes. The body diameter of bolts shall have tolerances as recommended by ASME B4.1 for the class of fit specified. Fitted bolts shall be fitted in reamed holes by selective assembly to provide an LN-2 fit.

(3) Holes for high strength bolts shall have diameters of not more than 1/16 inch larger than bolt diameters. If the thickness of the material is not greater than the diameter of the bolts the holes may be punched. If the thickness of the material is greater than the diameter of the bolts the holes may be drilled full size or subpunched or subdrilled at least 1/8 inch smaller than the diameter of the bolts and then reamed to full size. Poor matching of holes will be cause for rejection. Drifting occurring during assembly shall not distort the metal or enlarge the holes.

Reaming to a larger diameter of the next standard size bolt will be allowed for slight mismatching.

2.2.3.2 Bolted Aluminum Connections

Punching, drilling, reaming and bolting for bolted aluminum connections shall conform to the requirements of AA SAS-30, Section 6.

2.2.4 Machine Work

Tolerances, allowances and gauges for metal fits between plain, non-threaded, cylindrical parts shall conform to ASME B4.1 for the class of fit shown or required unless otherwise shown on approved detail drawings. Where fits are not shown they shall be suitable as approved. Tolerances for machine-finished surfaces designated by non-decimal dimensions shall be within 1/64 inch. Sufficient machining stock shall be allowed on placing pads to ensure true surfaces of solid material. Finished contact or bearing surfaces shall be true and exact to secure full contact. Journal surfaces shall be polished and all surfaces shall be finished with sufficient smoothness and accuracy to ensure proper operation when assembled. Parts entering any machine shall be accurately machined and all like parts shall be interchangeable except that parts assembled together for drilling or reaming of holes or machining will not be required to be interchangeable with like parts. All drilled holes bolts shall be accurately located.

2.2.4.1 Finished Surfaces

Surface finishes indicated or specified shall be in accordance with ASME B46.1. Values of required roughness heights are arithmetical average deviations expressed in microinches. These values are maximum. Lesser degrees will be satisfactory unless otherwise indicated. Compliance with surface requirements shall be determined by sense of feel and visual inspection of the work compared to Roughness Comparison Specimens in accordance with the provisions of ASME B46.1. Values of roughness width and waviness height shall be consistent with the general type of finish specified by roughness height. Where the finish is not indicated or specified it shall be that which is most suitable for the particular surface, provide the class of fit required and be indicated on the detail drawings by a symbol which conforms to ASME B46.1 when machine finishing is provided. Flaws such as scratches, ridges, holes, peaks, cracks or checks which will make the part unsuitable for the intended use will be cause for rejection.

2.2.4.2 Unfinished Surfaces

All work shall be laid out to secure proper matching of adjoining unfinished surfaces unless otherwise directed. Where there is a large discrepancy between adjoining unfinished surfaces they shall be chipped and ground smooth or machined to secure proper alignment. Unfinished surfaces shall be true to the lines and dimensions shown and shall be chipped or ground free of all projections and rough spots. Depressions or holes not affecting the strength or usefulness of the parts shall be filled in an approved manner.

2.2.4.3 Pin Holes

Pin holes shall be bored true to gauges, smooth, straight and at right angles to the axis of the member. The boring shall be done after the

member is securely fastened in position.

2.2.4.4 Shafting

All shafting shall be turned or ground hot-rolled or cold-rolled steel as required unless otherwise specified or authorized. Fillets shall be provided where changes in section occur. Cold-finished shafting may be used where keyseating is the only machine work required.

2.2.5 Miscellaneous Provisions

2.2.5.1 Metallic Coatings

a. Zinc Coatings - Zinc coatings shall be applied in a manner and of a thickness and quality conforming to ASTM A 123. Where zinc coatings are destroyed by cutting, welding or other causes the affected areas shall be regalvanized. Coatings 2 ounces or heavier shall be regalvanized with a suitable low-melting zinc base alloy similar to the recommendations of the American Hot-Dip Galvanizers Association to the thickness and quality specified for the original zinc coating. Coatings less than 2 ounces shall be repaired in accordance with ASTM A 780.

2.2.5.2 Cleaning of Corrosion-Resisting Steel

Oil, paint and other foreign substances shall be removed from corrosion-resisting steel surfaces after fabrication. Cleaning shall be done by vapor degreasing or by the use of cleaners of the alkaline, emulsion or solvent type. After the surfaces have been cleaned they shall be given a final rinsing with clean water followed by a 24 hour period during which the surfaces are intermittently wet with clean water and then allowed to dry for the purpose of inspecting the clean surfaces. The surfaces shall be visually inspected for evidence of paint, oil, grease, welding slag, heat treatment scale, iron rust or other forms of contamination. If evidence of foreign substance exist the surface shall be cleaned in accordance with the applicable provisions of ASTM A 380. The proposed method of treatment shall be furnished for approval. After treatment the surfaces shall be visually reinspected. Brushes used to remove foreign substances shall have only stainless steel or nonmetallic bristles. Any contamination occurring subsequent to the initial cleaning shall be removed by one or more of the methods indicated above.

2.2.5.3 Lubrication

The arrangement and details for lubrication shall be as shown. Before erection or assembly all bearing surfaces shall be thoroughly cleaned and lubricated with an approved lubricant.

2.2.6 Shop Assembly

Each machinery and structural unit furnished shall be assembled in the shop to determine the correctness of the fabrication and matching of the component parts unless otherwise specified. Tolerances shall not exceed those shown. Each unit assembled shall be closely checked to ensure that all necessary clearances have been provided and that binding does not occur in any moving part. Assembly in the shop shall be in the same position as final installation in the field unless otherwise specified. Assembly and disassembly work shall be performed in the presence of the Contracting Officer unless waived in writing. Errors or defects disclosed shall be

immediately remedied by the Contractor without cost to the Government. Before disassembly for shipment each piece of a machinery or structural unit shall be match-marked to facilitate erection in the field. The location of match-marks shall be indicated by circling with a ring of white paint after the shop coat of paint has been applied or as otherwise directed.

2.3 TESTS, INSPECTIONS, AND VERIFICATIONS

The Contractor shall have required material tests and analyses performed and certified by an approved laboratory to demonstrate that materials are in conformity with the specifications. These tests and analyses shall be performed and certified at the Contractor's expense. Tests, inspections, and verifications shall conform to the requirements of the particular sections of these specifications for the respective items of work unless otherwise specified or authorized. Tests shall be conducted in the presence of the Contracting Officer if so required. The Contractor shall furnish specimens and samples for additional independent tests and analyses upon request by the Contracting Officer. Specimens and samples shall be properly labeled and prepared for shipment.

2.3.1 Nondestructive Testing

Material parts may be subjected to any form of nondestructive testing determined by the Contracting Officer. This may include ultrasonic, magnaflux, dye penetrant, x-ray, gamma ray or any other test that will thoroughly investigate the part in question. The cost of such investigation will be borne by the Contractor. Any defects will be cause for rejection and rejected parts shall be replaced and retested at the Contractor's expense. The frequency of testing shop and field welds is stated in paragraph 2.3.3.2.

2.3.2 Tests of Machinery and Structural Units

The details for tests of machinery and structural units shall conform to the requirements of the particular sections of these specifications covering these items. Each complete machinery and structural unit shall be assembled and tested in the shop in the presence of the Contracting Officer unless otherwise directed. Waiving of tests will not relieve the Contractor of responsibility for any fault in operation, workmanship or material that occurs before the completion of the contract or guarantee. After being installed at the site each complete machinery or structural unit shall be operated through a sufficient number of complete cycles to demonstrate to the satisfaction of the Contracting Officer that it meets the specified operational requirements in all respects.

2.3.3 Inspection of Structural Steel Welding

The Contractor shall maintain an approved inspection system and perform required inspections in accordance with Contract Clause CONTRACTOR INSPECTION SYSTEM. Welding shall be subject to inspection to determine conformance with the requirements of AWS D1.1, the approved welding procedures and provisions stated in other sections of these specifications. Nondestructive examination of designated welds will be required. Supplemental examination of any joint or coupon cut from any location in any joint may be required.

2.3.3.1 Visual Examination

All visual examination of completed welds shall be cleaned and carefully examined for insufficient throat or leg sizes, cracks, undercutting, overlap, excessive convexity or reinforcement and other surface defects to ensure compliance with the requirements of AWS D1.1, Section 3 and Section 9, Part D.

2.3.3.2 Nondestructive Examination

The nondestructive examination of shop and field welds shall be performed as designated or described in the sections of these specifications covering the particular items of work.

a. Testing Agency - The nondestructive examination of welds and the evaluation of examination tests as to the acceptability of the welds shall be performed by a testing agency adequately equipped and competent to perform such services or by the Contractor using suitable equipment and qualified personnel. In either case written approval of the examination procedures is required and the examination tests shall be made in the presence of the Contracting Officer. The evaluation of examination tests shall be subject to the approval and all records shall become the property of the Government.

b. Examination Procedures - Examination procedures shall conform to the following requirements.

(1) Ultrasonic Testing - Making, evaluating and reporting ultrasonic testing of welds shall conform to the requirements of AWS D1.1, Section 6, Part C. The ultrasonic equipment shall be capable of making a permanent record of the test indications. A record shall be made of each weld tested.

(2) Radiographic Testing - Making, evaluating and reporting radiographic testing of welds shall conform to the requirements of AWS D1.1, Section 6, Part B.

(3) Magnetic Particle Inspection - Magnetic particle inspection of welds shall conform to the applicable provisions of ASTM E 709.

(4) Dye Penetrant Inspection - Dye penetrant inspection of welds shall conform to the applicable provisions of ASTM E 165.

c. Acceptability of Welds - Welds shall be unacceptable if shown to have defects prohibited by AWS D1.1, Subsection 9.25 or possess any degree of incomplete fusion, inadequate penetration or undercutting.

d. Nondestructive Examination of shop and field welds shall be as follows:

(1) 10 percent of the full penetration welds shall be inspected by ultrasonic testing.

(2) 10 percent of the groove welds shall be inspected by ultrasonic testing.

(3) 10 percent of the fillet welds shall be inspected by magnetic particle testing or liquid penetrate testing.

(4) The samples shall be randomly selected and shall be representative of the welds on the weldment. Stainless steel

welding shall be visually inspected as a minimum.

(5) 100 percent of designed fracture critical welds shall be ultrasonic tested.

2.3.3.3 Test Coupons

The Government reserves the right to require the Contractor to remove coupons from completed work when doubt as to soundness cannot be resolved by nondestructive examination. Should tests of any two coupons cut from the work of any welder show strengths less than that specified for the base metal it will be considered evidence of negligence or incompetence and such welder shall be removed from the work. When coupons are removed from any part of a structure the members cut shall be repaired in a neat manner with joints of the proper type to develop the full strength of the members. Repaired joints shall be peened as approved or directed to relieve residual stress. The expense for removing and testing coupons, repairing cut members and the nondestructive examination of repairs shall be borne by the Government or the Contractor in accordance with the Contract Clauses INSPECTION AND ACCEPTANCE.

2.3.3.4 Supplemental Examination

When the soundness of any weld is suspected of being deficient due to faulty welding or stresses that might occur during shipment or erection the Government reserves the right to perform nondestructive supplemental examinations before final acceptance. The cost of such inspection will be borne by the Contractor.

2.3.4 Structural Steel Welding Repairs

Defective welds in the structural steel welding repairs shall be repaired in accordance with AWS D1.1, Subsection 3.7. Defective weld metal shall be removed to sound metal by use of air carbon-arc or oxygen gouging. Oxygen gouging shall not be used on ASTM A 514/A 514M steel. The surfaces shall be thoroughly cleaned before welding. Welds that have been repaired shall be retested by the same methods used in the original inspection. Except for the repair of members cut to remove test coupons and found to have acceptable welds costs of repairs and retesting shall be borne by the Contractor.

2.3.5 Inspection and Testing of Steel Stud Welding

Fabrication and verification inspection and testing of steel stud welding shall conform to the requirements of AWS D1.1, Subsection 7.8 except as otherwise specified. The Contracting Officer will serve as the verification inspector. One stud in every 100 and studs that do not show a full 360 degree weld flash, have been repaired by welding or whose reduction in length due to welding is less than normal shall be bent or torque tested as required by AWS D1.1, Subsection 7.8. If any of these studs fail two additional studs shall be bent or torque tested. If either of the two additional studs fail all of the studs represented by the tests shall be rejected. Studs that crack under testing in either the weld, base metal or shank shall be rejected and replaced by the Contractor at no additional cost.

PART 3 EXECUTION

3.1 INSTALLATION

All parts to be installed shall be thoroughly cleaned. Packing compounds, rust, dirt, grit and other foreign matter shall be removed. Holes and grooves for lubrication shall be cleaned. Enclosed chambers or passages shall be examined to make sure that they are free from damaging materials. Where units or items are shipped as assemblies they will be inspected prior to installation. Disassembly, cleaning and lubrication will not be required except where necessary to place the assembly in a clean and properly lubricated condition. Pipe wrenches, cold chisels or other tools likely to cause damage to the surfaces of rods, nuts or other parts shall not be used for assembling and tightening parts. Bolts and screws shall be tightened firmly and uniformly but care shall be taken not to overstress the threads. When a half nut is used for locking a full nut the half nut shall be placed first and followed by the full nut. Threads of all bolts except high strength bolts, nuts and screws shall be lubricated with an approved lubricant before assembly. Threads of corrosion-resisting steel bolts and nuts shall be coated with an approved antigalling compound. Driving and drifting bolts or keys will not be permitted.

3.1.1 Alignment and Setting

Each machinery or structural unit shall be accurately aligned by the use of steel shims or other approved methods so that no binding in any moving parts or distortion of any member occurs before it is fastened in place. The alignment of all parts with respect to each other shall be true within the respective tolerances required. Machines shall be set true to the elevations shown.

3.1.2 Blocking and Wedges

All blocking and wedges used during installation for the support of parts to be grouted in foundations shall be removed before final grouting unless otherwise directed. Blocking and wedges left in the foundations with approval shall be of steel or iron.

3.1.3 Foundations and Grouting

Concreting of subbases and frames and the final grouting under parts of machines shall be in accordance with the procedures as specified in Section 03301, CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS.

3.1.4 Special Workmanship Requirements

The fish transport water passages shall be inspected after installation. All welds and joints shall be smooth. Special grinding shall be required to remove all burrs, sharp- edges or protrusions into the fish water transportation passages, including the trashrack beams and columns. Caulking of wide joints with an approved sealant shall be required for all voids that exceed 3/16 inch in width. These smooth transitions shall be required at all steel surfaces that fish will pass by.

3.2 PROTECTION OF FINISHED WORK

3.2.1 Machined Surfaces

Machined surfaces shall be thoroughly cleaned of foreign matter. All finished surfaces shall be protected by suitable means. Unassembled pins and bolts shall be oiled and wrapped with moisture resistant paper or protected by other approved means. Finished surfaces of ferrous metals to

be in bolted contact shall be washed with an approved rust inhibitor and coated with an approved rust resisting compound for temporary protection during fabrication, shipping and storage periods. Finished surfaces of metals which shall be exposed after installation except corrosion resisting steel or nonferrous metals shall be as shown. Reference Section 09965, PAINTING: HYDRAULIC STRUCTURES.

3.2.2 Lubrication After Assembly

After assembly all lubricating systems shall be filled with the lubricant specified and additional lubricant shall be applied at intervals as required to maintain the equipment in satisfactory condition until acceptance of the work.

3.2.3 Aluminum

Aluminum that shall be in contact with grout or concrete shall be protected from galvanic or corrosive action by being given a coat of zinc-chromate primer and a coat of aluminum paint. Aluminum in contact with structural steel shall be protected against galvanic or corrosive action by being given a coat of zinc-chromate primer and a coat of aluminum paint. The zinc-chromate primer shall conform to SAE AMS 3110. The aluminum paint shall consist of a aluminum paste conforming to ASTM D 962, spar varnish conforming to SAE AMS 3132 and thinner compatible with the varnish. The aluminum paint shall be field mixed in proportion of 2 pounds of paste, not more than one gallon of spar varnish and not more than one pint of thinner.

3.3 TESTS

3.3.1 Workmanship

Workmanship shall be of the highest grade and in accordance with the best modern practices to conform with the specifications for the item of work being furnished.

3.3.2 Production Welding

Production welding shall conform to the requirements of AWS D1.1 or AWS D1.2 as applicable. Studs on which pre-production testing is to be performed shall be welded in the same general position as required on production items (flat, vertical, overhead or sloping). Test and production stud welding will be subjected to visual examination or inspection. If the reduction of the length of studs becomes less than normal as they are welded, welding shall be stopped immediately and not resumed until the cause has been corrected.

-- End of Section --

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SECTION 05120

STRUCTURAL STEEL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC ASD Manual	(1989) Manual of Steel Construction Allowable Stress Design
AISC ASD/LRFD Vol II	(1992) Manual of Steel Construction Vol II: Connections
AISC LRFD Vol II	(1995) Manual of Steel Construction Load & Resistance Factor Design, Vol II: Structural Members, Specifications & Codes
AISC Pub No. S303	(1992) Code of Standard Practice for Steel Buildings and Bridges

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 6/A 6M	(1998a) General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
ASTM A 36/A 36M	(1997ae1) Carbon Structural Steel
ASTM A 53	(1999) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 242/A 242M	(1998) High-Strength Low-Alloy Structural Steel
ASTM A 276	(2000)Stainless Steel Bars and Shapes
ASTM A 307	(1998) Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength
ASTM A 325	(1997) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 500	(1999) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 563	(1997) Carbon and Alloy Steel Nuts

ASTM A 572/A 572M	(1999) High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM A 588/A 588M	(1997) High-Strength Low-Alloy Structural Steel with 50 ksi (345 MPa) Minimum Yield Point to 4 in. (100 mm) Thick
ASTM F 436	(1993) Hardened Steel Washers
ASTM F 844	(1998) Washers, Steel, Plain (Flat), Unhardened for General Use

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(1998) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS D1.1	(1998) Structural Welding Code - Steel

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 20	(1991) Zinc-Rich Primers
SSPC Paint 22	(1991) Epoxy-Polyamide Paints

1.2 GENERAL REQUIREMENTS

Structural steel fabrication and erection shall be performed by an organization experienced in structural steel work of equivalent magnitude. The Contractor shall be responsible for correctness of detailing, fabrication, and for the correct fitting of structural members. Connections, for any part of the structure not shown on the contract drawings, shall be considered simple shear connections and shall be designed and detailed in accordance with pertinent provisions of AISC ASD Manual, and AISC LRFD Vol II. Substitution of sections or modification of connection details will not be accepted unless approved by the Contracting Officer. AISC ASD Manual and AISC ASD/LRFD Vol II shall govern the work. Welding shall be in accordance with AWS D1.1 and Section 05055, METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS POVISIONS, of the specifications.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Structural Steel System; G
Structural Connections; G

Shop and erection details including members (with their connections) not shown on the contract drawings. Welds shall be indicated by standard welding symbols in accordance with AWS A2.4.

SD-03 Product Data

Erection; G

Prior to erection, erection plan of the structural steel framing describing all necessary temporary supports, including the sequence of installation and removal.

Welding; G

WPS not prequalified.

WPS prequalified.

SD-04 Samples

High Strength Bolts and Nuts
Carbon Steel Bolts and Nuts
Nuts Dimensional Style
Washers

Random samples of bolts, nuts, and washers as delivered to the job site if requested, taken in the presence of the Contracting Officer and provided to the Contracting Officer for testing to establish compliance with specified requirements.

SD-07 Certificates

Mill Test Reports

Certified copies of mill test reports for structural steel, structural bolts, nuts, washers and other related structural steel items, including attesting that the structural steel furnished contains no less than 25 percent recycled scrap steel and meets the requirements specified, prior to the installation.

Welder Qualifications

Certified copies of welder qualifications test records showing qualification in accordance with AWS D1.1.

Welding Inspector

Welding Inspector qualifications.

Fabrication

A copy of the AISC certificate indicating that the fabrication plant meets the specified structural steelwork category.

1.4 STORAGE

Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

1.5 WELDING INSPECTOR

Welding Inspector qualifications shall be in accordance with AWS D1.1

PART 2 PRODUCTS

2.1 STRUCTURAL STEEL

2.1.1 Carbon Grade Steel

Carbon grade steel shall conform to ASTM A 36/A 36M.

2.1.2 High-Strength Low-Alloy Steel

High-strength low-alloy steel shall conform to ASTM A 572/A 572M, Grade 50 ksi. All steel shapes and plates used in the project shall be ASTM A 572/A 572M, Grade 50 ksi unless otherwise noted.

2.1.3 Corrosion-Resistant High-Strength Low-Alloy Steel

Corrosion-resistant steel shall conform to ASTM A 242/A 242M and ASTM A 588/A 588M.

2.2 STRUCTURAL TUBING

Structural tubing shall conform to ASTM A 500, Grade B, minimum yield strength 46 ksi.

2.3 STEEL PIPE

Steel pipe shall conform to ASTM A 53, Grade B, unless otherwise noted.

2.4 Stainless Steel

Stainless steel plates and shapes shall conform to ASTM A 276, Type 304, unless otherwise noted.

2.5 HIGH STRENGTH BOLTS AND NUTS

High strength bolts shall conform to ASTM A 325, Type 1 with carbon steel nuts conforming to ASTM A 563, Grade DH.

2.6 CARBON STEEL BOLTS AND NUTS

Carbon steel bolts shall conform to ASTM A 307, Grade A with carbon steel nuts conforming to ASTM A 563, Grade A.

2.7 NUTS DIMENSIONAL STYLE

Carbon steel nuts shall be Heavy Hex style when used with ASTM A 307 bolts and Heavy Hex style when used with ASTM A 325 bolts.

2.8 WASHERS

Plain washers shall conform to ASTM F 844. Other types, when required, shall conform to ASTM F 436.

2.9 PAINT

Paint shall conform to SSPC Paint 20 and SSPC Paint 22 as specified in Section 09965, PAINTING: HYDRAULIC STRUCTURES.

PART 3 EXECUTION

3.1 FABRICATION

Fabrication shall be in accordance with the applicable provisions of AISC ASD Manual. Fabrication and assembly shall be done in the shop to the greatest extent possible. Fabrication and mill tolerances shall generally follow ASTM A 6/A 6M, AISC Pub No. S303 and the AISC ASD Manual, unless noted otherwise.

All exposed steel other than stainless steel shall be painted as specified in Section 09965, PAINTING: HYDRAULIC STRUCTURES after fabrication, unless otherwise noted.

3.2 ERECTION

a: Erection of structural steel, shall be in accordance with the applicable provisions of AISC ASD Manual and AISC Pub No. S303.

3.2.1 Structural Connections

Anchor bolts and other connections between the structural steel and foundations shall be provided and shall be properly located and built into connecting work. Field welded structural connections shall be completed before load is applied.

3.2.2 Base Plates and Bearing Plates

Column base plates for columns and bearing plates for beams, girders, and similar members shall be provided. Base plates and bearing plates shall be provided with full bearing after the supported members have been plumbed and properly positioned, but prior to placing superimposed loads. Separate setting plates under column base plates will not be permitted. The area under the plate shall be damp-packed solidly with bedding mortar, except where nonshrink grout is indicated on the drawings. Bedding mortar and grout shall be as specified in Section 03301 CAST-IN-PLACE STRUCTURAL CONCRETE FOR CIVIL WORKS.

3.2.3 Field Priming

After erection, the field bolt heads and nuts, field welds, and any abrasions in the shop coat shall be cleaned and primed with paint of the same quality as that used for the shop coat. Galvanized steel surfaces with abrasions shall be cleaned and primed with zinc-rich paint (SSPC Paint 20).

3.3 WELDING

The contractor shall develop and submit the Welding Procedure Specifications (WPS) for all welding, including welding done using prequalified procedures. Prequalified procedures may be submitted for information only; however, procedures that are not prequalified shall be submitted for approval.

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SECTION 05500

MISCELLANEOUS METAL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ALUMINUM ASSOCIATION (AA)

AA DAF-45	(1997) Designation System for Aluminum Finishes

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A14.3	(1992) Ladders - Fixed - Safety Requirements

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 36/A 36M	(1997ae1) Carbon Structural Steel
ASTM A 53/A 53M	(1999b) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
ASTM A 123/A 123M	(1997ael) Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 392	(1996) Zinc-Coated Steel Chain-Link Fence Fabric
ASTM A 500	(1999) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
ASTM A 653/A 653M	(1999a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
ASTM A 786/A 786M	(2000b) Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates
ASTM A 924/A 924M	(1999) General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	(1998) Structural Welding Code - Steel

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-344	(Rev B) Lacquer, Clear Gloss, Exterior, Interior

NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (NAAMM)

NAAMM MBG 531	(1994) Metal Bar Grating Manual
NAAMM MBG 532	(1994) Heavy Duty Metal Bar Grating Manual

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Miscellaneous Metal Items; G.

Detail drawings indicating material thickness, type, grade, and class; dimensions; and construction details. Drawings shall include catalog cuts, erection details, manufacturer's descriptive data and installation instructions, and templates.

1.3 GENERAL REQUIREMENTS

The Contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Welding to or on structural steel shall be in accordance with AWS D1.1. Items specified to be galvanized, when practicable and not indicated otherwise, shall be hot-dip galvanized after fabrication. Galvanizing shall be in accordance with ASTM A 123/A 123M, ASTM A 653/A 653M, or ASTM A 924/A 924M, as applicable. Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with the material to which fastenings are applied. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included. Poor matching of holes for fasteners shall be cause for rejection. Fastenings shall be concealed where practicable. Thickness of metal and details of assembly and supports shall provide strength and stiffness. Joints exposed to the weather shall be formed to exclude water.

1.4 DISSIMILAR MATERIALS

Where dissimilar metals are in contact, or where aluminum is in contact with concrete, mortar, masonry, wet or pressure-treated wood, or absorptive materials subject to wetting, the surfaces shall be protected with a coat of bituminous paint or asphalt varnish.

1.5 WORKMANSHIP

Miscellaneous metalwork shall be well formed to shape and size, with sharp lines and angles and true curves. Drilling and punching shall produce clean true lines and surfaces. Welding shall be continuous along the entire area of contact except where tack welding is permitted. Exposed

connections of work in place shall not be tack welded. Exposed welds shall be ground smooth. Exposed surfaces of work in place shall have a smooth finish, and unless otherwise approved, exposed riveting shall be flush. Where tight fits are required, joints shall be milled. Corner joints shall be coped or mitered, well formed, and in true alignment. Work shall be accurately set to established lines and elevations and securely fastened in place. Installation shall be in accordance with manufacturer's installation instructions and approved drawings, cuts, and details.

1.6 ANCHORAGE

Anchorage shall be provided where necessary for fastening miscellaneous metal items securely in place. Anchorage not otherwise specified or indicated shall include slotted inserts made to engage with the anchors, expansion shields, and power-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; and lag bolts and screws for wood.

1.7 ALUMINUM FINISHES

Unless otherwise specified, aluminum items shall have anodized finish. The thickness of the coating shall be not less than that specified for protective and decorative type finishes for items used in interior locations or architectural Class I type finish for items used in exterior locations in AA DAF-45. Items to be anodized shall receive a polished satin finish. Aluminum surfaces to be in contact with plaster or concrete during construction shall be protected with a field coat conforming to CID A-A-344.

1.8 SHOP PAINTING

Surfaces of ferrous metal except galvanized surfaces, shall be cleaned and shop coated with the manufacturer's standard protective coating unless otherwise specified. Surfaces of items to be embedded in concrete shall not be painted. Items to be finish painted shall be prepared according to manufacturer's recommendations or as specified.

PART 2 PRODUCTS

2.1 ACCESS DOORS AND PANELS

Doors and panels shall be flush type unless otherwise indicated. Frames for access doors shall be fabricated of not lighter than 16 gauge steel with welded joints and finished with anchorage for securing into construction. Access doors shall be a minimum of 14 by 20 inches and of not lighter than 14 gauge steel, with stiffened edges, complete with attachments. Access doors shall be hinged to frame and provided with a flush face, screw driver operated latch. Exposed metal surfaces shall have a baked enamel finish color light gray.

2.2 FLOOR GRATINGS AND FRAMES

Carbon steel grating shall be designed in accordance with NAAMM MBG 531 or NAAMM MBG 532 to meet the indicated load requirements. Edges shall be banded with bars 1/4 inch less in height than bearing bars for grating sizes above 3/4 inch. Banding bars shall be flush with the top of bearing grating. Frames shall be of welded steel construction finished to match the grating. Floor gratings and frames shall be galvanized after fabrication.

2.3 FLOOR PLATES

Floor plates shall be carbon steel conforming to ASTM A 36/A 36M and ASTM A 786/A 786M, pattern 3 or 4, unless otherwise noted.

2.4 HANDRAILS

Handrails shall be designed to resist a concentrated load of 200 pounds in any direction at any point of the top of the rail or 20 pounds per foot applied horizontally to top of the rail, whichever is more severe.

2.4.1 Steel Handrails, Including Carbon Steel Inserts

Steel handrails, including inserts in concrete, shall be steel pipe conforming to ASTM A 53/A 53M or structural tubing conforming to ASTM A 500, Grade B of equivalent strength. Steel railings shall be the size shown. Railings shall be hot-dip galvanized. Pipe collars shall be hot-dip galvanized steel.

a. Joint posts, rail, and corners shall be fabricated by one of the following methods:

   (1) Flush type rail fittings of commercial standard, welded and ground smooth with railing splice locks secured with 3/8 inch hexagonal recessed-head setscrews.

   (2) Mitered and welded joints by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints, and grinding smooth. Railing splices shall be butted and reinforced by a tight fitting interior sleeve not less than 6 inches long.

   (3) Railings may be bent at corners in lieu of jointing, provided bends are made in suitable jigs and the pipe is not crushed.

b. Removable sections, toe-boards, and brackets shall be provided as indicated.

2.5 CHAIN LINK FENCE FABRIC

Chain link fence fabric shall conform to the requirements of ASTM A 392, 2-inch mesh, and 9-gauge galvanized steel wire. Zinc coating shall be Class 2.

2.6 LADDERS

Ladders shall be galvanized steel or aluminum, fixed rail type in accordance with ANSI A14.3.

2.7 MISCELLANEOUS

Miscellaneous plates and shapes for items that do not form a part of the structural steel framework, such as lintels, sill angles, miscellaneous mountings, and frames, shall be provided to complete the work.

2.8 STEEL DOOR FRAMES

Steel door frames built from structural shapes shall be neatly mitered and

securely welded at the corners with all welds ground smooth. Jambs shall be provided with 2 by 1/4 by 12 inch bent, adjustable metal anchors spaced not over 2 feet 6 inches on centers. Provision shall be made to stiffen the top member for all spans over 3 feet. Continuous door stops shall be made of 1-1/2 by 5/8 inch bars.

2.9 TRENCH COVERS, FRAMES, AND LINERS

Trench covers shall be designed to meet the indicated load requirements. Trench frames and anchors shall be all welded steel construction designed to match cover. Covers shall be secured to frame and shall be raised-tread, or steel floor plate. Grating opening widths shall not exceed 1 inch. Trench liners shall be cast iron with integral frame for cover.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

All items shall be installed at the locations shown and according to the manufacturer's recommendations. Items listed below require additional procedures as specified.

3.2 REMOVABLE ACCESS PANELS

A removable access panel not less than 12 by 12 inches shall be installed directly below each valve, flow indicator, damper, or air splitter that is located above the ceiling, other than an acoustical ceiling, and that would otherwise not be accessible.

3.3 ATTACHMENT OF HANDRAILS

Toeboards and brackets shall be installed where indicated. Splices, where required, shall be made at expansion joints. Removable sections shall be installed as indicated.

3.3.1 Installation of Steel Handrails and Guardrails

Installation shall be as shown.

3.4 DOOR FRAMES

Door frames shall be secured to the floor slab by means of angle clips and expansion bolts. Continuous door stops shall be welded to the frame or tap screwed with countersunk screws at no more than 18 inchcenters, assuring in either case full contact with the frame. Any necessary reinforcements shall be made and the frames shall be drilled and tapped as required for hardware.

3.5 TRENCH FRAMES AND COVERS

Trench frames and covers shall finish flush with the floor.

-- End of Section --

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SECTION 05616

STOPLOGS AND LIFTING BEAM

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 153/A 153M	(1995) Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 276	(2000) Stainless Steel Bars and Shapes
ASTM A 307	(1998) Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength
ASTM A 325	(1997) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 572/A 572M	(1999) High-Strength Low-Alloy Columbium-Vanadium Structural Steel
ASTM B 505/B 505M	(1996) Copper-Base Alloy Continuous Castings
ASTM D 395	(1989; R 1994) Rubber Property - Compression Set
ASTM D 412	(1998a) Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
ASTM D 413	(1982; R 1993) Rubber Property - Adhesion to Flexible Substrate
ASTM D 471	(1995) Rubber Property - Effect of Liquids
ASTM D 572	(1988; R 1994) Rubber - Deterioration by Heat and Oxygen
ASTM D 2240	(1995) Rubber Property - Durometer Hardness

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be

submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Detail Drawings; G

Detail drawings shall be submitted as specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

Detail drawings shall be submitted for each stoplog and for the lifting beam. The detail drawings for the lifting beam shall fully detail the mechanical linkages required for smooth operation of the lifting beam.

SD-03 Product Data

Welding; G

Schedules of welding procedures for structural steel shall be submitted as specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

Materials

Materials orders, materials lists and materials shipping bills shall be submitted as specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

Materials Disposition Records

A system of identification which shows the disposition of specific lots of approved materials and fabricated items in the work shall be established and submitted before completion of the contract.

SD-06 Test Reports

Tests, Inspections, and Verifications

Certified test reports for material tests shall be submitted with all materials delivered to the site.

1.3 QUALIFICATION OF WELDERS AND WELDING OPERATORS

Qualification of welders and welding operators shall conform to the requirements of Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

1.4 DELIVERY, STORAGE AND HANDLING

Delivery, handling and storage of materials and fabricated items shall conform to the requirements specified herein and in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS. Materials and equipment delivered to the site by the Contracting Officer, including the Government provided lifting beam,shall be unloaded by the Contractor. The Contractor shall verify the condition and quantity of the items delivered by the Contracting Officer and acknowledge receipt and condition thereof in writing to the Contracting Officer. If delivered items are damaged or a shortage is determined, the Contractor shall notify the Contracting Officer

of such in writing within 24 hours after delivery.

1.4.1 Rubber Seals

Rubber seals shall be stored in a place which permits free circulation of air, maintains a temperature of 70 degrees F or less, and prevents the rubber from being exposed to the direct rays of the sun. Rubber seals shall be kept free of oils, grease, and other materials which would deteriorate the rubber. Rubber seals shall not be distorted during handling.

PART 2 PRODUCTS

2.1 MATERIALS

Materials orders, materials lists and materials shipping bills shall conform to the requirements of Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

2.1.1 Metals

Structural steel and other metal materials sections and standard articles shall be as shown and as specified herein and in Section 05120 Structural Steel

2.1.1.1 Structural Steel

Structural steel shall conform to ASTM A 572/A 572M, Grade 50 ksi unless otherwise noted.

2.1.1.2 Bronze

All Bronze shall confrom to ASTM B 505/B 505M, Copper Alloy UNS C93200.

2.1.2 Rubber Seals

Rubber seals shall be fluorocarbon (Teflon) clad rubber seals of the mold type only, shall be compounded of natural rubber, synthetic polyisoprene, or a blend of both, and shall contain reinforcing carbon black, zinc oxide, accelerators, antioxidants, vulcanizing agents, and plasticizers. However, horizontal seals need not be fluorocarbon (Teflon) clad. Physical characteristics of the seals shall meet the following requirements:

PHYSICAL TEST	TEST VALUE	TEST METHOD SPECIFICATION
Tensile Strength	2,500 psi (min.)	ASTM D 412
Elongation at Break	450% (min.)	ASTM D 412
300% Modulus	900 psi (min.)	ASTM D 412
Durometer Hardness (Shore Type A)	60 to 70	ASTM D 2240
*Water Absorption	5% by weight (max.)	ASTM D 471
Compression Set	30% (max.)	ASTM D 395

PHYSICAL TEST	TEST VALUE	TEST METHOD SPECIFICATION
Tensile Strength (after aging 48 hrs)	803500f tensile strength (min.)	ASTM D 572

* The "Water Absorption" test shall be performed with distilled water. The washed specimen shall be blotted dry with filter paper or other absorbent material and suspended by means of small glass rods in the oven at a temperature of 70 degrees plus/minus 2 degrees C for 22 plus/minus 1/4 hour. The specimen shall be removed, allowed to cool to room temperature in air, and weighed. The weight shall be recorded to the nearest 1 mg as W1 (W1 is defined in ASTM D 471). The immersion temperature shall be 70 degrees plus/minus 1 degree C and the duration of immersion shall be 166 hours.

2.1.2.1 Fabrication

Vertical rubber seals shall have a fluorocarbon film vulcanized and bonded to the sealing surface of the bulb. Horizontal seals need not have the fluorocarbon film. The film shall be 0.060 inch thick Huntington Abrasion Resistant Fluorocarbon Film No. 4508, or equal, and shall have the following physical properties:

Tensile strength ..... 2,000 psi (min.)

Elongation ..... 250 percent (min.)

The outside surface of the bonded film shall be flush with the surface of the rubber seal and shall be free of adhering or bonded rubber. Strips and corner seals shall be molded in lengths suitable for obtaining the finish lengths shown and with sufficient excess length to provide test specimens for testing the adequacy of the adhesion bond between the film and bulb of the seal. At one end of each strip or corner seal to be tested, the fluorocarbon film shall be masked during bonding to prevent a bond for a length sufficient to hold the film securely during testing.

2.2 MANUFACTURED UNITS

2.2.1 Bolts, Nuts and Washers

High-strength bolts, nuts, and washers shall conform to ASTM A 325, Type 1, hot-dip galvanized. Bolts, nuts, studs, stud bolts and bolting materials other than high-strength shall conform to ASTM A 307, Grade A, hot-dip galvanized. Bolts 1/2 inch and larger shall have heavy hexagon heads. The finished shank of bolts shall be long enough to provide full bearing. Washers for use with bolts shall conform to the requirements specified in the applicable specification for bolts.

2.2.2 Screws

Screws shall be of the type indicated.

2.2.3 Lifting Beam for Stoplogs

The lifting beam for the stoplogs shall be fabricated by the Contractor in the same fabrication shop used to fabricate the stoplogs prior to being needed for lifting and placing the stoplogs.

2.2.3.1 Bearings

All bearing-to-housing press fit shall be in accordance with Bearing Manufacturer's recommendations.

2.2.3.2 Hardware

All hardware specified as galvanized shall conform to ASTM A 153/A 153M.

2.3 FABRICATION

2.3.1 Detail Drawings

Detail drawings of stoplogs and lifting beam and appurtenant shop fabricated items, including fabrication drawings, shop assembly drawings, delivery drawings, and field installation drawings, shall conform to the requirements specified and in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

2.3.1.1 Fabrication Drawings

Fabrication drawings shall show complete details of materials, tolerances, connections, and proposed welding sequences which clearly differentiate shop welds and field welds.

2.3.1.2 Shop Assembly Drawings

Shop assembly drawings shall provide details for connecting the adjoining fabricated components in the shop to assure satisfactory field installation.

2.3.1.3 Delivery Drawings

Delivery drawings shall provide descriptions of methods of delivering components to the site, including details for supporting fabricated components during shipping to prevent distortion or other damages.

2.3.1.4 Field Installation Drawings

Field installation drawings shall provide a detailed description of the field installation procedures. The description shall include the location and method of support of installation and handling equipment; provisions to be taken to protect concrete and other work during installation; method of maintaining components in correct alignment; and methods for installing appurtenant items.

2.3.2 Structural Fabrication

Structural fabrication shall conform to the requirements specified and in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

2.3.3 Welding

Welding shall conform to the requirements specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

2.3.4 Bolted Connections

Bolted connections shall conform to the requirements specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

2.3.5 Machine Work

Machine work shall conform to the requirements specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

2.3.6 Miscellaneous Provisions

Miscellaneous provisions for fabrication shall conform to the requirements specified and in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS. Zinc coating of hardware items shall conform to ASTM A 153/A 153M.

2.3.7 Fabrications

2.3.7.1 Stoplogs

Stoplogs shall be fabricated of structural steel conforming to ASTM A 572/A 572M, Grade 50 ksi, unless otherwise noted.

2.3.7.2 Stoplog Guides

Stoplog guides shall be fabricated of stainless steel conforming to ASTM A 276, Type 304, unless otherwise noted.

2.3.7.3 Miscellaneous Embedded Metals

Corner protection angles, frames, base plates, and other embedded metal items required for complete installation shall conform to the details shown, and shall conform to ASTM A 276, Type 304 stainless steel, unless otherwise noted.

2.3.8 Seal Assemblies

Seal assemblies shall consist of rubber seals, stainless steel retainer and spacer bars, and fasteners. Rubber seals shall be continuous over the full length. Seals shall be accurately fitted and drilled for proper installation. Bolt holes shall be drilled in the rubber seals by using prepared templates or the retainer bars as templates. Splices in seals shall be fully molded, develop a minimum tensile strength of 50 percent of the unspliced seal, and occur only at locations shown. All vulcanizing of splices shall be done in the shop. The vulcanized splices between molded corners and straight lengths shall be located as close to the corners as practicable. Splices shall be on a 45 degree bevel related to the "thickness" of the seal. The surfaces of finished splices shall be smooth and free of irregularities. Stainless steel retainer bars shall be field-spliced only where shown and machine-finished after splicing.

2.4 TESTS, INSPECTIONS, AND VERIFICATIONS

Tests, inspections, and verifications for materials shall conform to the requirements specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS. The lifting beam shall be tested in the shop with a stoplog to ensure the lifting mechanism and all linkages work correctly prior to delivery to the site.

2.4.1 Testing of Rubber Seals

The fluorocarbon film of rubber seals shall be tested for adhesion bond in

accordance with ASTM D 413 using either the machine method or the deadweight method. A 1 inch long piece of seal shall be cut from the end of the seal which has been masked and subjected to tension at an angle approximately 90 degrees to the rubber surface. There shall be no separation between the fluorocarbon film and the rubber when subjected to the following loads:

THICKNESS OF FLUOROCARBON FILM	MACHINE METHOD AT 2 INCHES PER MINUTE	DEADWEIGHT METHOD
0.060 inch	30 pounds per inch width	30 pounds per inch width

Failure of any specimen to meet the requirements of the test used will be cause for rejection of the piece from which the test specimen was taken.

2.4.2 Testing of Lifting Beam Mechanism

The lifting beam mechanism shall be tested in the fabrication yard prior to shipping to the job site. The test shall consist of the lifting beam mechanism fully engaging and releasing a stop log.

PART 3 EXECUTION

3.1 INSTALLATION

Installation shall conform to the requirements specified and in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

3.1.1 Embedded Metals

Corner protection angles, frames, base plates, and other embedded metal items required for complete installation shall be accurately installed to the alignment and grade required to ensure accurate fitting and matching of components. Embedded metals shall be given a primer coat of the required paint on all surfaces prior to installation in concrete forms. Anchors for embedded metals shall be installed as shown. Items requiring two concrete pours for installation shall be attached to the embedded anchors after the initial pour, adjusted to the proper alignment, and concreted in place with the second pour.

3.1.2 Seal Assemblies

Rubber seal assemblies shall be installed after the embedded metal components have been concreted in place and the gate installation, including painting, completed. Rubber seals shall be fastened securely to metal retainers. Before operating the gate(s), a suitable lubricant shall be applied to the rubber seal rubbing plates to protect the rubber.

3.1.3 Painting

3.1.3.1 Painting Stoplogs

Exposed parts of stoplogs and appurtenances except machined surfaces, corrosion-resistant surfaces, surfaces of anchorages embedded in concrete, rubber seals, and other specified surfaces shall be painted as specified in Section 09965 PAINTING: HYDRAULIC STRUCTURES.

3.1.3.2 Painting Lifting Beam

All steel surfaces shall be painted except galvanized corrosion resistant steel and machined surfaces. All painted surfaces shall be cleaned and painted in accordance with specification 09965 PAINTING: HYDRAULIC STRUCTURES.

3.1.4 Lubrications

All items of the Lifting Beam to be lubricated shall be lubricated with Molylube Alloy 777 waterproof grease.

3.2 PROTECTION OF FINISHED WORK

Protection of finished work shall conform to the requirements specified in Section 05055 METALWORK FABRICATION, MACHINE WORK, MISCELLANEOUS PROVISIONS.

3.3 ACCEPTANCE TRIAL OPERATION

After completion of installation, the Contracting Officer will examine the stoplog installation for final acceptance. The individual components of the stoplog installation will be examined first to determine whether or not the workmanship conforms to the specification requirements. The Contractor will be required to place the stoplogs in the guides with the lifting beam a sufficient number of times to demonstrate that the stoplogs fit properly, seat uniformly and the lifting beam mechanism operates smoothly. Required repairs or replacements to correct defects, shall be made at no cost to the Government. The trial operation shall be repeated after defects are corrected.

-- End of Section --

SECTION 09965

PAINTING: HYDRAULIC STRUCTURES

PART 1 GENERAL

This specification covers the requirements for furnishing all plant, labor, equipment, and materials, except materials specified to be furnished by the Government, and performing all operations in connection with the preparation of surfaces and the application of paint to exposed steel, other than stainless steel and other surfaces specifically excluded from painting. This work includes, but is not limited to, the trashrack structures, the stoplog structures, and the lifting beam in accordance with these specifications and applicable drawings.

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 153	(1986; R 1996el) Specific Gravity of Pigments
ASTM D 281	(1995) Oil Absorption of Pigments by Spatula Rub-Out
ASTM D 561	(1982; R 1999) Carbon Black Pigment for Paint
ASTM D 740	(1994; R 1997) Methyl Ethyl Ketone
ASTM D 841	(1997) Nitration Grade Toluene
ASTM D 1045	(1995) Sampling and Testing Plasticizers Used in Plastics
ASTM D 1152	(1989; R 1997) Methanol (Methyl Alcohol)
ASTM D 1153	(1994; R 1997) Methyl Isobutyl Ketone
ASTM D 1186	(1993) Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base
ASTM D 1200	(1994; R 1999) Viscosity by Ford Viscosity Cup
ASTM D 1210	(1996) Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage
ASTM D 2917	(1991; R 1998) Methyl Isoamyl Ketone
ASTM D 3721	(1983; R 1999) Synthetic Red Iron Oxide

	Pigment
ASTM D 4417	(1993; R 1999) Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM E 1347	(1997) Color and Color-Difference Measurement by Tristimulus (Filter) Colorimetry

MUNSELL BOOK OF COLOR: MACBETH DIVISION (MD)

MD-40219	(Matte Edition) Munsell Book of Color: Matte Finish Collection

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

40 CFR 261	Identification and Listing of Hazardous Waste
40 CFR 262	Standards Applicable to Generators of Hazardous Waste
40 CFR 262.22	Number of Copies
40 CFR 263	Standards Applicable to Transporters of Hazardous Waste
49 CFR 171	Hazardous Materials Regulations

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC SP 1	(1982) Solvent Cleaning
SSPC SP 5	(1994) White Metal Blast Cleaning

1.2 WORK PERFORMANCE

Work shall comply with all applicable federal, state and local requirements for occupational and environmental safety and health. Matters of interpretation of the standards shall be submitted to the Contracting Officer for resolution before starting work. Where the regulations conflict, the most stringent requirements shall apply.

1.2.1 License and Permits

Copies of licenses and permits as required by applicable Federal, State and local regulations shall be obtained at least 20 days before the start of the project.

1.2.2 Disposal Documentation

Written evidence shall be provided that the hazardous waste treatment, storage, or disposal facility is approved for disposal by the EPA and state or local regulatory agencies. One copy shall be submitted of the completed manifest; signed, and dated by the initial transporter in accordance with 40 CFR 262.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Waste Classification, Handling, and Disposal Plan; G

The Contractor is responsible for assuring the proper disposal of all hazardous and nonhazardous waste generated during the project. Therefore, the Contractor shall develop a Waste Classification, Handling, and Disposal Plan for the job site in accordance with the requirements of 40 CFR 261 and 40 CFR 262. In addition, the following provisions shall be included:

a. Hazardous waste shall be placed in closed containers and shall be shielded adequately to prevent dispersion of the waste by wind or water. Any evidence of improper storage shall be cause for immediate shutdown of the project until corrective action is taken.

b. Nonhazardous waste shall be stored in closed containers separate from hazardous waste storage areas.

c. All hazardous waste shall be transported by a licensed transporter in accordance with 40 CFR 263 and 49 CFR 171, Subchapter C.

d. All nonhazardous waste shall be transported in accordance with local regulations regarding waste transportation.

e. In addition to the number of manifest copies required by 40 CFR 262.22, one copy of each manifest will be supplied to the Contracting Officer prior to transportation.

f. Landfill name, address, and telephone number. A copy of the landfill's state and locally issued license, and a signed agreement that the landfill will accept the hazardous wastes.

g. Detailed delivery tickets prepared, signed and dated by an agent of the landfill, certifying the amount of hazardous waste materials delivered to the landfill, within 3 days after delivery to the landfill.

SD-04 Samples

Special Paint Formulas; G

Samples of special paint formulas, listed in paragraph PAINT FORMULATION, shall be submitted. For all vinyl-type paints submitted for laboratory testing, separate 1/2-pint samples of ingredient raw materials shall be furnished. The ingredient samples shall be clearly identified by commercial name, trade designation, manufacturer, batch or lot number, and such other data as may be required.

Specification and Proprietary Paints; G

Federal, Military, and Steel Structures Painting Council specification paints are those formulated to meet Federal, military, and industry specifications. When the required quantity of any type is 50 gallons or less, the Contractor can submit:

a. A certified test report showing the results of required tests made on the material and a statement that it meets all of the specification requirements.

b. A certified test report showing the results of required tests made on a previous batch of paint produced by the same firm using the same ingredients and formulation except for minor differences necessitated by a color change and a statement that the previous batch met all of the specification requirements. A report of tests on the proposed batch showing the following properties applicable to the material specifications shall be furnished: color, gloss, drying time, opacity, viscosity, weight per gallon, and fineness of grind.

c. A proprietary paint - When the required quantity of a particular type or color of a paint is 10 gallons or less, a proprietary, name-brand, shelf item paint of the same type and with similar properties to the material specified may be proposed without sampling. Proprietary paints are any which do not follow the formulas in paragraph PAINT FORMULATION or the complete specification requirements of Federal, Military, and Steel Structures Painting Council specifications. To receive consideration, a statement from the supplier that the paint is appropriate as to type, color, and gloss and is a premium grade of paint shall be furnished.

Thinners; G

Samples shall be submitted of the thinners, which are those solvents used to reduce the viscosity of the paint.

SD-06 Test Reports

Inspections and Operations; G

The Contractor shall document and submit records of inspections and operations performed. Submittals shall be made on a timely basis and shall include but are not limited to:

a. Inspections performed, including the area of the structure involved and the results of the inspection.

b. Surface preparation operations performed, including the area of the structure involved, the mode of preparation, the kinds of solvent, abrasive, or power tools employed, and whether contract requirements were met.

c. Thinning operations performed, including thinners used, batch numbers, and thinner/paint volume ratios.

d. Application operations performed, including the area of the

structure involved, mode of application employed, ambient temperature, substrate temperature, dew point, relative humidity, type of paint with batch numbers, elapsed time between surface preparation and application, elapsed time for recoat, condition of underlying coat, number of coats applied, and if specified, measured dry film thickness or spreading rate of each new coating.

1.4 PAINT APPLICATION QUALITY CONTROL

The Contractor shall submit for review and acceptance the credentials of the Contractor's painting (including shop, field, touch-up and repainting) quality control personnel. Quality control personnel shall operate under the direct charge of a National Association of Corrosion Engineers (NACE) certified Level 3 Paint Inspector. All work specified herein shall be conducted only when the NACE certified Level 3 Paint Inspector is on the job site full time. The NACE Inspector shall be a third party, independent of the Contractor. All costs associated with the NACE Inspector shall be paid by the Contractor including repair and rework time. The painting contractor shall be QP-1 and QP-2 certified. The painting supplier shall have a material technical representative on site during painting.

1.5 SAMPLING AND TESTING

The Contractor shall allow at least 30 days for sampling and testing. Sampling may be at the job site or source of supply. The Contractor shall notify the Contracting Officer when the paint is available for sampling. Sampling of each batch shall be witnessed by the Contracting Officer unless otherwise specified or directed. A 1-quart sample of paint and thinner shall be submitted for each batch proposed for use. The sample shall be labeled to indicate formula or specification number and nomenclature, batch number, batch quantity, color, date made, and applicable project contract number. Testing and retesting of rejected material will be performed by the Contractor.

1.6 PAINT PACKAGING, DELIVERY AND STORAGE

Paints shall be processed and packaged to ensure that within a period of one year from date of manufacture, they will not gel, liver, or thicken deleteriously, or form gas in the closed container. Paints, unless otherwise specified or permitted, shall be packaged in standard containers not larger than 5 gallons, with removable friction or lug-type covers. Containers for vinyl-type paints shall be lined with a coating resistant to solvents in the formulations and capable of effectively isolating the paint from contact with the metal container. Each container of paint or separately packaged component thereof shall be labeled to indicate the purchaser's order number, date of manufacture, manufacturer's batch number, quantity, color, component identification and designated name, and formula or specification number of the paint together with special labeling instructions, when specified. Paint shall be delivered to the job in unbroken containers. Paints that can be harmed by exposure to cold weather shall be stored in ventilated, heated shelters. All paints shall be stored under cover from the elements and in locations free from sparks and flames.

PART 2 PRODUCTS

2.1 SPECIAL PAINT FORMULA

Special paints shall have the composition as indicated in the formulas

listed herein. Where so specified, certain components of a paint formulation shall be packaged in separate containers for mixing on the job. If not specified or otherwise prescribed, the color shall be that naturally obtained from the required pigmentation.

2.2 PAINT FORMULATIONS

Special paint formula shall comply with the following:

2.2.1 Formula V-766e, Vinyl-Type White (or Gray) Paint

INGREDIENTS	PERCENT BY WEIGHT
Vinyl Resin, Type 3	5.6
Vinyl Resin, Type 4	11.6
Titanium Dioxide and (for Gray) Carbon Black	13.0
Diisodecyl Phthalate	2.9
Methyl Isobutyl Ketone	32.0
Toluene	34.7
Ortho-Phosphoric Acid	0.2
	100.0

a. The dispersion of pigment shall be accomplished by means of pebble mills or other approved methods to produce a fineness of grind (ASTM D 1210) of not less than 7 on the Hegman scale. Grinding in steel-lined or steel-ball mills will not be permitted. No grinding aids, antisettling agents, or any other materials except those shown in the formula will be permitted. The paint shall show the proper proportions of specified materials when analyzed by chromatographic and/or spectrophotometric methods. The ortho-phosphoric acid shall be measured accurately and diluted with at least four parts of ketone to one part of acid and it shall be slowly incorporated into the finished paint with constant and thorough agitation.

b. The viscosity of the paint shall be between 60 and 90 seconds using ASTM D 1200 and a No. 4 Ford cup.

c. The white and gray paints shall be furnished in the volume ratio designated by the purchaser. The gray paint shall contain no pigments other than those specified. Enough carbon black shall be included to produce a dry paint film having a reflectance of 20-24 (ASTM E 1347). The resulting gray color will approximate Munsell color 2.5PB 5/2 identified in MD-40219.

2.2.2 Formula VZ-108d, Vinyl-Type Zinc-Rich Primer

INGREDIENTS	PERCENT BY WEIGHT	POUNDS	GALLONS
	COMPONENT A		
Vinyl Resin, Type 3	16.6	109.2	9.65
Methyl Isobutyl Ketone	80.6	528.9	79.30
Suspending Agent E	0.7	4.6	0.28
Suspending Agent F	0.4	2.7	0.19
Methanol	0.5	3.3	0.50
Synthetic Iron Oxide (Red)	1.2	7.9	0.19
	100.0	656.6	90.11
	COMPONENT B		
Silane B	100.0	4.1	0.47
	COMPONENT C		
Zinc Dust	100.0	550.0	9.42
			100.00
			(mixed paint)

a. The iron oxide and suspending agents shall be dispersed into the vehicle (Component A) to a fineness of grind of not less than 4 on the Hegman scale (ASTM D 1210). Grinding in steel-lined containers or using steel-grinding media shall not be permitted. The sole purpose of the iron oxide pigment is to produce a contrasting color. A red iron oxide-type 3 vinyl resin vehicle paste may be used in place of dry iron oxide provided compensating adjustments are made in the additions of Type 3 resin and methyl isobutyl ketone. The finished product with zinc dust added shall produce a paint which has a red tone upon drying and a reflectance of not more than 16 (ASTM E 1347).

b. VZ-108d paint shall be supplied as a kit. Each kit shall consist of 4.5 gallons (33.1 pounds) of Component A in a 5-gallon lug closure type pail, 27.5 pounds of zinc dust (Component C) packaged in a 1-gallon plastic pail, and 3 fluid ounces of silane (Component B) packaged in a glass bottle of suitable size having a polyethylene lined cap. The bottle of silane shall be placed on the zinc dust in the gallon pail. In addition to standard labeling requirements, each container of each component shall be properly identified as to component type and each container label of Component A shall carry the following: MIXING AND APPLICATION INSTRUCTIONS: WARNING - THIS PAINT WILL NOT ADHERE TO STEEL SURFACES UNLESS COMPONENT B IS ADDED. Remove the 3 ounces of bottled Component B (silane) from the Component C (zinc dust) container and add to the base paint (Component A) with thorough stirring. Then sift the zinc dust into the base paint while it is being vigorously agitated with a power-driven stirrer and continue the stirring until the zinc dust has been dispersed. The mixed paint shall at some point be strained through a 30-60 mesh screen to prevent zinc dust slugs from reaching the spray gun nozzle. The paint shall be stirred continuously during application at a rate that will prevent settling. If spraying is interrupted for longer than 15 minutes, the entire length of the hose shall be whipped vigorously to redisperse the zinc. If the spraying is to be interrupted for more than 1 hour, the hose shall be emptied by blowing the paint back into the paint pot. Thinning will not normally be required when ambient temperatures are below about 80

degrees F, but when the ambient and steel temperatures are higher, methyl isoamyl ketone (MIAK) or methyl isobutyl ketone (MIBK) should be used. If paint is kept covered at all times, its pot life will be about 8 days.

2.3 INGREDIENTS FOR SPECIAL PAINT FORMULAS

The following ingredient materials and thinners apply only to those special paints whose formula is shown above in detail:

2.3.1 Pigments and Suspending Agents

2.3.1.1 Carbon Black

Carbon black shall conform to ASTM D 561, Type I or II.

2.3.1.2 Iron Oxide

Iron oxide, (Dry) synthetic (red), shall conform to ASTM D 3721. In addition, the pigment shall have a maximum oil absorption of 24 and a specific gravity of 4.90 to 5.20 when tested in accordance with ASTM D 281 and ASTM D 153, Method A, respectively. When the pigment is dispersed into specified vinyl paint formulation, the paint shall have colors approximating Munsell colors 7.5R 4/8 (light color) and 7.5R 3/6 (dark color) identified in MD-40219, and shall show no evidence of incompatibility or reaction between pigment and other components after 6 months storage.

2.3.1.3 Titanium Dioxide

Titanium dioxide in vinyl paint Formula V-766e shall be one of the following: Kronos 2160 or 2101, Kronos, Inc.; Ti-Pure 960, E.I. Dupont DeNemours and Co., Inc.; Unitane OR-650, Kermira, Inc.

2.3.1.4 Suspending Agent E

Suspending Agent E shall be a light cream colored finely divided powder having a specific gravity of 2 to 2.3. It shall be an organic derivative of magnesium aluminum silicate mineral capable of minimizing the tendency of zinc dust to settle hard without increasing the viscosity of the paint appreciably. Bentone 14, produced by Rheox, Inc., has these properties.

2.3.1.5 Suspending Agent F

Suspending Agent F shall be a light cream colored finely divided powder having a specific gravity of approximately 1.70. It shall be an organic derivative of a special montmorillonite. Bentone 27, produced by Rheox, Inc., has these properties.

2.3.2 Resins, Plasticizer, and Catalyst

2.3.2.1 Diisodecyl Phthalate

Diisodecyl Phthalate shall have a purity of not less than 99.0 percent, shall contain not more than 0.1 percent water, and shall have an acid number (ASTM D 1045) of not more than 0.10.

2.3.2.2 Vinyl Resin, Type 3

Vinyl resin, Type 3, shall be a vinyl chloride-acetate copolymer of medium

average molecular weight produced by a solution polymerization process and shall contain 85 to 88 percent vinyl chloride and 12 to 15 percent vinyl acetate by weight. The resin shall have film-forming properties and shall, in specified formulations, produce results equal to Vinylite resin VYHH, as manufactured by the Union Carbide Corporation.

2.3.2.3 Vinyl Resin, Type 4

Vinyl resin, Type 4, shall be a copolymer of the vinyl chloride-acetate type produced by a solution polymerization process, shall contain (by weight) 1 percent interpolymerized dibasic acid, 84 to 87 percent vinyl chloride, and 12 to 15 percent vinyl acetate. The resin shall have film-forming properties and shall, in the specified formulations, produce results equal to Vinylite resin VMCH, as manufactured by the Union Carbide Corporation.

2.3.2.4 Ortho-phosphoric Acid

Ortho-phosphoric acid shall be a chemically pure 85-percent grade.

2.3.3 Solvent and Thinners

2.3.3.1 Methanol

Methanol (methyl alcohol) shall conform to ASTM D 1152.

2.3.3.2 Methyl Ethyl Ketone

Methyl ethyl ketone (MEK) shall conform to ASTM D 740.

2.3.3.3 Methyl Isobutyl Ketone

Methyl isobutyl ketone (MIBK) shall conform to ASTM D 1153.

2.3.3.4 Methyl Isoamyl Ketone

Methyl isoamyl ketone (MIAK) shall conform to ASTM D 2917.

2.3.3.5 Toluene

Toluene shall conform to ASTM D 841.

2.4 TESTING

2.4.1 Chromatographic Analysis

Solvents in vinyl and paints and thinners shall be subject to analysis by programmed temperature gas chromatographic methods and/or spectrophotometric methods, employing the same techniques that give reproducible results on prepared control samples known to meet the specifications. If the solvent being analyzed is of the type consisting primarily of a single chemical compound or a mixture or two or more such solvents, interpretation of the test results shall take cognizance of the degree of purity of the individual solvents as commercially produced for the paint industry.

2.4.2 Vinyl Paints

Vinyl paints shall be subject to the following adhesion test. When V-766e

formulation is tested, 5 to 7 mils (dry) shall be spray applied to mild steel panels. The steel panels shall be essentially free of oil or other contaminants that may interfere with coating adhesion. The test panels shall be dry blast cleaned to a White Metal Blast Clean grade which shall be in compliance with SSPC SP 5. The surface shall have an angular profile of 2.0 to 2.5 mils as measured by ASTM D 4417, Method C. In all cases, the complete system shall have a total dry film thickness of 5 to 7 mils above the blast profile. After being air dried for 2 hours at room temperature, the panel shall be dried in a vertical position for 16 hours at 120 degrees F. After cooling for 1 hour, the panel shall be immersed in tap water at 85 to 90 degrees F for 48 to 72 hours. Immediately upon removal, the panel shall be dried with soft cloth and examined for adhesion as follows: With a pocket knife or other suitable instrument, two parallel cuts at least 1 inch long shall be made 1/4 to 3/8 inch apart through the paint film to the steel surface. A third cut shall be made perpendicular to and passing through the end of the first two. With the tip of the knife blade, the film shall be loosened from the panel from the third cut between the parallel cuts for a distance of 1/8 to 1/4 inch. With the panel being held horizontally, the free end of the paint film shall be grasped between the thumb and forefinger and pulled vertically in an attempt to remove the film as a strip from between the first two cuts. The strip of paint film shall be removed at a rate of approximately 1/10 inch per second and shall be maintained in a vertical position during the process of removal. The adhesion is acceptable if the strip of paint breaks when pulled or if the strip elongates a minimum of 10 percent during its removal. Paints not intended to be self-priming shall exhibit no delamination from the primer.

PART 3 EXECUTION

3.1 CLEANING AND PREPARATION OF SURFACES TO BE PAINTED

3.1.1 General Requirements

Surfaces to be painted shall be cleaned before applying paint or surface treatments. Deposits of grease or oil shall be removed in accordance with SSPC SP 1, prior to mechanical cleaning. Solvent cleaning shall be accomplished with mineral spirits or other low toxicity solvents having a flashpoint above 100 degrees F. Clean cloths and clean fluids shall be used to avoid leaving a thin film of greasy residue on the surfaces being cleaned. Items not to be prepared or coated shall be protected from damage by the surface preparation methods. Machinery shall be protected against entry of blast abrasive and dust into working parts. Cleaning and painting shall be so programmed that dust or other contaminants from the cleaning process do not fall on wet, newly painted surfaces, and surfaces not intended to be painted shall be suitably protected from the effects of cleaning and painting operations. Welding of, or in the vicinity of, previously painted surfaces shall be conducted in a manner to prevent weld spatter from striking the paint and to otherwise reduce coating damage to a minimum; paint damaged by welding operations shall be restored to original condition. Surfaces to be painted that will be inaccessible after construction, erection, or installation operations are completed shall be painted before they become inaccessible.

3.1.2 Ferrous Surfaces Subject to Severe Exposure

All surfaces required for painting shall be dry blast-cleaned to SSPC SP 5. The blast profile, unless otherwise specified, shall be 2.0 to 2.5 mils as measured by ASTM D 4417, Method C. Appropriate abrasive blast media shall be used to produce the desired surface profile and to give an angular

anchor tooth pattern. If recycled blast media is used, an appropriate particle size distribution shall be maintained so that the specified profile is consistently obtained. Steel shot or other abrasives that do not produce an angular profile shall not be used. Weld spatter not dislodged by blasting shall be removed with impact or grinding tools and the areas reblasted prior to painting. Surfaces shall be dry at the time of blasting. Within 8 hours after cleaning, prior to the deposition of any detectable moisture, contaminants, or corrosion, all ferrous surfaces blast cleaned to SSPC SP 5 shall be cleaned of dust and abrasive particles by brush, vacuum cleaner, and/or blown down with clean, dry, compressed air, and given the first coat of paint.

3.2 PAINT APPLICATION

3.2.1 General

The finished coating shall be free from holidays, pinholes, bubbles, runs, drops, ridges, waves, laps, excessive or unsightly brush marks, and variations in color, texture, and gloss. Application of initial or subsequent coatings shall not commence until the NACE certified Level 3 Paint Inspector has verified that atmospheric conditions and the surfaces to be coated are satisfactory. Each paint coat shall be applied in a manner that will produce an even, continuous film of uniform thickness. Edges, corners, crevices, seams, joints, welds, rivets, corrosion pits, and other surface irregularities shall receive special attention to ensure that they receive an adequate thickness of paint. Spray equipment shall be equipped with traps and separators and, where appropriate, mechanical agitators, pressure gauges, pressure regulators, and screens or filters. Air caps, nozzles, and needles shall be as recommended by the spray equipment manufacturer for the material being applied. Airless-type equipment shall not be used for the application of vinyl paints.

3.2.2 Mixing and Thinning

Paints shall be thoroughly mixed, strained where necessary, and kept at a uniform composition and consistency during application. Paste or dry-powder pigments specified to be added at the time of use shall, with the aid of powered stirrers, be incorporated into the vehicle or base paint in a manner that will produce a smooth, homogeneous mixture free of lumps and dry particles. Where necessary, in the opinion of the NACE certified Level 3 Paint Inspector, to suit conditions of the surface temperature, weather, and method of application, the paint may be thinned immediately prior to use. Thinning shall generally be limited to the addition of not more than 1 pint per gallon of the proper thinner. This general limitation shall not apply when more specific thinning instructions are provided. Paint that has been stored at low temperature, shall be brought up to at least 70 degrees F before being mixed and thinned, and its temperature in the spray tank or other working container shall not fall below 60 degrees F during the application. Paint that has deteriorated in any manner to a degree that it cannot be restored to essentially its original condition by customary field-mixing methods shall not be used and shall be removed from the project site. Paint and thinner that is more than 1 year old shall be resampled and resubmitted for testing to determine its suitability for application.

3.2.3 Atmospheric and Surface Conditions

Paint shall be applied only to surfaces that are above the dew point temperature and that are completely free of moisture as determined by sight

and touch. Paint shall not be applied to surfaces upon which there is detectable frost or ice. Except as otherwise specified, the temperature of the surfaces to be painted and of air in contact therewith shall be not less than 45 degrees F during paint application nor shall paint be applied if the surfaces can be expected to drop to 32 degrees F or lower before the film has dried to a reasonably firm condition. During periods of inclement weather, painting may be continued by enclosing the surfaces and applying artificial heat, provided the minimum temperatures and surface dryness requirements prescribed previously are maintained. Paint shall not be applied to surfaces heated by direct sunlight or other sources to temperatures that will cause detrimental blistering, pinholing, or porosity of the film.

3.2.4 Time Between Surface Preparation and Painting

Surfaces that have been cleaned and/or otherwise prepared for painting shall be primed as soon as practicable after such preparation has been completed but, in any event, prior to any deterioration of the prepared surface.

3.2.5 Method of Paint Application

Unless otherwise specified, paint shall be applied by brush or spray to ferrous and nonferrous metal surfaces. Special attention shall be directed toward ensuring adequate coverage of edges, corners, crevices, pits, rivets, bolts, welds, and similar surface irregularities. Other methods of application to metal surfaces shall be subject to the specific approval of the Contracting Officer.

Clipped corners, rat holes, mouse holes and drain holes shall be backbrushed to ensure a good paint job and good paint coverage thickness.

3.2.6 Coverage and Film Thickness

Film thickness or spreading rates shall be as specified hereinafter. Where no spreading rate is specified, the paint shall be applied at a rate normal for the type of material being used. In any event, the combined coats of a specified paint system shall completely hide base surface and the finish coats shall completely hide undercoats of dissimilar color.

3.2.6.1 Measurement on Ferrous Metal

Where dry film thickness requirements are specified for coatings on ferrous surfaces, measurements shall be made with one of the thickness gages listed below. They shall be calibrated and used in accordance with ASTM D 1186. They shall be calibrated using plastic shims with metal practically identical in composition and surface preparation to that being coated, and of substantially the same thickness (except that for measurements on metal thicker than 1/4 inch, the instrument may be calibrated on metal with a minimum thickness of 1/4 inch). Frequency of measurements shall be as recommended for field measurements by ASTM D 1186 and reported as the mean for each spot determination. The instruments shall be calibrated or calibration verified prior to, during, and after each use. Authorized thickness gages include:

a. Mikrotest, Elektro-Physik, Inc.

b. Inspector Gage, Elcometer Instruments, Ltd.

c. Positest, Defelsko Corporation.

d. Minitector, Elcometer Instruments, Ltd.

e. Positector 2000, Defelsko Corporation.

3.2.7 Progress of Painting Work

Where painting on any type of surface has commenced, the complete painting operation, including priming and finishing coats, on that portion of the work shall be completed as soon as practicable, without prolonged delays. Sufficient time shall elapse between successive coats to permit them to dry properly for recoating, and this period shall be modified as necessary to suit adverse weather conditions. Paint shall be considered dry for recoating when it feels firm, does not deform or feel sticky under moderate pressure of the finger, and the application of another coat of paint does not cause film irregularities such as lifting or loss of adhesion of the undercoat. All coats of all painted surfaces shall be unscarred and completely integral at the time of application of succeeding coats. At the time of application of each successive coat, undercoats shall be cleaned of dust, grease, overspray, or foreign matter by means of airblast, solvent cleaning, or other suitable means. Cement and mortar deposits on painted steel surfaces, not satisfactorily removed by ordinary cleaning methods, shall be brushoff blast cleaned and completely repainted as required. Undercoats of high gloss shall, if necessary for establishment of good adhesion, be scuff sanded, solvent wiped, or otherwise treated prior to application of a succeeding coat.

3.2.8 Recording of Painting Application

The Contractor shall provide instrumentation to continuously record, either directly or indirectly, dew point temperature, ambient temperature and surface temperature of the items to be painted. Records for the data listed above shall be submitted within 24 hours to the Contracting Officer for initial determination of compliance with respect to acceptance of the paint system. The Contractor's method of determining dew point shall be submitted to the Contracting Officer for approval. Temperature shall be recorded from the noted areas to portray the minimum and maximum ranges. The Contractor's quality control inspector shall sign and date the data sheet after the paint coating has been inspected for compliance with these specifications. The NACE certified Level 3 Paint Inspector shall then sign the data sheet once the adequacy of the paint coating has been assured. The Contractor will not be permitted to apply the next coating of paint until the signature of the NACE certified Level 3 Paint Inspector is affixed to the data sheet. The Contractor's quality control inspector shall utilize, as a minimum, the following tools for inspection:

a. A thickness gauge as specified in paragraph: Measurement on Ferrous Metal.

b. A pinhole tester equivalent to the pinhole tester manufactured by Zormco Electronics Corporation.

c. A magnifying glass.

The Contractor shall submit for approval the type of instruments to be utilized and coordinate their calibration with the Contracting Officer.

3.2.9 Contacting Surfaces

When riveted or ordinary bolted contact is to exist between surfaces of ferrous or other metal parts of substantially similar chemical composition, such surfaces will not be required to be painted, but any resulting crevices shall subsequently be filled or sealed with paint. Unless otherwise specified, corrosion-resisting metal surfaces, including cladding therewith, shall not be painted.

3.2.10 Drying Time Prior to Immersion

Minimum drying periods after final coat prior to immersion shall be at least 3 days, for vinyl-type paint systems. Minimum drying periods shall be increased twofold if the drying temperature is below 65 degrees F and/or if the immersion exposure involves considerable abrasion.

3.2.11 Protection of Painted Surfaces

Where shelter and/or heat are provided for painted surfaces during inclement weather, such protective measures shall be maintained until the paint film has dried and discontinuance of the measures is authorized. Items that have been painted shall not be handled, worked on, or otherwise disturbed until the paint coat is fully dry and hard. All metalwork coated in the shop shall be stored out of contact with the ground in a manner and location that will minimize the formation of water-holding pockets; soiling, contamination, and deterioration of the paint film, and damaged areas of paint on such metalwork shall be cleaned and touched up without delay.

3.2.12 Vinyl Paints

3.2.12.1 General

Vinyl paints shall be spray applied, except that area inaccessible to spraying shall be brushed. The vinyl paint requires thinning for spray application. Thinners for vinyl paint shall be as follows:

APPROXIMATE AMBIENT AIR TEMPERATURE (Degree F)	
Below 50	MEK
50 - 70	MIBK
Above 70	MIAK

The amount of thinner shall be varied to provide a wet spray and avoid deposition of particles that are semidry when they strike the surface. Vinyl paints shall not be applied when the temperature of the ambient air receiving surfaces is less than 35 degrees F nor when the receiving surfaces are higher than 125 degrees F. Each spray coat of vinyl paint shall consist of a preliminary extra spray pass on edges, corners, interior angles, pits, seams, crevices, junctions of joining members, rivets, weld lines, and similar surface irregularities followed by an overall double spray coat. A double spray coat of vinyl-type paint shall consist of applying paint to a working area of not less than several hundred square feet in a single, half-lapped pass, followed after drying to at least a near tack-free condition by another spray pass applied at the same coverage rate and where practicable at right angles to the first. Rivets, bolts,

and similar surface projections shall receive sprayed paint from every direction to ensure complete coverage of all faces. Pits, cracks, and crevices shall be filled with paint insofar as practicable, but in any event, all pit surfaces shall be thoroughly covered and all cracks and crevices shall be sealed off against the entrance of moisture. Fluid and atomization pressures shall be kept as low as practicable consistent with good spraying results. Unless otherwise specified, not more than 2.0 mils, average dry film thickness, of vinyl paint shall be applied per double spray coat. Except where otherwise indicated, an undercoat of the vinyl-type paint may receive the next coat any time after the undercoat is tack-free and firm to the touch, provided that no speedup or delay in the recoating schedule shall cause film defects such as sags, runs, air bubbles, air craters, or poor intercoat adhesion. Neither the prime coat nor any other coat shall be walked upon or be subjected to any other abrading action until it has hardened sufficiently to resist mechanical damage.

3.2.12.2 Vinyl Zinc-Rich Primer

Primer shall be field mixed combining components A, B, and C. Mixing shall be in accordance with label instructions. After mixing, the paint shall be kept covered at all times to avoid contamination and shall be applied within 8 days after it is mixed. When the ambient and/or steel temperature is below about 80 degrees F, the paint will not normally require thinning; however, the paint shall at all times contain sufficient volatiles (thinners) to permit it to be satisfactorily atomized and to provide a wet spray and to avoid deposition of particles that are semidry when they reach the surface. The paint shall be stirred continuously during application at a rate that will prevent the zinc dust from settling. When spraying is resumed after any interruption of longer than 15 minutes, the entire length of the material hose shall be whipped vigorously until any settled zinc is redispersed. Long periods of permitting the paint to remain stagnant in the hose shall be avoided by emptying the hoses whenever the painting operation is to be suspended for more than 1 hour. The material (paint) hoses shall be kept as short as practicable, preferably not more than 50 feet in length. Equipment used for spraying this zinc primer shall not be used for spraying other vinyl-type paints without first being thoroughly cleaned, since many of the other paints will not tolerate zinc contamination; no type of hot spray shall be used. An average dry film thickness of up to 2.5 mils may be applied in one double-spray coat. Unless specifically authorized, not more than 8 days shall elapse after application of a VZ-108d zinc-rich coat before it receives a succeeding coat.

3.2.12.3 Vinyl Paint Formula V-766e

Vinyl Paint Formula V-766e is a ready-mixed paint designed to be spray applied over a wide range of ambient temperatures by field thinning with the proper type and amount of thinner. For spray application, it shall be thinned as necessary up to approximately 25 percent (1 quart per gallon of base paint) with the appropriate thinner; when ambient and steel temperatures are above normal, up to 40-percent thinning may be necessary for satisfactory application.

3.3 PAINT SYSTEM APPLICATION

The required paint system and the surfaces to which they shall be applied are identified below:

3.3.1 Surface Preparation

The method of surface preparation and pretreatment shown in the tabulation of paint systems is for identification purposes only. Cleaning and pretreatment of surfaces prior to painting shall be accomplished in accordance with detailed requirements previously described.

3.3.2 Paint System No. 5-E-Z

Paint shall be spray applied to an average minimum dry film thickness of 7.0 mils for the completed system, and the thickness at any point shall not be less than 5.5 mils. The dry film thickness of the zinc-rich primer shall be approximately 2.5 mils. The specified film thickness shall be attained in any event, and any extra coats needed to attain the specified thickness shall be applied at no additional cost to the Government. Attaining the specified film thickness by applying fewer than the prescribed number of coats or spray passes will be acceptable provided heavier applications do not cause an increase in pinholes, bubbles, blisters, or voids in the dried film and also provided that not more than 2.0 mils (dry film thickness) per double spray coat nor more than 1.0 mil per single spray pass of nonzinc paint shall be applied at one time.

3.3.3 Protection of Nonpainted Items and Cleanup

Nonpainted items in the vicinity of the surfaces being painted shall be maintained free from damage by paint or painting activities. Paint spillage and painting activity damage shall be promptly repaired.

3.4 APPURTENANT ITEMS

The Contractor shall conduct a joint inventory with the Contracting Officer, within 21 days after notice to proceed, for the purpose of identifying all items or surfaces not to be painted.

3.4.1 Seals

Elastomeric Seals for the stoplogs shall not be painted.

3.5 PAINTING SCHEDULE

Items to be coated include all exposed steel, other than stainless steel surfaces and other surfaces specifically excluded from painting. This work includes, but is not limited to, the trashrack structures, the stoplogs structures, and the lifting beam.

SYSTEM NO. 5-E-Z

SURFACE PREPARATION	1st COAT	2nd COAT	3rd COAT	4th COAT
White Metal blast cleaning (SSPC SP 5)	zinc-rich VZ-108d (double spray coat)	Gray Vinyl V-766e (double spray coat)	White Vinyl V-766e (double spray coat)	Gray metal Vinyl V-766e (double spray coat)

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