

**Contract Specifications for Construction
for
Powerhouse Access Road Repairs**

MID-RFP-2018-03



744 W. 20th Street
Merced, CA 95340
(209) 722-5761

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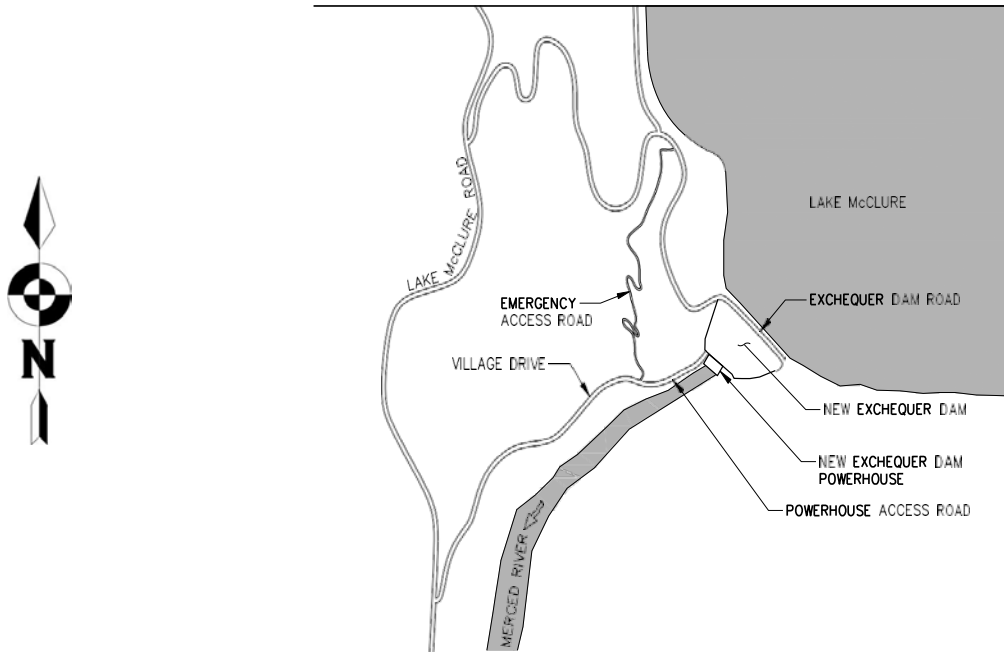
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REQUEST FOR PROPOSAL

INVITATION TO BIDDERS

MERCED IRRIGATION DISTRICT
MERCED, CALIFORNIA
NOTICE TO CONTRACTORS INVITING BIDS

- 0.1 **Project Title** - New Exchequer Dam Powerhouse Access Road Repairs
- 0.2 **Project Description** – Repairs at three locations along the access road to the powerhouse at New Exchequer Dam.
- 0.3 **Work Location** - 9188 Village Drive, Snelling CA. 95369 (**Vicinity**)



- 0.4 **Summary of Work** – The New Exchequer Dam Powerhouse Access Road Repairs project consists of road improvements along the Powerhouse Access Road in accordance with the Contract Documents and as Described in Section 2.21 Measurement and Payment. The Project includes:

1. Mobilization / Demobilization
2. Anchored Shotcrete Wall
3. RSP
4. Rockfall Netting
5. AC Pavement
6. Soldier Pile Wall
7. Soil Nail Wall Facing
8. Soil Nail Ground Anchors

INVITATION TO BIDDERS

The Contractor shall furnish all labor, equipment, materials, and service necessary to construct the work shown on the drawings and in the manner described in these specifications. All equipment and materials furnished and installed shall be new.

The Contractor shall comply with all codes, ordinances, regulations, orders, and other legal requirements of public authorities having bearing on the performance of the Work.

Any change in the scope of the work to be done, method of performance, nature of materials or price thereof, or to any other matter materially affecting the performance or nature of the work will not be paid for or accepted unless such change, addition or deletion is approved in advance, in writing by a supplemental agreement executed by the District. Contractor's "authorized representative(s)" has (have) the authority to execute such written change for Contractor.

- 0.5 **Notice** - Notice is hereby given that sealed bids will be received at the District until 5:00 p.m., Pacific Standard Time, **13 July** at the following address. Bid envelopes must be clearly marked with, **Powerhouse Access Road Improvements and MID-RFP-2018-03** Bids received after that time will be returned unopened without consideration.

Send Bids To:

Merced Irrigation District
744 W. 20th Street
Merced, CA 95340
Attn: Mel Trujillo

- 0.6 **Copies:** All bid documents and plans may be downloaded from the District's website at www.mercedid.org/ by going to the RFP tab to the right and hovering to see the link. The plans and specifications and other documents may also be examined at the District main office addressed above

- 0.7 **Site Walk-through** - A pre-bid project walk-through is **mandatory** and is scheduled on **June 29th** at 10 a.m. at the job site. Exchequer Powerhouse, 9188 Village Drive, Snelling CA 95340. Hard Hats, Safety Glasses, and Closed Toed Shoes will be required for the Project Walk.

- 0.8 **Prevailing Wage** - Attention of bidders is particularly called to the requirements as to conditions of employment to be observed, and minimum wage rates to be paid under the contract. This is a prevailing wage project. Copies of payroll submittals to Contractor employees shall be submitted to District upon request for progress project payments. The Contractor shall pay not less than the wage rates established by the Director of Industrial Relations, State of California. A copy of this wage scale may also be obtained at the following Web Site: www.dir.ca.gov/dlsr.

The Contractor shall comply with the requirements of the California Labor Code and specific attention is called to Section 1777.5 regarding Apprenticeship Standards. No bid will be accepted from a Contractor who has not been licensed in accordance with the provisions of Section 7000 through 7145, inclusive and as amended to date, of the Business and Professions Code of the State of California.

- 0.9 **Registered with DIR** – Labor Code Section 1771.1(a) A contractor or subcontractor shall not be qualified to bid on, be listed in a bid proposal, subject to the requirements of Section 4104 of the Public Contract Code, or engage in the performance of any contract for Public Work, as defined in this chapter, unless currently registered and qualified to perform Public Work pursuant to Section 1725.5. It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions Code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded.

- 0.10 **Work Completion** - Work shall be completed by **October 5th 2018**

INVITATION TO BIDDERS

- 0.11 **Pre-Construction Meeting** - A pre-construction meeting will be mandatory and will be scheduled typically within five business days of NTP.
- 0.12 **Miscellaneous** - The Contract shall be signed within 10 days, not including Sundays and legal holidays, after receipt of the Notice of Award.

For purposes of having an alternate pool of contractors, no bidder may withdraw his bid within 30 days after the actual date of the opening thereof.

No interpretation or correction of the plans, specifications, or any other pre-bid document will be made orally.

The District reserves the right to select any proposal that in its sole determination best meets the requirements of the District, regardless of bid price, or to reject any and all proposals. Bidders will be notified if additional information from them is requested, if they were not successful, and if they were chosen for one or more sections of the proposed scope of work, if more than one section exists..

For any moneys earned by the Contractor and withheld by the District to ensure the performance of the contract, the Contractor may, at his request and expense, substitute securities equivalent to the amount withheld in the form and manner and subject to the conditions provided in Sections 2230 and 10263 of the Public Contracts Code.

0.13 **Procurement Schedule**

RFP Published	06/22/2018
Project Job Walk	06/29/2018
Deadline for Pre-Bid RFI	07/06/2018
Addendum issued with RFI Responses	07/10/2018
Proposals Due	07/13/2018
Anticipated Award Date	07/20/2018
Begin Construction	08/13/2018
Project Completion	10/05/2018

END OF SECTION

SECTION 1 - INSTRUCTIONS TO BIDDERS

SECTION 1 - INSTRUCTION TO BIDDERS

- 1.01 **Contract Documents** - The Contract Documents consist of: the executed contract; the Contract Specifications (Specifications); the Contract Drawings (Drawings or Plans); Permits from other agencies as may be required by law, and reference specifications as specified in the Plans or Specifications.
- 1.02 **Proposal Forms**
- A. The District may consider non-responsive, any proposal not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all proposals.
- B. All proposals must be made upon the blank forms contained in Section 3, Bid Proposal, bound herein. Neither the bid form nor any other portion of the Contract Documents shall be detached here from. All proposals must give the proposed prices, both in writing and figures, and must be signed by the bidder. In case of disagreement between the written prices and the figures, the written prices will be used, and in case of disagreement between the unit prices and the total amounts, the unit prices and corrected totals will be considered as representing the bidder's intentions. All proposals must be completely filled out. Each bid must be submitted in a sealed envelope, bearing on the outside, the name of the bidder, their address, and the name of the project for which the bid is submitted.
- 1.03 **Approximate Estimate** - The quantities given in the notice inviting bids and the proposal are approximate only, being as a basis for the comparison of bids, and the District does not, expressly or by implication, agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of any class or portion of the work, or to omit portions of the work, as may be deemed necessary or advisable by the Engineer.
- 1.04 **Contractor's Responsibility**
- A. It shall be the Contractor's responsibility to become familiar with the project site, and to compare his examination of the site with the Plans and Specifications. The Contractor shall satisfy himself as to the nature and extent of the work, and all pertinent conditions under which the work is to be performed. The submission of a bid shall be conclusive evidence that the bidder has satisfied himself through his own investigation as to the nature and location of the work, the general and local conditions, particularly those bearing upon transportation, disposal, handling and storage of material, availability of labor, water, electric power, roads and uncertainties of weather, or similar physical conditions at the site; the conformation and condition of the ground, the character and quality and quantity of surface and subsurface materials, including groundwater, to be encountered; the character of equipment and facilities needed preliminary to and during prosecution of the work; all the requirements of the Plans and Specifications; and all other matters which can in any way affect the work or the cost thereof under this contract. Any failure by the Contractor to acquaint himself with all the available information concerning these conditions will not relieve him from responsibility for estimating proper difficulty or cost of successfully performing the work.
- B. Contractor shall be held to have visited the site (See Paragraph 0.6 - "Invitation To Bidders, Site Walk-Through") prior to submitting proposal to determine existing conditions, nature of materials to be encountered and to evaluate other information concerning or affecting the work to be performed under the contract.
- C. No payment shall subsequently be made to the Contractor because of error on his part or of negligence or failure to acquaint himself with the existing conditions, limitations, or features of the site or requirements of the Contract Document; or by reason of any estimates, tests, or representation of any officer, employee or agent of the District.
- D. The Contractor shall also be responsible for informing the Engineer of any discrepancies or omissions in the Plans or Specifications that would adversely affect the intended outcome of the finished product.

SECTION 1 - INSTRUCTION TO BIDDERS

- 1.05 **Addenda and Interpretations** - Every request for interpretation or correction of any ambiguity, inconsistency, or error, should be in writing, addressed to: "**Attention Mel Trujillo**", Merced Irrigation District, 744 W. 20th Street, Merced, CA 95340 (209) 354-2817 OR email requests may be sent to **RTRUJILLO@MERCEDID.ORG**. Failure of any bidder to receive any such addendum or interpretation shall not relieve such bidder from any obligation under his bid as submitted. Only a written interpretation or correction by Addendum shall be binding. No bidder shall rely upon any interpretation or correction given by any other method. All addenda shall become a part of the contract documents.
- 1.06 **Rejection of Proposals** - Proposals may be rejected if they show any alteration of form, additions not called for, conditional bids, incomplete bids, obviously unbalanced prices, erasures or irregularities of any kind. The District reserves the right to reject any and all proposals.
- 1.07 **Bidders Security** - All bids shall be presented under sealed cover and accompanied by one of the following forms of bidder's security: certified check or bidder's bond. Bonds shall be duly executed by a responsible corporate surety, authorized to insure such bonds in the State of California, and secured through an authorized agent with an office in California. The security for each bond (bid bond and performance and payment bond) shall be a percentage of the bid in an amount equal to at least 10% for the bid bond and 100% for the performance and payment bond. A bid will not be considered unless one of the forms of bidder's security is enclosed with it. The bidder's security shall be attached to the appropriate page in the Contract Documents.
- 1.08 **Designation of Subcontractors and Suppliers** - Any sub-contractors or suppliers doing work shall be designated in the proposal.
- 1.09 **Withdrawal of Proposals**
- A. Any bid may be withdrawn at any time prior to the time fixed in the public notice for the opening of bids only by written request for the withdrawal of the bid filed with the Engineer. The request shall be executed by the bidder or his duly authorized representative. The withdrawal of the bid does not prejudice the right of the bidder to file a new bid.
- B. Whether or not bids are opened exactly at the time fixed in the public notice for opening bids, a bid will not be received after that time, nor may any bid be withdrawn after the time fixed in the public notice for the opening of bids.
- 1.10 **Relief of Bidders** - Attention is directed to the provisions of Public Contracts Code Sections 5100 to 5108 inclusive, concerning relief of bidders and in particular to the requirement therein, that if the bidder claims a mistake was made in his bid, the bidder shall give the District written notice within 5 days after the opening of the bids of the alleged mistake, specifying in the notice in detail how the mistake occurred.
- 1.11 **Disqualification of Bidders** - More than one proposal from an individual, firm, partnership, corporation or combination thereof under the same or different names will not be considered. Reasonable grounds for believing that any individual, firm, partnership, corporation or combination thereof has submitted more than one proposal under separate cover, name, or number for the work contemplated in this solicitation may cause the rejection of all proposals in which such individual, firm, partnership, corporation or combination thereof has submitted. If there is reason for believing that collusion exists among the bidders, any or all proposals may be rejected.
- 1.12 **Competency of Bidder** - Before any contract is awarded, the bidder may be required to furnish a complete statement of his financial ability and experience in performing public works projects of the type contemplated herein.
- 1.13 **Power of Attorney** - Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.
- 1.14 **Award of Contract**

SECTION 1 - INSTRUCTION TO BIDDERS

- A. The District reserves the right to waive any informalities in the bidding and to reject any and all proposals.
- B. All bids will be compared on the basis of the Engineer's estimate of the quantities of work to be done.
- C. The award of the Construction Contract, if it is awarded, will be to the lowest responsible and responsive bidder whose proposal is complete with all the requirements prescribed.
- D. Such award, if made, will be made within 14 calendar days after the opening of proposals or upon Board approval. If the lowest responsible and responsive bidder refuses or fails to execute the Construction Contract, the District may award the contract to the second lowest responsible and responsive bidder. Such award, if made, will be made within 21 days after the opening of proposals. If the second lowest responsible and responsive bidder refuses or fails to execute the contract, the District may award the contract to the third lowest responsible and responsive bidder. Such award, if made, will be made within 28 days after the opening of proposals.
- E. The periods of time specified above, within which the award of contract may be made, shall be subject to extension for much further period as may be agreed upon in writing between the District and the bidder concerned.

1.15 Execution of Contract

- A. The Construction Contract shall be signed by the successful bidder and returned, together with the Performance and Payment bond and satisfactory evidence of insurance, as designated in Section 2 herein, within 10 calendar days , not including Sundays and legal holidays, after the bidder has received notice that the contract has been awarded.
- B. Failure to provide contract copies of required documents within the required time period may result in revocation of contract.

1.16 **Notice to Proceed** - The Contractor will begin work within five (5) calendar days after the date of the Notice to Proceed, and shall diligently prosecute the contract to completion before the expiration date. The Notice to Proceed will be issued upon receipt of the signed Construction Contract, bonds and evidence of insurance, as required in Section 1.15, herein.

1.17 **Failure to Execute Contract** - Failure of the bidder awarded the contract to execute said contract shall be just cause for the annulment of the award and the forfeiture of the bidder's security. The successful bidder may file with the District a written notice, signed by the bidder or his authorized representative, specifying that the bidder will refuse to execute the contract presented to him. The filing of such notice shall have the same force and effect as the failure of the bidder to execute the contract and furnish acceptable bonds within the time hereinbefore prescribed.

1.18 **Return of Bidder's Securities** - Within 10 days after award of the contract to the lowest responsible and responsive bidder, the District will return the bidder's securities (except bidder's bonds) accompanying such of the proposals as are not to be further considered in making the award. Retained bidder's securities will be held until the contract has been finally executed, after which all bidder's securities (except bidder's bonds and any securities which have been forfeited) will be returned to the respective bidders whose proposals they accompany.

END OF SECTION

SECTION 2 - BID PROPOSAL

BIDDER'S EXPERIENCE/REFERENCES

Complete and return with the submittal package. Three references are required.

REFERENCE NO. 1 – AGENCY NAME:

ADDRESS:

CONTACT PERSON: _____ TITLE:

E-MAIL: _____ TELEPHONE NO.:

AMT. OF CONTRACT:

DATE/TYPE OF PROJECT

REFERENCE NO. 2 – AGENCY NAME:

ADDRESS:

CONTACT PERSON: _____ TITLE:

E-MAIL: _____ TELEPHONE NO.:

AMT. OF CONTRACT:

DATE/TYPE OF PROJECT

REFERENCE NO. 3 – AGENCY NAME:

ADDRESS:

CONTACT PERSON: _____ TITLE:

E-MAIL: _____ TELEPHONE NO.:

AMT. OF CONTRACT:

DATE/TYPE OF PROJECT

BID PROPOSAL
FOR
POWERHOUSE ACCESS ROAD REPAIR

FOR THE
MERCED IRRIGATION DISTRICT

FROM: CONTRACTOR

NAME OF BIDDER: _____

BUSINESS ADDRESS: _____

PHONE: _____

TO: PETER WADE – HYDROELECTRIC DEPARTMENT MANAGER

Gentlemen:

In accordance with the "Invitation to Bidders", the undersigned, as bidder, declares that he has carefully examined the location of the proposed work, the plans and specifications, read the accompanying instructions to bidders, the contract forms, the bond forms, and agrees that if his proposal is accepted he will contract, on the required form, with the District to, at his own cost, do all of the work and furnish all of the equipment, materials, and labor necessary to complete the work in the manner and in the time described in the plans and specifications and agrees to provide all bonds and insurance certificates and to fulfill all requirements of the contract for the following Prices:

_____ LUMP SUM BID.

The undersigned acknowledges receipt of the following addenda to the RFP: Addendum

No. _____, dated _____

Addendum No. _____, dated _____

Addendum No. _____, dated _____

Addendum No. _____, dated _____

Addendum No. _____, dated _____

Bidder's Signature

BID ITEMS

MID Control/Operations Facility (Phase 2)

MERCED IRRIGATION DISTRICT

BASE BID (everything included in the Contract Documents)

MID Control/Operations Facility (Phase 2): \$ _____

FOR THE SUM OF:

_____ **DOLLARS**

(\$ _____)

Name of Company: _____

Business Address: _____

Name of Bidder (Print): _____

By: _____ Date: _____

Bidder's Signature

POWERHOUSE ACCESS ROAD REPAIR

Bid Item List Due:

Item No	Item Description	Method of Pricing	Estimated Units	Cost Per Unit	Item Total
1	MOBILIZATION / DEMOBILIZATION	LS			
2	ANCHORED SHOTCRETE WALL	LS			
3	RSP	Unit Cost / TON	55		
4	ROCKFALL NETTING	LS			
5	AC PAVEMENT	Unit Cost / SY	20		
6	SOLDIER PILE WALL	LS			
7	SOIL NAIL WALL FACING	Unit Cost / SF	1,500		
8	SOIL NAIL GROUND ANCHORS	Unit Cost / EA	34		
	TOTAL				

SUBSTITUTION REQUEST FORM

Project: **MID Control/Operations Facility (Phase 2)**

Pursuant to Public Contract Code Section 3400, bidder hereby requests substitution of the following articles, devices, equipment, products, materials, fixtures, patented processes, forms, methods, or types of construction:

Specified Item.	Requested Substituted Item	Agree to Provide Specific Item In the Event Request is Denied¹ (circle one)		The District Decision (circle one)	
1. _____	_____	Yes	No	Grant	Deny
2. _____	_____	Yes	No	Grant	Deny
3. _____	_____	Yes	No	Grant	Deny
4. _____	_____	Yes	No	Grant	Deny
5. _____	_____	Yes	No	Grant	Deny
6. _____	_____	Yes	No	Grant	Deny
7. _____	_____	Yes	No	Grant	Deny
8. _____	_____	Yes	No	Grant	Deny
9. _____	_____	Yes	No	Grant	Deny

¹ Substitution request must be submitted by prospective general contractor.

² Bidder must state whether bidder will provide the Specified Item in the event that The District denies the request for substitution. If bidder states that bidder will not provide the Specified Item in the event their request for substitution is denied, bidder's bid will be considered non responsive. However, if bidder states that bidder will provide the Specified Item in the event that bidder's request for substitution is denied, bidder shall execute the Agreement and provide such Specified Item(s) and if bidder fails to execute the Agreement with the Specified Item(s), bidder's bond will be forfeited.

This Request Form must be accompanied by evidence as to whether the proposed substitution (1) is equal in quality, service, and ability to the Specified Item; (2) will entail no change in detail, construction, and scheduling of related work; (3) will be acceptable in consideration of the required design and artistic effect; (4) will provide no cost disadvantage to the District; (5) will require no excessive or more expensive maintenance, including adequacy and availability of replacement parts; and (6) will require no change of the construction schedule.

The undersigned states that the following paragraph, unless modified on attachments, are correct:

1. The proposed substitution does not affect the dimensions shown on the Drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse effect on other trades, the construction schedule, or specified warranty requirements.
4. Maintenance and service parts will be available locally for the proposed substitution.

Name of Bidder: _____

By: _____

The District: _____

By: _____

PUBLIC CONTRACT CODE

California Public Contract Code, Section 10285.1

In accordance with Public Contract Code Section 1028.5, the bidder hereby declares under penalty of perjury under the laws of the State of California that the bidder has _____, has not _____ been convicted within the preceding three years of any offenses referred to in that section, including any charge of fraud, bribery, collusion, conspiracy, or any other act in violation of any state or Federal antitrust law in connection with the bidding upon, award of, or performance of, any public works contract, as defined in Public Contract Code Section 1101, with any public entity, as defined in Public Contract Code Section 1100, including the Regents of the University of California or the Trustees of the California State University. The term "bidder" is understood to include any partner, member, officer, director, responsible managing officer, or responsible managing employee thereof, as referred to in Section 10285.1

Note: The bidder must place a check mark after "has or "has not" in one of the blank spaces provided.

The above Statement is part of the Bid. Signing this Bid on the signature portion thereof shall also constitute signature of this Statement.

Bidders are cautioned that making false certification may subject the certifier to criminal prosecution.

PUBLIC CONTRACT CODE QUESTIONNAIRE

California Public Contract Code, Section 10162

In accordance with Public Contract Code Section 10162, the Bidder under penalty of perjury, the following questionnaire:

Has the bidder, any officer of the bidder, or any employee of the bidder who has a proprietary interest in the bidder, ever been disqualified, removed, or otherwise prevent from bidding on, or completing a federal, state, or local government project because of a violation of law or a safety regulation?

YES _____ NO _____

If the answer is yes, explain the circumstances in the following space:

PUBLIC CONTRACT CODE SECTION 10232 STATEMENT

In accordance with Public Contract Code Section 10232, the contractor hereby states, under penalty of perjury, that no more than one final unappeasable finding of contempt of court by a federal court has been issued against the Contract within the immediately preceding two year period because of the Contractor's failure to comply with an order of a federal court which orders the Contractor to comply with an order of the National Labor Relations Board.

Note: The above Statement and Questionnaire are part of the Bid. Signing this Bid on the signature portion thereof shall also constitute signature of the Statement and Questionnaire.

Bidder are cautioned that making a false certification may subject the certifier to criminal prosecution.

SAFETY PROVISIONS

California Labor Code, Chapter 2, Par. 6424

The State of California requires the issuance of a permit as a condition precedent to the construction of a pipeline, sewer, private sewage disposal system, boring and jacking pits or similar trenches, or open excavations which are five feet or deeper.

The Division of Industrial Safety may conduct on-site inspections during construction of such trenches or excavations.

The Division will submit to each applicant for such permit, in writing, the division's safety orders relating to trenches and excavations, for the purpose of informing the applicant of his responsibility to provide adequate sheeting, shoring, and bracing for the protection of life or limb.

Permit shall be obtained by Contractor, at his expense, prior to commencement of any work. Permit may be obtained from:

State of California
Department of Industrial Relations
Division of Industrial Safety

Name of Company: _____

Business Address: _____

Acknowledged by Bidder (Print): _____

By: _____ Date: _____

Bidder's Signature

NONCOLLUSION AFFIDAVIT

" _____, being first duly sworn, deposes and says that he/she is _____ of _____ whom is submitting the foregoing bid, that the bid is not made in the interest of, or on association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contain in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository or to any member or agent thereof to effectuate a collusive or sham bid."

By: _____
Bidder

State of California }
 }SS.
County of _____}

On this the _____ day of _____, 20_____, before me
_____ personally appeared
_____ personally known to me

_____ proved to me on the basis of satisfactory evidence) to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s) or the entity upon behalf of which the person(s) acted, executed the instrument.

WITNESS my hand and official seal.

Notary's Signature

CONTRACTOR'S CERTIFICATE
REGARDING WORKERS' COMPENSATION

Description of Contract:

Labor Code Section 3700 Provides (in part):

“Every employer except the State shall secure the payment of compensation in one or more of the following ways:

- (a) By being insured against liability to pay compensation in one or more insurers duly authorized to write compensation insurance in this State.
- (b) By securing from the Director of Industrial Relations a certificate of consent to self- insure, which may be given upon furnishing proof satisfactory to the Director of Industrial Relations of ability to self-insure and to pay any compensation that may become due to his employees.”

I am aware of the provisions of Section 3700 of the Labor Code which requires every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions before commencing the performance of the work of this contract.

Dated: _____

(Contractor)

By: _____

(Official Title)

(Seal)

(Labor Code Section 1861 provides that the above certificate must be signed and filed by the Contractor with the Owner prior to performing any work under this contract.)

CERTIFICATE OF CONTRACTOR

I, _____, certify that I am a/the _____ [designate sole proprietor, partner in partnership, or specify corporate office, e.g., secretary] in the entity named as CONTRACTOR in the foregoing contract.

I hereby expressly certify that the name of the entity to which I am associated is _____; that this entity is in good standing and has complied with all applicable laws and regulations, and that I have been expressly authorized by the proper parties in this entity to execute this contract on behalf of the above-named entity.

ATTEST:

Name _____ (Please type)

Title _____

State of California)

)ss.

County of _____)

On this the _____ day of _____, 20_____, before me

_____ personally appeared

_____ personally known to me

_____ proved to me on the basis of satisfactory evidence) to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s) or the entity upon behalf of which the person(s) acted, executed the instrument.

WITNESS my hand and official seal.

Notary's Signature

CERTIFICATION OF LIQUIDATED DAMAGES

The undersigned agrees, if this proposal is accepted, to commence said work and prosecute the name to completion within the time limits prescribed in the Specifications and Contract Documents; and further agrees to pay, as liquidated damages, the sum of \$1,000.00 for each consecutive calendar day of delay in completing said work or any portion thereof in excess of said time limits and any authorized time extensions.

It is further understood and agreed that the District reserves the right to reject any and all proposals and to waive any informalities in the bidding; and that no verbal agreement or conversation with any officer, agent or employee of the District either before or after the execution of the Contract, shall affect or modify any of the terms or obligations of this proposal.

The undersigned acknowledges receipt of the following addenda:

The undersigned certifies that he and his sub-contractors are properly licensed in accordance with the laws of the State of California. The following list shows each of the sub-contractors who will perform under the contract, subject to the approval of the District, in excess of 1/2% of the total bid price:

Signature

Date

BID BOND

We, _____, as Principal,

and _____, as Surety, jointly and severally, bind ourselves, our heirs, representatives, successors and assigns, as set forth herein, to the

(herein called District) for payment of the penal sum of _____

_____ Dollars (\$ _____),

lawful money of the United States. Principal has submitted the accompanying bid for the construction of the project. If the Principal is awarded the contract and enters into a written contract, in the form prescribed by the District, at the price designated by his bid, and files two bonds with the District, or substitute security in lieu thereof, one to guarantee payment for labor and materials and the other to guarantee faithful performance, in the time and manner specified by the District, and carries all insurance in type and amount which conforms to the contract documents and furnishes required certificates and endorsements thereof, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

Forfeiture of this bond, or any deposit made in lieu thereof, shall not preclude the District from seeking all other remedies provided by law to cover losses sustained as a result of the Principal's failure to do any of the foregoing.

Principal and Surety agree that if the District is required to engage the services of an attorney in connection with the enforcement of this bond, each shall pay District's reasonable attorney's fees incurred with or without suit.

Executed on _____, 20_____

PRINCIPAL

(Seal if Corporation)

By: _____ Title:

—
(signature must be notarized)

(Attach Acknowledgment of Authorized Representative of Principal) Any claims under this bond may be addressed to:

_____ (name and address of Surety)

_____ (name and address of Surety's agent for service of
_____ process in California, if different from above)

_____ (telephone number of Surety's agent in California)

(Attach Acknowledgment)

SURETY

By: _____

(Attorney-in-Fact)

NOTICE:

No substitution or revision to this bond form will be accepted. Sureties must be authorized to do business in and have an agent for service of process in California. Certified copy of Power of Attorney must be attached.

END OF SECTION

SECTION 3 – GENERAL SPECIFICATIONS

SECTION 3 - GENERAL SPECIFICATIONS

SECTION 3 – GENERAL SPECIFICATIONS

- 3.01 **Definitions** - Whenever used in the Standard Specifications, in these Contract Specifications and Contract Documents or on the Plans, the following terms shall have the primary meaning given herein:
- A. *Board* - Board of Directors of the Merced Irrigation District
 - B. *Contract* - The written agreement covering performance of the work including, but not limited to, the formal contract, notice inviting bids, proposal, specifications, bonds, plans/drawings/specifications, supplemental agreements between the Contractor and the District, and approved change orders.
 - C. *Engineer or Chief Engineer* - Engineer of the Merced Irrigation District, acting either directly or through properly authorized agents, such agents, acting within the scope of the particular duties entrusted to them.
 - D. *Design Engineer* - Merced Irrigation District staff engineers.
 - E. *District* - Merced Irrigation District or M. I. D.
 - F. *Plans* - All plans, maps and other drawings (including standard plans or drawings), together with all printed or written explanatory matter thereof, as listed in these Contract Documents.
 - G. *Specifications* - Standard Specifications, reference specifications, Contract Specifications and any specifications in change orders or supplemental agreements between the Contractor and the District. Other terms defined in the Standard Specifications shall have the intent and meaning specified therein.
- 3.02 **Precedence of Contract Documents** - If there are conflicting requirements in the Contract Documents, the requirement first in precedence shall control. The precedence shall be determined as follows:
- A. First: Plans/Drawings
 - B. Second: Contract Specifications
- 3.03 **Contract Bonds**
- A. The Contractor will be required to execute the Performance and Payment Bonds within ten calendar days from the date when the Notice of Award is mailed to the Contractor. The Performance and Payment Bonds must be in the amount of 100 percent of the Contract price with a corporate surety approved by the District and authorized to do business in the state where the Contract is to be performed. Failure to execute the bonds within the time specified shall allow the District to consider that the bidder has abandoned the Contract, in which case the check or bidder's bond accompanying the proposal shall be the property of the District
 - B. The bond covering performance and shall be conditioned upon the performance by the Contractor of all undertakings, covenants, terms, conditions, and agreements of the Contract. The bond covering payment shall be conditioned upon the prompt payment by the Contractor to all persons supplying labor and materials to be used in the performance of the Work. Such bond(s) shall also run in favor of any other person or entities required by law and shall be in the form(s) required by applicable statutes, if any, and acceptable to District Evidence of authority of any attorney, in fact, acting for the corporate surety must be provided in the form of a certificate as to his power of attorney and to the effect that it is not terminated and remains in full force and effect on the date of the bond. The expense of such bond(s) shall be borne by the Contractor. If at any time a surety on such bond(s) becomes irresponsible or loses its right to do business in the aforementioned State, the District may require another surety, which the Contractor shall furnish within ten calendar days after receipt of written notice to do so.
 - C. The performance bond shall guarantee the repair of all damage due to faulty materials or workmanship provided or done by the Contractor. This guarantee shall remain in effect for a period of one year after the date of final acceptance of the job by the District
 - D. All alterations, extensions of time, extra and additional work, and other changes authorized by these specifications or any part of the contract, may be made without securing the consent of the surety or sureties of the contract bonds.

SECTION 3 – GENERAL SPECIFICATIONS

- 3.04 **Workers' Compensation Insurance** - By his/her signature hereunder, Contractor certifies that he/she is aware of the provisions of Section 3700 of the California Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and he/she will comply with such provisions before commencing the performance of the work of this agreement.
- 3.05 **Indemnification** - To the fullest extent permitted by law, Contractor shall indemnify and hold harmless and defend Merced Irrigation District, its directors, officers, employees, or authorized volunteers, and each of them from and against:
- A. Any and all claims, demands, causes of action, damages, costs, expenses, losses or liabilities, in law or in equity, of every kind or nature whatsoever for, but not limited to, injury to or death of any person including Merced Irrigation District and/or Contractor, or any directors, officers, employees, or authorized volunteers of Merced Irrigation District or Contractor, and damages to or destruction of property of any person, including but not limited to, Merced Irrigation District and/or Contractor or their directors, officers, employees, or authorized volunteers, arising out of or in any manner directly or indirectly connected with the work to be performed under this agreement, however caused, regardless of any negligence of Merced Irrigation District or its directors, officers, employees, or authorized volunteers, except the sole negligence or willful misconduct or active negligence of Merced Irrigation District or its directors, officers, employees, or authorized volunteers;
 - B. Any and all actions, proceedings, damages, costs, expenses, penalties or liabilities, in law or equity, of every kind or nature whatsoever, arising out of, resulting from, or on account of the violation of any governmental law or regulation, compliance with which is the responsibility of Contractor;
 - C. Any and all losses, expenses, damages (including damages to the work itself), attorneys' fees, and other costs, including all costs of defense, which any of them may incur with respect to the failure, neglect, or refusal of Contractor to faithfully perform the work and all of the Contractor's obligations under the agreement. Such costs, expenses, and damages shall include all costs, including attorneys' fees, incurred by the indemnified parties in any lawsuit to which they are a party.
 - D. Contractor shall defend, at Contractor's own cost, expense and risk, any and all such aforesaid suits, actions, or other legal proceedings of every kind that may be brought or instituted against Merced Irrigation District or its directors, officers, employees, or authorized volunteers.
 - E. Contractor shall pay and satisfy any judgment, award or decree that may be rendered against Merced Irrigation District or its directors, officers, employees, or authorized volunteers, in any and all such suits, actions, or other legal proceedings.
 - F. Contractor shall reimburse Merced Irrigation District or its directors, officers, employees, or authorized volunteers, for any and all legal expenses and costs incurred by each of them in connection therewith or in enforcing the indemnity herein provided.
 - G. Contractor's obligation to indemnify shall not be restricted to insurance proceeds, if any, received by Merced Irrigation District, or its directors, officers, employees, or authorized volunteers.
- 3.06 **Laws, Regulations and Permits** - The Contractor shall give all notices required by law and comply with all laws, ordinances, rules and regulations pertaining to the conduct of the work. The Contractor shall be liable for all violations of the law in connection with work furnished by the Contractor. If the Contractor observes that the drawings or specifications are at variance with any law or ordinance, rule or regulation, he/she shall promptly notify Merced Irrigation District engineer in writing and any necessary changes shall be made by written instruction or change order. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules or regulations and without giving notice to Merced Irrigation District engineer, the Contractor shall bear all costs arising therefrom.

SECTION 3 – GENERAL SPECIFICATIONS

- 3.07 **Safety** - The Contractor shall execute and maintain his/her work so as to avoid injury or damage to any person or property. The Contractor shall comply with the requirements of the specifications relating to safety measures applicable in particular operations or kinds of work.
- A. In carrying out his/her work, the Contractor shall at all times exercise all necessary precautions for the safety of employees appropriate to the nature of the work and the conditions under which the work is to be performed, and be in compliance with all applicable federal, state and local statutory and regulatory requirements including California Department of Industrial Relations (Cal/OSHA) regulations; and the U.S. Department of Transportation Omnibus Transportation Employee Testing Act. Safety precautions, as applicable, shall include but shall not be limited to: adequate life protection and lifesaving equipment; adequate illumination; instructions in accident prevention for all employees, such as the use of machinery guards, safe walkways, scaffolds, ladders, bridges, gang planks, confined space procedures, trenching and shoring, fall protection, and other safety devices; equipment and wearing apparel as are necessary or lawfully required to prevent accidents, injuries, or illnesses; and adequate facilities for the proper inspection and maintenance of all safety measures.
- B. The Contractor shall be responsible for the safeguarding of all utilities. At least two working days before beginning work, the Contractor shall call the Underground Service Alert (USA) in order to determine the location of sub-structures. The Contractor shall immediately notify Merced Irrigation District and the utility owner if he/she disturbs, disconnects, or damages any utility.
- C. In accordance with Section 6705 of the California Labor Code, the Contractor shall submit to Merced Irrigation District specific plans to show details of provisions for worker protection from caving ground during excavations of trenches of five feet or more in depth. The excavation/trench safety plan shall be submitted to and accepted by Merced Irrigation District prior to starting excavation. The trench safety plan shall have details showing the design of shoring, bracing, sloping or other provisions to be made for worker protection from the hazard of caving ground. If such a plan varies from the shoring system standards established by the Construction Safety Orders of the California Department of Industrial Relations (Cal/OSHA), the plan shall be prepared by a California registered civil or structural engineer. As part of the plan, a note shall be included stating that the registered civil or structural engineer certifies that the plan complies with the Cal/OSHA Construction Safety Orders, or that the registered civil or structural engineer certifies that the plan is not less effective than the shoring, bracing, sloping or other provisions of the Safety Orders. In no event shall the Contractor use a shoring, sloping, or protective system less effective than that required by said Construction Safety Orders. Submission of this plan in no way relieves the Contractor of the requirement to maintain safety in all areas. If excavations or trench work requiring a Cal/OSHA permit are to be undertaken, the Contractor shall submit his/her permit with the excavation/trench work safety plan to Merced Irrigation District before work begins.
- D. Contractor's Safety Plan
1. The Plan shall include project-specific safety plans, procedures, and staffing assignments as necessary to ensure the safe performance of the Work, at a minimum, the Contractor's Safety Plan shall include/address the items listed below:
 - (1) Descriptions of specific roles and responsibilities for Contractor's Safety Professional and supporting personnel, including safety inspections, record/report generating and routing, and forms to be used.
 - (2) A safety inspection summary table listing all safety inspections required for the Work. The summary table shall include: each inspection name, Specification or Drawing reference, feature of work to inspected, and frequency of inspections.
 - (3) Emergency Response Plan (ERP), indicating how Contractor will respond to an emergency, including how emergency services will be contacted and/or accessed. PG&E will work with Contractor to finalize an ERP for use by PG&E and / or Contractor. However, Contractor remains solely responsible for verifying the effectiveness of the plan, implementation of the plan if needed, and for timely medical response to Contractor's and sub-contractor's employees.
- E. Job Safety Analyses

SECTION 3 – GENERAL SPECIFICATIONS

1. Project- and task-specific Job Safety Analyses (JSAs) for Work activities that pose hazards to personnel and equipment. JSAs shall identify hazards associated with the Work, and shall identify appropriate procedures and mitigation measures to minimize such hazards.
- 3.08 **Commercial General Liability and Automobile Liability Insurance** - The Contractor shall provide and maintain the following commercial general liability and automobile liability insurance:
- 3.09 **Coverage** - Coverage for commercial general liability and automobile liability insurance shall be at least as broad as the following:
1. Insurance Services Office (ISO) Commercial General Liability Coverage (Occurrence Form CG 0001)
 2. Insurance Services Office (ISO) Business Auto Coverage (Form CA 0001), covering Symbol 1 (any auto)
- 3.10 **Limits** - The Contractor shall maintain limits no less than the following:
1. General Liability - Two million dollars (\$2,000,000) per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit or products-completed operations aggregate limit is used, either the general aggregate limit shall apply separately to the project/location (with the ISO CG 2503, or ISO CG 2504, or insurer's equivalent endorsement provided to Merced Irrigation District) or the general aggregate limit and products-completed operations aggregate limit shall be Five million dollars (\$5,000,000) Annual Aggregate.
 2. Automobile Liability - One million dollars (\$2,000,000) for bodily injury and property damage each accident limit.
- 3.11 **Required Provisions** - The general liability and automobile liability policies are to contain, or be endorsed to contain, the following provisions:
1. Merced Irrigation District, its directors, officers, employees, and authorized volunteers are to be given insured status (via ISO endorsement CG 2010, CG 2033, or insurer's equivalent for general liability coverage) as respects: liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the Contractor; premises owned, occupied or used by the Contractor; and automobiles owned, leased, hired or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to Merced Irrigation District, its directors, officers, employees, or authorized volunteers.
 2. For any claims related to this project, the Contractor's insurance shall be primary insurance as respects Merced Irrigation District, its directors, officers, employees, or authorized volunteers. Any insurance, self-insurance, or other coverage maintained by Merced Irrigation District, its directors, officers, employees, or authorized volunteers shall not contribute to it.
 3. Any failure to comply with reporting or other provisions of the policies including breaches of warranties shall not affect coverage provided to Merced Irrigation District, its directors, officers, employees, or authorized volunteers.
 4. The Contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.
 5. Each insurance policy required by this agreement shall state, or be endorsed to state, that coverage shall not be canceled by the insurance carrier or the Contractor, except after thirty (30) days (10 days for non-payment of premium) prior written notice by U.S. mail has been given to Merced Irrigation District.

SECTION 3 – GENERAL SPECIFICATIONS

6. Such liability insurance shall indemnify the Contractor and his/her sub-contractors against loss from liability imposed by law upon, or assumed under contract by, the Contractor or his/her sub-contractors for damages on account of such bodily injury (including death), property damage, personal injury, completed operations, and products liability.
 7. The general liability policy shall cover bodily injury and property damage liability, owned and non-owned equipment, blanket contractual liability, completed operations liability, explosion, collapse, underground excavation, and removal of lateral support.
 8. The automobile liability policy shall cover all owned, non-owned, and hired automobiles.
 9. All of the insurance shall be provided on policy forms and through companies satisfactory to Merced Irrigation District.
- 3.12 **Deductibles and Self-Insured Retentions** - Any deductible or self-insured retention must be declared to and approved by Merced Irrigation District. At the option of Merced Irrigation District, the insurer shall either reduce or eliminate such deductibles or self-insured retentions.
- 3.13 **Acceptability of Insurers** - Insurance is to be placed with insurers having a current A.M. Best rating of no less than A-:VII or equivalent or as otherwise approved by Merced Irrigation District.
- 3.14 **Workers' Compensation and Employer's Liability Insurance** - The Contractor and all sub-contractors shall insure (or be a qualified self-insured) under the applicable laws relating to workers' compensation insurance, all of their employees working on or about the construction site, in accordance with the "Workers' Compensation and Insurance Act", Division IV of the Labor Code of the State of California and any Acts amendatory thereof. The Contractor shall provide employer's liability insurance with limits of no less than \$1,000,000 each accident, \$1,000,000 disease policy limit, and \$1,000,000 disease each employee.
- 3.15 **Responsibility for Work** - Until the completion and final acceptance by Merced Irrigation District of all the work under and implied by this agreement, the work shall be under the Contractor's responsible care and charge. The Contractor shall rebuild, repair, restore and make good all injuries, damages, re-erections, and repairs occasioned or rendered necessary by causes of any nature whatsoever.
- A. The Contractor shall provide and maintain builder's risk insurance (or installation floater) covering all risks of direct physical loss, damage or destruction to the work in the amount specified in the General Conditions, to insure against such losses until final acceptance of the work by Merced Irrigation District. Such insurance shall insure at least against the perils of fire and extended coverage, theft, vandalism and malicious mischief, and collapse. Merced Irrigation District, its directors, officers, employees, and authorized volunteers shall be named insureds on any such policy. The making of progress payments to the Contractor shall not be construed as creating an insurable interest by or for Merced Irrigation District or be construed as relieving the Contractor or his/her sub-contractors of responsibility for loss from any direct physical loss, damage or destruction occurring prior to final acceptance of the work by Merced Irrigation District.
 - B. The Contractor shall waive all rights of subrogation against Merced Irrigation District, its directors, officers, employees, or authorized volunteers.
- 3.16 **Evidences of Insurance** - Prior to execution of the agreement, the Contractor shall file with Merced Irrigation District a certificate of insurance (Acord Form 25-S or equivalent) signed by the insurer's representative evidencing the coverage required by this agreement. Such evidence shall include an additional insured endorsement signed by the insurer's representative and evidence of waiver of rights of subrogation against Merced Irrigation District (if builder's risk insurance is applicable). Such evidence shall also include confirmation that coverage includes or has been modified to include Required Provisions 1-5.
- A. The Contractor shall, upon demand of Merced Irrigation District, deliver to Merced Irrigation District such policy or policies of insurance and the receipts for payment of premiums thereon.

SECTION 3 – GENERAL SPECIFICATIONS

- 3.17 **Continuation of Coverage** - If any of the required coverages expire during the term of this agreement, the Contractor shall deliver the renewal certificate(s) including the general liability additional insured endorsement and evidence of waiver of rights of subrogation against Merced Irrigation District (if builder's risk insurance is applicable) to Merced Irrigation District at least ten (10) days prior to the expiration date.
- 3.18 **Sub-Contractors** - In the event that the Contractor employs other contractors (sub-contractors) as part of the work covered by this agreement, it shall be the Contractor's responsibility to require and confirm that each sub-contractor meets the minimum insurance requirements specified above.
- 3.19 **Safety Orders** - The Contractor shall comply with the provisions of Subsections 7-1.09 and 7-1.01E of the Standard Specifications. The Contractor shall comply with all applicable provisions of the California Occupational Safety and Health Act of 1973, including any amendments thereto, and the rules, standards, orders and regulations prescribed by the Occupational Safety and Health Standards Board and the Division of Industrial Safety in the California Department of Industrial Relations. He shall further comply with all other applicable safety laws, ordinances and regulations.
- 3.20 **General Guaranty**
- A. Should any of the materials installed pursuant to the Plans, Specifications and Contract Documents, except existing materials or materials furnished by the District, prove defective or should any of the work prove defective due to faulty workmanship, materials furnished or methods of construction within one year from the date of acceptance of the work by the District, the Contractor shall reimburse the District, upon demand, for its expenses incurred in restoring the work to the condition contemplated in said Plans, Specifications and Contract Documents, including the cost of any materials replaced or, upon demand by the District, shall replace any such materials and repair the work completely without cost to the District.
 - B. The District shall have the unqualified option to make any needed repairs or replacements done by the Contractor. In the event the District elects to have said work performed by the Contractor, the Contractor shall furnish all necessary materials and make the required repairs and installations within a reasonable time after receipt of notice from the District. The District will give notice of observed defects with reasonable promptness. The faithful performance bond required by Section 2 hereof shall remain in full force and effect during the period covered by this guaranty, except that, instead of the faithful performance bond remaining in effect during the guaranty period, the Contractor may provide for this guaranty to be secured by a surety bond in the amount of 10 percent of the contract price or \$5,000.00, whichever is greater. Said surety bond, if furnished, shall be on a form satisfactory to the District, shall be executed by a surety company or companies satisfactory to the District, and shall remain in full force and effect during the period covered by this guaranty. Said bond, if furnished, shall be delivered to the District prior to the date of final acceptance of the work.
- 3.21 **Measurement and Payment**
- A. General - Measurement and payment shall be made in one lump sum at the completion of the project unless circumstances deem it necessary to develop a percentage-based milestone payment schedule. Measurements of the completed work shall be in accordance with, and by instruments and devices calibrated to United States Standard Measures and the units of measurement for payment, and the limits thereof, shall be made as shown on the Plans, Specifications, General Requirements, and Supplementary Conditions.
 - B. Units of Measurement – Measurements shall be in accordance with U.S. Standard Measures. A pound is an avoirdupois pound. A ton is 2,000 pounds avoirdupois. The unit of liquid measure is the U.S. gallon.
 - C. Certified Weights - When payment is to be made on the basis of weight, the weighing shall be done on certified platform scales, or when approved by the Construction Manager, on a completely automated weighing and recording system. The Contractor shall furnish the Construction Manager with duplicate

SECTION 3 – GENERAL SPECIFICATIONS

licensed weighmaster's certificates showing the actual net weights. The Owner will accept the certificates as evidence of the weights delivered.

- D. Methods of Measurement - Materials and items of work to be paid for on the basis of measurement shall be measured in accordance with the method stipulated in the particular sections involved or the description of Bid Items found in article E of this Section. In determining quantities, all measurements shall be made in a horizontal plane unless otherwise specified.

Material not used from a transporting vehicle shall be determined by the Construction Manager and deducted from the certified tag.

When material is to be measured and paid for on a volume basis and it would be impractical to determine the volume, or when requested by the Contractor in writing and approved by the Construction Manager in writing, the material will be weighed and converted to volume measurement for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the Construction Manager and shall be agreed to by the Contractor before such method of measurement of pay quantities will be adopted.

Full compensation for all expense involved in conforming to the above requirements for measuring and weighing materials shall be considered as included in the unit prices paid for the materials being measured or weighed and no additional allowances will be made therefore.

Quantities of material wasted or disposed of in a manner not called for under the Contract; or rejected loads of material, including material rejected after it has been placed by reason of failure of the Contractor to conform to the provisions of the Contract; or material not unloaded from the transporting vehicle; or material placed outside the lines indicated on the plans or given by the Construction Manager; or material remaining on hand after completion of the Contract, will not be paid for and such quantities will be deducted from the final total quantities. No compensation will be allowed for hauling rejected material.

E. Description of Bid Items

1. Summary - The Bid Amounts for each Bid Item will be used for comparative bid analysis. The Bid amounts will also form the basis of monthly progress payments. Each Lump Sum bid amount will undergo further breakdown as described later in this section. Unit prices for any unit price bid items will be the basis for monthly progress payment determinations and for any changes related to that Work item. Bid items are not intended to be exclusive descriptions of work categories and the Contractor shall determine and include in its pricing all materials, labor, and equipment necessary to complete the Work as shown and specified.

2. Description of Bid Items

Bid Item 1 - Mobilization / Demobilization

The lump sum bid for mobilization shall not exceed four percent (6%) of the total bid price. Mobilization shall include: the obtaining of insurance and bonds; moving onto the site of all equipment; submittal and approval of initial project schedule; obtaining and paying for all permits by other agencies as applicable; furnishing temporary construction utilities (temporary power, toilets, water, fences, etc.); installing construction signs; temporary buildings and field office trailer(s); and other construction all as required for the proper performance and completion of the work.

The lump sum bid for demobilization shall not exceed two percent (4%) of the total bid price. Demobilization shall include site cleaning and restoration of surfaces within the job site, post-construction meeting, removal of all temporary facilities and equipment from the work area, disconnection of the temporary construction utilities and turnover of project to the Owner.

SECTION 3 – GENERAL SPECIFICATIONS

In the event the Contractor writes in a Mobilization/Demobilization price greater than ten percent (10%) on the Bid Schedule, the Owner will pay any excess with the final Progress Payment.

Contractor may apply for payment of mobilization on a percent complete basis as the items covered in the Mobilization are being completed.

Contractor may apply for payment of demobilization after the overall project substantial completion is achieved and the project begins to demobilize.

The lump sum price shall be full compensation for the preparation and installation or submittal of these materials, and for all labor, equipment, tools and incidentals to complete this item.

Bid Item 2 - Anchored Shotcrete Wall

The lump sum amount for furnishing and installing the anchored shotcrete wall, including, but not limited to, pull-testing and pre-tensioning of rock anchors and creation and testing of shotcrete test panels. The lump sum price shall be full compensation for the preparation and installation or submittal of these materials, and for all labor, equipment, tools and incidentals to complete this item.

Bid Item 3 – Rock Slope Protection (RSP)

The unit price per ton of rock shall include all costs associated with rock slope protection, including, but not limited to clearing and grubbing, excavation and offhaul, installation of geotextile fabric, and placement of rock. The unit price shall be full compensation for the furnishment, preparation, and installation or submittal of these materials, and for all labor, equipment, tools and incidentals to complete this item.

Bid Item 4 - Rockfall Netting

The lump sum amount for rockfall netting shall include all costs associated with rockfall netting, including, but not limited to, removal and off hauling of loose rocks and debris on slope prior to placing netting and attaching the rockfall netting to the existing rockfall barrier located on the outboard road edge. The lump sum price shall be full compensation for the furnishment, preparation, and installation or submittal of these materials, and for all labor, equipment, tools and incidentals to complete this item.

Bid Item 5 - AC Pavement

The unit price per square yard of asphalt concrete pavement shall include all costs associated with the work, including, but not limited to, preparation of the subgrade, placing and compacting all backfill materials, connection with existing pavement, and achieving finish grade. The unit price shall be full compensation for the furnishment, preparation, and installation or submittal of these materials, and for all labor, equipment, tools and incidentals to complete this item.

Bid Item 6 - Soldier Pile Wall

The lump sum amount for furnishing and installing the soldier pile wall, including, but not limited to, installation and pull-testing of wire rope anchor tiebacks and placement of CLSM backfill. The lump sum price shall be full compensation for the preparation and installation or submittal of these materials, and for all labor, equipment, tools and incidentals to complete this item.

Bid Item 7 - Soil Nail Wall Facing

The unit price per square foot of soil nail wall facing shall include all costs associated with the work, including, but not limited to, preparation of surfaces to receive shotcrete, placement of primary and secondary shotcrete and reinforcement, installation of drain strips, slotted pipes, and weep holes. The unit price shall be full compensation for the furnishment, preparation, and installation or submittal of these materials, and for all labor, equipment, tools and incidentals to complete this item.

Bid Item 8 - Soil Nail Ground Anchors

The price per each soil nail ground anchor shall include all costs associated with the work, including, but not limited to, layout, drilling, grouting, grout sample collecting and strength testing, inserting

SECTION 3 – GENERAL SPECIFICATIONS

the anchor, and pull testing of the test anchors. The price per each soil nail ground anchor shall be full compensation for the furnishment, preparation, and installation or submittal of these materials, and for all labor, equipment, tools and incidentals to complete this item.

3.22 **Work Not Listed In Proposal** - It is the intent of the Plans, Specifications and Contract Documents to provide for the construction of complete and finished facilities and works of improvement unless otherwise specifically provided. Except for authorized changes, improvements will be made only on the basis of the contract items of work listed in the proposal. All other work, including the furnishing of plant, labor, materials, tools, equipment and incidentals, provided for in the Plans, Specifications and Contract Documents, or required for the proper completion of the work as a whole, for which no separate payment has been provided shall be a supplementary obligation of the Contractor and payment therefore shall be considered included in the prices paid for the various contract items of work listed in the proposal.

3.23 **Changes In Work** - No payment will be made for any work which has not been approved in writing by the District Engineer.

3.24 **Abandonment of Work**

- A. Should the Contractor abandon the work called for under the Plans and Specifications and Contract Documents, or assign his contract, or if the Contractor unnecessarily and unreasonably delays the work, or if the Contractor willfully violates any of the conditions of the work in bad faith, the District shall have the power to notify the Contractor to discontinue all work or any part thereof under this contract, and thereupon the Contractor shall cease to continue said work or such part thereof as the District may designate, and the owner shall thereupon have the power to employ such persons as it may consider desirable, and to obtain by contract, purchase, hire or otherwise, such implements, tools or materials as the owner may deem advisable to work at and be used to complete the work herein described, or such part thereof as shall not have been completed, and to use such material as it may find on the site of said work, and to charge the expense of such labor and materials, implements and tools to the Contractor and the expense so charged shall be due, or may at any time thereafter become due to the Contractor hereunder and by virtue of the contract.
- B. In the case such expense is less than the sum which would have been payable under the contract, if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference, and in case such expense shall exceed the last said amount, then the Contractor or his bondsman shall pay the amount of such excess to the District on notice to either from the District of the excess so due.

3.25 **Permits**

- A. The Contractor shall procure all permits and licenses, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the work.
- B. Permits required by governmental authorities will be obtained at Contractor's expense, and Contractor will comply with local, state and federal regulations and statutes including the Cal/OSHA requirements.

3.26 **Order Of Work**

- A. Contractor shall submit proposed schedule and order of work for project construction to Engineer for review within five (5) calendar days of the Notice to Proceed.
- B. Contractor shall establish communication with property owners affected by construction and shall cooperate with them to minimize disruption of their operations due to construction.

3.27 **Scheduling of Work**

SECTION 3 – GENERAL SPECIFICATIONS

A. Beginning Of Work And Time Of Completion

1. The Contractor shall begin work on or before the contract starting date, which will be specified in a Notice to Proceed issued by the District, and shall diligently prosecute the same to completion before the time indicated in the Invitation to Bidders Section, Paragraph 0.8, "Work Completion".
2. Preconstruction Meeting: A preconstruction meeting will be held at the time and date specified in the Invitation to Bidders Section, Paragraph 0.9, "Pre-Construction Meeting". The purpose will be to issue the Notice to Proceed and to go over the various requirements of the specifications and the Contractor's responsibilities with regard to process control, schedule, submittals, and safety.

B. Liquidated Damages

1. It is agreed by the parties to the contract, that time is of the essence and that in case all the work called for under the contract in all parts and requirements is not finished or completed within the number of calendar days as set forth in the Contract Documents, damage will be sustained by the District, and that it is, and will be, impractical and extremely difficult to ascertain and determine the actual damage which the District will sustain in the event of, and by reason of, such delay; and it is, therefore, agreed that the Contractor will pay to the District the sum of **\$1000.00 per day** for each and every calendar days delay in finishing the work in excess of the number of days prescribed; and the Contractor agrees to pay said liquidated damages herein provided for, and further agrees that the District may deduct the amount thereof from any monies due, or that may become due, the Contractor under the contract.
2. It is further agreed that in case the work called for under the contract is not finished and completed in all parts and requirements within the number of days specified, the District shall have the right to increase the number of days, or not, as may seem best to serve the interest of the District, and if the said number of days is increased, the District shall further have the right to charge the Contractor to deduct from the final payment for the work all or any part as the District may deem proper, of the actual cost of engineering, inspection and other overhead expenses which are directly chargeable to the contract, and which accrue during the period of such extension, except that cost of final surveys and preparation of final estimates shall not be included in such charges.
3. The Contractor will be granted an extension of time and will not be assessed with liquidated damages or the cost of engineering and inspection for any portion of the delay in completion of the work beyond the time named in the contract for the completion of the work caused by acts of God or of the Public enemy, fire, floods, weather conditions that prevent access to the construction sites or conducting a work activity, or freight embargoes, provided that the Contractor shall notify the Engineer in writing of the causes of delay within 5 days from the beginning of any such delay. The Engineer shall ascertain the facts and the extent of the delay, and his findings thereon shall be final and conclusive.

- C. Work By Others - The Contractor will cooperate with others that may have to work within the area. Where such work has been anticipated, allowances have been made in the time of completion. The Contractor shall cooperate with said companies and allow them to complete their work without undue hindrance or hardship.

3.28 Road Access Plan

- A. The Powerhouse Access Road is the only means of accessing the powerhouse, switchyard, and shop facilities. As such the road must be passable by vehicle a minimum of twice per day, once in the morning and once in the afternoon. The road shall be left accessible to vehicles at all times outside construction windows. If an extended road access restriction is required contractor shall coordinate with MID no less than seven (7) days in advance of the restriction. Five days after notice to proceed contractor shall submit a road access plan which details how vehicle access will be maintained throughout the project.

3.29 Relevant Legal Provisions

SECTION 3 – GENERAL SPECIFICATIONS

- A. Elimination Of Items - In case the total bid price of the project is in excess of the budgeted amount, the District reserves the right to eliminate a certain item or items prior to award of the Contract.
 - B. Inspection And Access To Records - The authorized representatives and agents of the District, shall be permitted to inspect all work, materials, payroll, records or personnel, invoices of material, and other relevant data and records.
 - C. Legal Relations And Responsibility - Certified payroll records to be submitted within two weeks of District acceptance to final project, or upon request by District. 10% of final payment may be withheld until certified payroll is submitted. For the purpose of maintaining traffic, attention is directed to Subsections: 7-1.08 "Public Convenience," 7-1.09 "Public Safety," 7-1.092 "Lane Closures," 7-1.093 "Portable Delineators," 7-1.095 "Flagging Costs" and these Contract Specifications. The costs of installing any signs, lights, flares, barricades and other facilities necessary under Subsection 7-1.08 "Public Convenience" shall be considered as included in the prices paid for the various contract items of work involved and no separate payment will be made therefore. In addition, all flagging costs shall be considered included in the prices paid for the various contract items of work involved and no separate payment will be made therefore. Any road closure, if allowed, must be approved by the governing agency at least one (1) week prior to the actual closure. Any road closure will be conditioned by the governing agency and all costs necessary to maintain any road closure, including required signing and flagging, shall be at the Contractor's expense. The costs of Traffic Control as per Subsections 7-1.09 "Public Safety," 7-1.092 "Lane Closure" and 7-1.093 "Portable Delineators" shall be considered as included in the prices paid for the various contract items of work involved and no separate payment will be made therefore. Provisions of Subsections 7-1.165 "Damage by Storm, Flood, Tidal Wave or Earthquake" shall not apply to this project.
- 3.30 **Plans** - The following drawings, including standard drawings, are referred to in these Contract Specifications and Contract as the Plans or Drawings. Said Plans are attached hereto and are an integral part of the Contract.
- A. Interpretation of Plans and Specifications
 1. It is the intent of these Plans and Specifications that the work performed under the contract shall result in a complete operating system in satisfactory working condition in respect to the functional purposes of the installations. The prices paid for the various items in the proposal shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals and doing all work necessary to complete the finished product as provided in the Plans and these Specifications.
 2. The Plans and Specifications are intended to be explanatory of each other. Any work shown on the Plans and not in the Specifications or vice versa, is to be executed as if indicated in both.
 3. Should it appear that the work to be done, or any matter relative thereto is not sufficiently detailed or explained in these Contract Specifications and Plans, the Contractor shall apply in writing to the Project Engineer for further explanation as may be necessary and shall conform to such explanation or interpretation as part of the contract, so far as may be consistent with the intent of the original Specification
 - B. Supplemental Drawings
 1. In addition to the drawings incorporated in the contract at the time of signing, the Engineer may furnish such supplemental drawings from time to time as may be necessary to clear, or to define in greater detail, the intent of the Plans and Specifications.
 2. In furnishing such additional drawings and/or instructions, the Engineer shall have the authority to make minor changes in the work, not involving extra cost, and not inconsistent with the nature of the work, and the Contractor shall have no basis for extra work claims. These supplemental drawings shall become a part of the Contract Documents, and the Contractor shall make his work conform to them.

SECTION 3 – GENERAL SPECIFICATIONS

- 3.31 **Special Requirements** - Contractor to possess "A - General Engineering Contractor" certification as shown in Division 3, Chapter 9, Contractors-Article 4 in the California Business and Professions Code.

END OF SECTION

SECTION 4 – TECHNICAL SPECIFICATIONS

PART 1 – SUMMARY OF WORK

MID plans to repair downslope portions of the access road leading to New Exchequer Dam Powerhouse by constructing a new soil nail retaining wall, replacing components of an existing soldier pile and timber lagging retaining wall, and constructing a new anchored shotcrete wall to improve long-term access to the facilities.

END OF SECTION

PART 2 – TECHNICAL SPECIFICATIONS

Specification Section	Description
037133	SHOTCRETE
313236a	SOIL NAILS
313236b	GROUND ANCHORS
313313	SCALING

PART 1: GENERAL

1.1. SCOPE

1.1.1. This Section includes materials, equipment, process, and quality control associated with installing shotcrete, geocomposite drainage material, weepholes, reinforcing steel, and anchor bearing plates and nuts, for the construction of shotcrete soil nail wall facing and anchored shotcrete wall stem as shown on the Drawings.

1.2. GENERAL PROVISIONS

1.2.1. Shotcrete shall consist of Portland cement concrete containing aggregate, with an accepted accelerator if required, pneumatically projected at high velocity onto a surface.

1.2.2. In the dry-mix process, dry materials are mixed thoroughly and transported pneumatically to a nozzle, where water, any liquid admixtures, and accelerator are introduced into the stream feed and then immediately sprayed onto the target surface with compressed air.

1.2.3. In the wet-mix process, all shotcrete material are mixed thoroughly within a batch/mix plant, transported via positive displacement pump to a nozzle where accelerator, if required, is introduced into the stream feed, and then immediately sprayed onto the target surface with compressed air.

1.3. REFERENCES

1.3.1. The work and materials of this Section shall be in conformance with the following standards, except as modified and supplemented herein:

1.3.1.1	ACI	American Concrete Institute
	ACI 117	Specifications for Tolerances for Concrete Construction and Material
	ACI 211.1	Standard Practice for Selecting Proportions for Normal, Heavy weight, and Mass Concrete
	ACI 301	Specifications for Structural Concrete for Buildings
	ACI 305R	Hot Weather Concreting
	ACI 306R	Cold Weather Concreting
	ACI 308	Recommended Practice for Curing Concrete
	ACI 315	Details and Detailing of Concrete Reinforcement
	ACI 318	Building Code Requirements for Reinforced Concrete
	ACI C-06	Application and Use of Shotcrete
	ACI 506R	Guide to Shotcrete
	ACI 506.2	Specification for Shotcrete

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ACI 546R	Concrete Repair Guide
ACI CCS4	Shotcrete for Craftsman
ACI CP 60	Shotcrete Nozzleman Craftsman Workbook
SP-66	Detailing Manual

1.3.1.2 ASTM American Society for Testing and Materials

ASTM A36	Standard Specification for Carbon Structural Steel
ASTM A563	Standard Specification for Carbon and Alloy Steel Nuts
ASTM A615	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM A1064	Standard Specification for Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C42	Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C143	Standard Test Method for Slump of Hydraulic Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C231	Test Method for Air Content of Freshly Mixed Concrete by Pressure Method
ASTM C260	Standard Specification for Air Entraining Admixtures for Concrete
ASTM C295	Guide for Petrographic Examination of Aggregates for Concrete ASTM C309 Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete
ASTM C494	Chemical Admixtures for Concrete
ASTM C566	Total Evaporable Moisture Content of Aggregate by Drying
ASTM C618	Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C881	Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C1017	Chemical Admixtures for Use in Producing Flowing Concrete

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	ASTM C1116	Standard Specifications for Fiber-Reinforced Concrete and Shotcrete
	ASTM C1140	Standard Practice for Preparing and Testing Specimens from Shotcrete Test Panels
	ASTM C1141	Standard Specification for Admixtures for Shotcrete
	ASTM C1385	Standard Practice for Sampling Materials for Shotcrete
	ASTM C1141	Standard Specification for Admixtures for Shotcrete
	ASTM C1436	Standard Specification for Materials for Shotcrete
	ASTM C1480	Specification for Packaged, Pre-Blended, Dry, Combined Materials for Use in Wet or Dry Shotcrete Applications
	ASTM C1550	Standard Test Method for Flexural Toughness of Fiber-Reinforced Concrete
	ASTM C1604	Standard Test Method for Obtaining and Testing Drilled Cores of Shotcrete
1.3.1.3	CRSI	Concrete Reinforcing Steel Institute, “Manual of Standard Practice”
1.3.1.4	Caltrans	State of California, Department of Transportation, Standard Specifications, most recent edition
1.3.1.5	AASHTO	American Association of State Highway and Transportation Officials
	M182	Standard Specification for Burlap Cloth Made from Jute or Kenaf
1.3.1.6	USACE	United States Army Corps of Engineers
	CRD-C572-74	Specifications for Polyvinylchloride (PVC) Waterstop
1.3.1.7	NSF/ANSI	National System Foundation, Standard 61, Drinking Water System Components

1.4. SUBMITTALS

- 1.4.1. Submit all specified items to MID for acceptance prior to the start of construction unless otherwise noted.
- 1.4.2. Specifications and data shall be submitted for review of equipment proposed for the project, including compressed air equipment, proposed arrangements, and capacities.
- 1.4.3. Submit data describing the equipment to be used for proportioning, mixing, and transporting shotcrete. In the case of ready-mixed shotcrete, submit evidence that the ready-mix plant is certified by the

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National Ready Mixed Concrete Association Plant Certification program or an equivalent program that satisfies the requirements of ASTM C94.

1.4.4. Submit drawings showing locations of construction joints; locations of embedment and block outs; and estimated volume of shotcrete to be placed in each lift including support and anchor details; reinforcement materials and grades and details of fabricating, bending, and placing reinforcement; number and location of splices; special reinforcement required for openings through shotcrete structures; formwork materials and details of formwork fabrication, assembly, and support.

1.4.5. Submit the following as specified elsewhere in this section:

- Certified test reports
- Certificates of Compliance
- Results of aggregate petrographic examination
- Mix designs
- Preconstruction test reports
- Field quality control reports
- Batch tickets

1.4.6. Submit samples of shotcrete materials as requested by MID.

1.4.7. Submit Product Data for synthetic fibers, curing materials, sealers and hardeners, drainage components.

1.4.8. The Contractor shall submit Product Data for proposed equipment for mixing and applying shotcrete.

1.4.9. Contractor shall prepare a cold weather concrete plan and submit to MID for review when such conditions are anticipated. The cold weather concrete plan shall contain the elements addressed by ACI 306.1 "Standard Specifications for Cold Weather Concreting."

1.4.10. Submit procedures for hot and cold weather concreting when such conditions are anticipated.

1.4.11. Submit a copy of current ACI Shotcrete Nozzleman Certification for each assigned nozzleman.

1.4.12. The Contractor shall submit the proposed shotcrete mix designs for each class of shotcrete specified including the following information establishing the basis of proportioning the mixes:

- The calculated standard deviation and required average strength for the batch plant (based on field strength test records from this past 24 months using similar mixes within 1000 psi of the specified strength).
- Documentation showing that the proposed mix designs will produce an average strength greater than the required average strength.

1.5. QUALITY ASSURANCE

1.5.1. Installer Qualifications: Nozzle operators for the Project shall have at least 2 years of applicable experience. Nozzle operators shall be ACI Shotcrete Nozzleman certified in Wet-Mix Process for

SECTION 037133: SHOTCRETE

Vertical and Overhead Positions, or ACI Shotcrete Nozzleman certified in Dry-Mix Process for Vertical and Overhead Positions (if proposed).

1.5.2. Comply with ACI 506.2, "Specification for Shotcrete."

1.5.3. Contractor shall furnish all required samples and perform all other required testing at its expense.

1.5.4. Methods of sampling and testing shall be as specified in ACI 301 and in other referenced standards.

1.5.5. Shotcrete mix design

1.5.5.1. No shotcrete shall be used in the work unless the mix design for that shotcrete has been accepted by MID.

1.5.6. Certificates of Compliance: Acceptability of the following materials will be based upon documentation furnished by the manufacturer identifying each batch of material and certifying compliance with the requirements specified:

- Portland cement
- Admixtures and curing materials
- Aggregates
- Pozzolan & fly ash
- Reinforcing Steel
- Steel bearing plates and nuts

1.6. STORAGE OF MATERIALS

1.6.1. Cement and fly ash shall be stored in suitable moisture proof enclosures. Cement and fly ash which have become caked or lumpy shall not be used.

1.6.2. All materials shall be stored, transported, handled and mixed so that water bodies are not contaminated by materials or runoff.

1.6.3. Reinforcement shall be carefully handled and shall be stored on supports which will keep the steel from contact with the ground.

1.6.4. Fine and coarse aggregate shall be regarded separately, and thus be stored separately. Aggregates shall be stored so that segregation and the inclusion of foreign materials are prevented. The bottom 6 inches of aggregate piles in contact with the ground shall not be used.

1.6.5. Care shall be taken in storing and handling of shotcrete materials to prevent segregation of aggregates, intermixing of the separate sizes of aggregates prior to batching, contamination of the materials by dirt or other foreign substances, damage to cement by dampness or weather, retention of free surface water

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in the aggregates, or excessive chipping and breaking of coarse aggregate which might produce undersize accumulations.

- 1.6.6. Geocomposite drainage strips shall be provided in rolls wrapped with a protective covering and stored in a manner which protects the fabric from mud, dirt, dust, debris, and shotcrete rebound. Protective wrapping shall not be removed until immediately before the drainage strip is installed. Extended exposure to ultraviolet sunlight shall be avoided.

PART 2: PRODUCTS

2.1 SHOTCRETE MATERIALS

- 2.1.1 Cement shall be clean, fresh, Type II, low alkali, moderate heat, Portland cement conforming to ASTM C150.

2.1.2 Aggregates

- 2.1.2.1 Aggregates shall conform to ASTM C33 and shall be hard, dense, clean, sound and free of deleterious substances. Hard durable aggregate material shall be obtained from established sources with proven record of producing good quality concrete.

- 2.1.2.2 The maximum aggregate sizes shall be as follows:

<u>Shotcrete Class Designation</u>	<u>Maximum Size</u>
Dry Shotcrete	Fine aggregate per ASTM C1436 Grading No. 1. with maximum size 3/8 inch (concrete sand)
Wet Shotcrete	Fine and coarse aggregates with maximum size 3/8 inch per ASTM C1436 Grading No. 2.

- 2.1.2.3 Fine aggregates shall meet sand equivalent of not less than 75 when tested in accordance with CMM Test Method No. Calif. 217. Fineness modulus for fine aggregates shall be between 2.0 and 4.0.

- 2.1.2.4 Coarse-aggregate deleterious limits shall be Class 3S according to ASTM C33.

- 2.1.2.5 Alkali-reactive aggregates are prohibited. Contractor shall provide petrographic examination data to demonstrate that the proposed aggregate material does not contain alkali-reactivity.

- 2.1.3 Water shall comply with ASTM C94/C94M and shall be potable, clean, fresh, and shall be free from deleterious substance, including silt, oil, acids, alkali, salts, organic substances, and shall not contain chlorides calculated as CI in excess of 1,000 ppm or no sulfates calculated as S04 in

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excess of 1,000 ppm.

2.1.4 Admixtures

2.1.4.1 Admixtures: ASTM C1141, Class A (liquid) or Class B (non- liquid) subject to acceptance by MID. Shotcrete admixtures shall not contain more than 0.1 percent chloride ions. The use of calcium chloride is prohibited. Admixtures shall be compatible and stored in a manner that avoids contamination, evaporation, freezing, overheating, or any other damage. If an additive, which will cause discoloration, is used in exposed concrete, it shall be used uniformly.

2.1.4.2 Air-entraining agent: ASTM C260. Shotcrete shall contain a sufficient amount of an air- entraining agent to produce the specified entrapped air, as recommended in ACI 301. Test for air content shall be performed in accordance with ASTM C231. Tests shall be made at least once per day during shotcrete operations.

2.1.4.3 Plasticizers: ASTM C1017 as accepted by MID.

2.1.4.4 Fly Ash: ASTM C618, Class C or Class F.

2.1.4.5 Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or Grade

2.1.4.6 Silica Fume: ASTM C1240, amorphous silica.

2.2 REINFORCING MATERIALS

2.2.1 Steel bars: ASTM A 615, Grade 60. All bars shall be deformed billet bars kept clean and free of rust scales.

2.2.2 Welded steel wire reinforcement (plain or deformed, as-drawn or galvanized): ASTM A1064.

2.2.3 Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire fabric in place; manufactured according to CRSI's "Manual of Standard Practice". Precast concrete reinforcement supports ("dobies") shall be used when supporting reinforcing steel against earth. Dobies shall have a compressive strength equal to or greater than the specified shotcrete compressive strength. Plastic, fiberglass, or epoxy coated steel form stakes may also be used against earth. Wooden form stakes shall not be used. When supporting reinforcing steel against existing canal lining, Class 3 supports shall be used, and may include concrete spikes, nails, or mechanical anchors.

2.2.4 Synthetic fibers: ASTM C1116 macro/micro fiber blend, such as Novomesh 950 by Propex or accepted equivalent. Fibers shall be batched in conformance with the manufacturer's instructions to prevent balling of the fibers.

2.3 DRAINAGE MATERIALS

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- 2.3.1 Geocomposite drainage strip: Miradrain 6000, Amerdrain 500, or equal. J-Drain SWD Side Outlet or equal.
 - 2.3.2 PVC pipe: ASTM 1785 Schedule 40 PVC, solid and perforated wall, classification 12454-B or 12354-C, wall thickness SDR with solvent weld or elastomeric gasket joints.
 - 2.3.3 PVC fittings: ASTM D3034, cell classification 12454-B or 12454-C, wall thickness SDR35, with solvent weld or elastomeric gasket joints.
 - 2.3.4 Solvent cement: ASTM D2564
 - 2.3.5 Primer: ASTM F656
- 2.4 FORM MATERIALS
- 2.4.1 When required for proper placement, form-facing panels shall provide continuous, straight, smooth, concrete surfaces. Furnish panels in largest practical sizes to minimize number of joints.
- 2.5 CURING MATERIALS
- 2.5.1 Liquid membrane-forming type shall conform to ASTM C309, Type 1, Class A or B, complying with California Air Quality Control regulations. For curing compounds in contact with potable water, conformance to NSF 61 is required. For NSF 61-compliant compounds, Section 6.1 of ASTM C309 shall be modified to read "0.68 Kg/m²" max water loss."
 - 2.5.2 Polyethylene film or white burlap-polyethylene sheet materials shall conform to ASTM C171.
 - 2.5.3 Burlap sheet shall conform to AASHTO M182, Class 3 or 4.
- 2.6 SHOTCRETE MIXES
- 2.6.1 Prepare design mixtures for each type and strength of shotcrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 506.2, per the requirements herein.
 - 2.6.2 Cementitious Materials
 - The minimum amount of fly ash used shall be 15% by weight of the total cementitious materials and maximum amount shall be 25%.
 - 2.6.2.1 The combined portions of fly ash, ground granulated blast-furnace slag, and silica fume shall not exceed 25 percent of Portland cement by weight.

2.7 SHOTCRETE EQUIPMENT

- 2.7.1 Mixing equipment shall be capable of thoroughly mixing shotcrete materials in sufficient quantities to maintain continuous placement.

Dry-mix delivery equipment shall be capable of discharging aggregate-cement mixture into delivery hose under close control and maintaining continuous stream of uniformly mixed materials at required velocity to discharge nozzle. Equip discharge nozzle with manually operated water-injection system for directing even distribution of water to aggregate-cement mixture.

- 2.7.1.1 Provide uniform, steady supply of clean, compressed air to maintain constant nozzle velocity while simultaneously operating blow pipe for cleaning away rebound.
- 2.7.1.2 Provide water supply with uniform pressure at discharge nozzle to ensure uniform mixing with aggregate-cement mix. Provide water pump to system if line water pressure is inadequate.
- 2.7.2 Wet-mix delivery equipment shall be capable of discharging aggregate-cement-water mixture accurately, uniformly, and continuously.

PART 3: EXECUTION

3.1 SHOTCRETE PRODUCTION

- 3.1.1 Shotcrete may be ready-mixed or site-mixed as specified in ASTM C94 and ACI 301.
- 3.1.2 Addition of water in excess of the amount specified in the accepted design mix(es) will not be permitted.
- 3.1.3 Wet-mix shotcrete shall be discharged within 90 minutes following the first intermingling of water and cement or cement and aggregates, whichever occurs first. If the air temperature is 85 degrees Fahrenheit or higher, the time limit specified above shall be reduced to 60 minutes unless MID's acceptance has been obtained for means to maintain acceptable shotcrete quality without such time reduction.
- 3.1.4 The temperature of the shotcrete at the time it is discharged from the transit mixer shall not exceed 85 degrees Fahrenheit, unless otherwise specified on the Drawings. Minimum temperature shall be as specified in ACI 306.1.
- 3.1.5 Shotcrete shall not be subjected to more than 250 total revolutions of any combination of mixing and agitating equipment following the first introduction of aggregates to the mixer.
- 3.1.6 Mixed shotcrete shall be homogeneous in distribution of materials and uniform in consistency and color.

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3.1.7 Dry-mixed shotcrete: For the purpose of this specification, dry-mixed shotcrete is defined as ready-mixed concrete produced by a process in which the dry ingredients are transported to the jobsite in a truck mixer and the addition of liquid ingredients and the completion of the mixing is accomplished at the jobsite. Dry-mixed shotcrete will be permitted and shall conform to the requirements for ready-mixed shotcrete as modified and augmented by the following:

3.1.7.1 Mixing water and admixtures in liquid form shall be batched at the batching plant into a separate tank mounted on the truck mixer, and shall be added at the jobsite under pressure at both front and rear of the drum with the drum rotating at mixing speed. Shotcrete shall be placed promptly upon completion of mixing.

3.1.7.2 The maximum allowable times between intermingling of cement and aggregates and placing of the shotcrete in its final position in the forms may be increased by 50 percent above the times specified above if all liquid ingredients are added at the jobsite. No increase in the maximum allowable number of revolutions of mixing and agitating equipment will be permitted.

3.1.8 Batching

Furnish and utilize tools and equipment required to accurately determine and control the specified quantities of the various materials in the shotcrete.

3.1.8.1 Do not mix shotcrete until acceptance of submittals outlining the proportions and ingredients has been obtained from MID.

3.1.8.2 At the time of batching, aggregate shall be dried or drained to obtain a stable moisture content that is not less than saturated surface dry nor shall the moisture content of fine aggregate exceed saturated surface dry by more than 8 percent. See Paragraph 1.6 for other storage and handling requirements.

3.1.8.3 Shotcrete shall be batched in a mechanical batcher of an accepted type and capacity equipped with accepted devices for measuring water, cement, sand, and the two sizes of coarse aggregate and batch counting that can be accurately set and locked.

3.1.8.3.1 Measurement: Shotcrete materials shall be measured for each batch by direct weighing. Prior to startup, weighing and measuring equipment shall be tested.

3.1.8.3.2 Accuracy of Weighing: Equipment shall be checked by absolute weight. Equipment for batching by mass shall be capable of the accuracy specified in ASTM C94/C94M.

3.1.8.3.3 Gradation as Batched: Gradation of each primary size of aggregate as batched shall conform to the grading requirements of ASTM C33. The combined grading shall conform to ACI 506R and ASTM 1436.

3.1.8.3.4 Admixtures shall be added at the mixer by the use of accepted

measuring dispensers.

3.1.9 Wet-Mix Shotcrete Mixing and Delivery

3.1.9.1 Shotcrete shall be mixed according to ASTM C94 to produce a uniform distribution of materials and for a period of not less than 1-1/2 minutes after the ingredients are in the drum or for the number of revolutions specified by the Manufacturer. The foregoing minimum mixing period shall be increased by 30 seconds for each additional cubic yard capacity greater than one cubic yard. Retempering shotcrete shall be in accordance with ASTM C94, Section 11. Mixer shall be completely discharged before being recharged and kept clean and in good working order. Mixer shall not be overloaded.

3.1.9.2 High Speed Mixers: Mixing time shall be subject to the acceptance of MID.

3.1.9.3 Transit Mixers: When transit-mixed shotcrete is used, each batch of shotcrete shall be mixed for not less than 70 nor more than 100 revolutions of the drum or blades at the rate of rotation designated by the Manufacturer of the equipment on the data plate on the truck as mixing speed. Any additional mixing shall be at the speed designated by the Manufacturer of the equipment as agitating speed. Materials, including water, shall be in the mixer drum before starting the count of the number of revolutions of mixing.

3.1.10 Dry-Mix Shotcrete Mixing and Delivery

3.1.10.1 For dry-mix shotcrete mixing, the mixing equipment shall be capable of thoroughly mixing the materials in sufficient quantity to maintain placing continuity and be capable of discharging all mixed material without any carryover from one batch to the next. The equipment shall be capable of discharging the aggregate-cement mixture into the delivery hose and delivering a continuous smooth stream of uniformly mixed material to the discharge nozzle. The discharge nozzle shall be equipped with a manually operated water injection system for directing an even distribution of water through the aggregate-cement mixture. The water valve shall be capable of ready adjustment to vary the quantity of water and shall be convenient to the nozzleman. The water pressure at the discharge nozzle shall be sufficiently greater than the operating air pressure to ensure that the water is completely mixed with the other materials. If the line water pressure is inadequate, a water pump shall be introduced into the line. The water pressure shall be steady. The delivery equipment shall be thoroughly cleaned at the end of each shift. Equipment parts, especially the nozzle liner and water ring, shall be regularly inspected and replaced as required.

3.2 SURFACE PREPARATION FOR PLACEMENT OF SHOTCRETE

3.2.1 The surface to receive shotcrete shall be trimmed to final line and grade, well drained, and cleared of loose materials, mud, rebound, overspray, or other foreign matter. The surface shall be moistened to a degree that will ensure a firm foundation and prevent absorption of water from

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the shotcrete. Shotcrete shall not be placed on frozen surfaces.

3.2.2 Control of Seepage and Runoff: Seepage and runoff shall be stopped or diverted from the surface against which shotcrete is to be placed. Any pipes installed to handle seepage, which are ultimately encased in shotcrete, shall be allowed to drain freely and shall not be capped.

3.2.3 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 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.

3.3 FORMS

3.3.1 General: Design, erect, support, brace, and maintain forms, according to ACI 301, to support shotcrete and construction loads and to facilitate shotcreting if necessary. Construct forms so shotcrete members and structures are secured to prevent excessive vibration or deflection during shotcreting.

3.3.1.1 Fabricate forms to be readily removable without impact, shock, or damage to shotcrete surfaces and adjacent materials.

3.3.1.2 Construct forms to required sizes, shapes, lines, and dimensions using ground wires and depth gages to obtain accurate alignment, location, and grades in finished structures. Construct forms to prevent mortar leakage but permit escape of air and rebound during shotcreting. Provide for openings, offsets, blocking, screeds, anchorages, inserts, and other features required in the Work.

3.3.2 Provide necessary openings, chases, recesses, bulkheads, keyways, and screeds in formwork. Determine sizes and locations from trades providing such items. Accurately place and securely support items built into forms.

3.4 WALL DRAINAGE

3.4.1 Wall Drainage Network:

3.4.1.1 Install and secure all elements of the wall drainage network as shown on the Drawings. The drainage network shall consist of installing geocomposite drain strips and PVC connection pipes as shown on the Drawings or as directed by the Engineer. All elements of the drainage network shall be installed prior to shotcreting.

3.4.1.2 Unanticipated subsurface drainage features exposed in the excavation cut face shall be captured independently of the wall drainage network and shall be mitigated prior to shotcrete application.

3.4.2 Geocomposite Drain Strips:

3.4.2.1 Install geocomposite drain strips as shown on the Drawings. The drain strips shall be at least 12 inches wide and placed with the geotextile side against the soil side. Secure the strips to the excavation face and prevent shotcrete from contaminating the soil side of the geotextile. Drain strips will be continuous. Splices shall be made with a 12 inch minimum overlap such that the flow of water is not impeded. Repair damage to the geocomposite drain strip, which may interrupt the flow of water.

3.4.3 Weepholes:

3.4.3.1 Weepholes shall be provided through the shotcrete facing to drain water from behind the facing. Install as shown on the Drawings. Cover the end of the pipe contacting the soil with a drainage geotextile. Prevent shotcrete intrusion into the discharge end of the pipe.

3.5 PLACEMENT OF REINFORCEMENT

3.5.1 Reinforcement shall be clean of loose rust and mill scale, earth, ice, and other materials that weaken shotcrete bonding. Rust and scale shall be removed in accordance with ICRI Technical Guideline 310.1R. Reinforcement shall be kept clean from mud or debris on the job site. Reinforcement shall not be dragged on wet or muddy subgrade without the use of a dolly or skid to prevent contamination. Where subgrade is wet or muddy, reinforcement shall be staged on blocks such that the entire length of reinforcement is elevated above the subgrade.

3.5.2 Reinforcement shall be placed in accordance with the CRSI “Manual of Standard Practice”.

3.5.3 Reinforcement shall be accurately positioned and securely tied in place to prevent displacement during shotcrete placement operations. Reinforcement shall be supported with bar supports, bolsters, chairs, spacers, and other devices as required to maintain minimum concrete cover.

3.5.4 Set wire ties with ends directed into shotcrete, not toward exposed shotcrete surfaces.

3.5.5 Reinforcing bars and welded wire fabric shall be spliced as indicated, by lapping and securely wiring together. Where the design allows, direct contact of lap splices should be avoided; non-contact lap splices are preferred. Non-contact lap splices shall have a minimum transverse spacing of at least three times the diameter of the largest bar at the splice, and a maximum spacing of one-fifth the lap length or 6 inches, whichever is less. Splices at locations other than those indicated are subject to the acceptance of the MID’s Engineer. Mechanical splices may be used if they are structurally equivalent to welded splices and are accepted by MID. In any case, placement of reinforcing shall be such that acceptable encasement of reinforcement steel can be achieved.

3.5.6 Welded wire reinforcement shall be placed in the center of the finished shotcrete section unless otherwise indicated on the Drawings. The fabric shall be lapped not less than two meshes and

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shall be tied with No. 16 annealed wire. Where new shotcrete is to be placed over existing shotcrete, the new welded wire fabric shall be anchored to the existing reinforcement on existing shotcrete.

Field welding of reinforcement is not permitted.

- 3.5.7 Supports for welded wire reinforcement and reinforcing steel bar shall be spaced no greater than 4 feet apart. Adjacent rows of supports shall be staggered by 2 feet.
- 3.5.8 Field bending of reinforcement is allowed up to a maximum bend angle of 90 degrees.
- 3.5.9 Field cutting of reinforcing is allowed.
- 3.5.10 Reinforcement shall be placed to clear anchor bolts and other embedded items.
- 3.5.11 The Contractor shall provide a minimum of 2 inches of shotcrete coverage over the reinforcement, unless otherwise indicated on the Drawings.
- 3.5.12 Placing tolerance shall conform to ACI 117.
- 3.5.13 The Contractor shall place welded wire reinforcement, rolled flat and held firmly in place against vertical or transverse movements, and as shown on the Drawings.

3.6 JOINTS

- 3.6.1 Construction joints are joints that are purposely placed in concrete to facilitate construction, reduce initial shrinkage stresses and cracks, allow time for installation of embedded metal work, or allow for subsequent placing of other concrete. Bond is required at construction joints regardless of whether or not reinforcement is continuous across joint.
- 3.6.2 Construction joints for shotcrete shall be tapered to a 1:1 slope with a shallow edge form, about 1 inch thick, where the joint is not subject to compression loads. Construction joints shall be non-tapered (square) where joint is perpendicular to main reinforcement unless otherwise noted on the drawings. If non-tapered 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 saturated surface dry prior to the application of additional shotcrete. Continue reinforcement through construction joints.

3.7 PLACEMENT OF SHOTCRETE

- 3.7.1 Apply shotcrete according to ACI 506.2.
- 3.7.2 Shotcrete temperature as delivered shall not exceed 85° F. If the definition of “cold weather” is met at the site, concrete temperature as delivered shall not exceed 75° F.

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- 3.7.3 All Shotcrete layers shall be built up to their specified thickness without cold joints, laminations, or sloughing of freshly placed material. However, each layer thickness shall be placed in one continuous operation except where there is evidence of sagging, excess moisture, or other defects, in which case no further Shotcrete shall be placed over the defective areas until they have been cut out and replaced by fresh satisfactory shotcrete. The minimum thickness of any shotcrete placement shall be 2 inches unless noted otherwise on the Drawings.
- 3.7.4 The temperature of the mixture shall be above 38°F at the time of mixing. The mixture shall be uniform and shall be continuously supplied to the delivery equipment so as to assure uninterrupted operation.
- 3.7.5 Shotcrete showing evidence of initial set prior to placement shall be discarded.
- 3.7.6 Provide a supply of clean, 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.
- 3.7.7 Nozzlemen shall maintain the nozzle about 3 feet from the placement surface. The nozzleman shall have complete and safe freedom of movement. Shotcrete is to be applied and in such a position that the material shall impinge as nearly as possible at right angles to the surface except at interior corners.
- 3.7.8 The Contractor shall provide joints, side forms, and shooting strips as required; and shall establish thickness, surfaces, and finish lines using measuring pins and gaging wires.
- 3.7.9 Shotcrete shall be placed in a manner that will result in minimum rebound or spatter and avoid contaminating adjacent water or other surrounding areas according to best practices. The Contractor shall maintain uniform velocity and constant pressure during the application of shotcrete. For the dry-mix process, the Contractor shall not apply materials that have been mixed for more than 45 minutes.
- 3.7.10 After shotcrete has been placed to the specified thickness, the Contractor shall check surfaces with a template or alternatively approved straight edge. Depressions shall be filled and finish surfaces shall be smooth and uniform. The Contractor shall remove loose shotcrete to its full depth and refill the area with fresh mortar.
- 3.7.11 Contractor shall control thickness, method of support, air pressure, and/or water content of shotcrete to preclude sagging or sloughing off. Discontinue shotcreting or provide suitable means to screen the nozzle stream if wind or air currents cause separation of the nozzle stream during placement.
- 3.7.12 Dampen absorptive substrate surfaces prior to placement of shotcrete to facilitate bond and to reduce the possibility of shrinkage cracking developing from premature loss of the mixing water.

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- 3.7.13 Broom or similarly scarify the surface of freshly placed shotcrete to which, after hardening, additional layers of shotcrete are to be bonded. Dampen surface just prior to application of succeeding layers.
- 3.7.14 Shotcrete shall be placed without exceeding installation tolerances permitted by ACI 117. Use adequate ground wires or other accepted means to establish the thickness, surface planes, and finish lines of the shotcrete. Maintain specified tolerances by keeping ground wires secure and taut.
- 3.7.15 Fill with sound material all corners and any area where rebound cannot escape or be blown free, followed by adjacent flat areas. Complete the corners between the web and the flanges of structural steel before application to the flat areas.
- 3.7.16 Placement around reinforcement
 - 3.7.16.1 The nozzle shall be held at such distance and angle to place material behind reinforcement before any material is allowed to accumulate on its face. In the dry-mix process additional water may be added to the mix when encasing reinforcement to facilitate a smooth flow of material behind the bars.
 - 3.7.16.2 Maintain reinforcement in position during shotcreting. Place shotcrete to completely encase reinforcement and other embedded items. Maintain steel reinforcement free of overspray, and prevent buildup against front face during shotcreting.
 - 3.7.16.3 Shotcrete shall have minimum cover in accordance with ACI 318 over reinforcement and a minimum cover of 1 ½ inch over welded wire fabric reinforcement.
- 3.7.17 Do not place shotcrete if drying or stiffening of the mix takes place at any time prior to delivery to the nozzle. Do not use rebound or previously expended material in the shotcrete mix. Remove all overspray or rebound prior to final set and before placement of shotcrete material on such adjacent surfaces. Install barriers between the shotcrete-placement area and surrounding areas if required to prevent overspray contamination
- 3.7.18 Shotcrete rebound and spatter from adjacent areas shall be cleaned and prevented from contaminating surrounding water or other areas.
- 3.7.19 The Contractor shall remove and replace with all shotcrete which lacks uniformity, exhibits segregation, honeycomb, laminations, or which contains dry patches, voids or sand pockets.
- 3.7.20 Placement shall be interrupted in case of sagging, excessive moisture, rebound pockets, or other

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defects. All defective shotcrete shall be cut out, and all laitance shall be removed by carefully performed light brooming before placement may be resumed.

3.7.21 Cold-Weather Shotcreting: Mix, place, and protect shotcrete according to ACI 306.1 and as follows. Protect shotcrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

3.7.21.1 Discontinue shotcreting when ambient temperature is 40 deg F and falling.

3.7.21.2 Uniformly heat water and aggregates before mixing to obtain a shotcrete shooting temperature of not less than 55 degrees F and not more than 75 degrees F.

3.7.21.3 Do not use frozen materials or materials containing ice or snow.

3.7.21.4 Do not place shotcrete on frozen surfaces or surfaces containing frozen materials.

3.7.21.5 Do not use calcium chloride, salt, or other materials containing antifreeze agents.

3.7.22 Hot-Weather Shotcreting: Mix, place, and protect shotcrete according to recommendations of ACI 305R when hot-weather conditions and high temperatures would seriously impair quality and strength of shotcrete. Cool ingredients before mixing to maintain shotcrete temperature at time of placement below 85 degrees Fahrenheit for wet mix.

3.8 FINISHING

3.8.1 Exposed shotcrete surfaces on anchored shotcrete wall shall have a smooth trowel finish. Exposed shotcrete surfaces on soil nail wall shall have a 'nozzle finish'.

3.9 ANCHORAGE

3.9.1 Attach a bearing plate and nut to each anchor head assembly as shown on the Drawings. Before the shotcrete's initial set, uniformly seat the plate on the shotcrete by hand wrench tightening the nut. Where uniform contact between the plate and the shotcrete cannot be provided, set the plate in a bed of grout. After grout has set for 24 hours, hand wrench tighten the nut. Embed the bearing plate and nut in the wall as shown on the Drawings. Ensure full encapsulation of the bearing plate and nut free of any voids or pockets behind the plate. Ensure bearing plates with headed studs are located within the tolerances shown on the Plans or specified herein.

3.10 CURING AND PROTECTION

3.10.1 Shotcrete shall be cured in accordance with ACI 308, and as additionally specified herein. Protect freshly placed shotcrete from premature drying and excessive cold or hot temperatures.

3.10.2 Begin curing of shotcrete with one of the following methods immediately after placing and

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finishing but not before free water, if any, has disappeared from shotcrete surface.

- 3.10.2.1 Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - 3.10.2.1.1 Water.
 - 3.10.2.1.2 Continuous water-fog spray.
 - 3.10.2.1.3 Water-saturated absorptive covers or moisture-retaining covers. Lap and seal sides and ends of covers with 12-inch lap over adjacent covers.
- 3.10.2.2 Curing Compound: Apply uniformly in continuous operation by power spray according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - 3.10.2.2.1 Do not apply curing compound to surfaces to receive additional applications of shotcrete.
 - 3.10.2.2.2 Apply curing compound to float finish or light broom finish at rate of 1 gal./200 sq. ft.
 - 3.10.2.2.3 Apply curing compound to natural gun finish or flash-coat shotcrete at rate of 1 gal./100 sq. ft. in two applications at 90 degree angles to each other.
- 3.10.2.3 Cure formed shotcrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- 3.10.3 The Contractor shall not discontinue curing until the results of seven-day compression tests representing parts of a structure being cured have been reported to MID.
- 3.10.4 When seven-day compression test cylinders indicate that the 28-day test strengths of in-place shotcrete may be less than 90 percent of the design strength, the Contractor shall provide additional curing for those parts of the structure so represented, as directed by MID. This provision shall not relieve the Contractor of his responsibility to provide shotcrete of adequate strength, nor constitute a waiver of any other Contract requirements regarding the strength of shotcrete.
- 3.10.5 Under warm and hot weather conditions, shotcrete shall be maintained in a moist condition, by covering the curing compound, or keeping constantly wet with water for a minimum of 7 days or by other accepted methods, commencing as soon as possible after shooting, or by the use of an accepted curing compound, complying with ASTM C309, Types 2 or 3. Rate of application

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of curing compound shall be per manufactures specification.

- 3.10.6 Under cold weather conditions, shotcrete shall be protected in accordance with the accepted cold weather concrete plan or ACI 306.1
- 3.11 No shotcrete shall be placed when the ambient temperature is likely to be less than 40°F during the curing period except when protective measures, accepted by MID, have been taken.
- 3.12 REPAIR AND PATCHING
 - 3.12.1 Contractor shall repair or patch defective shotcrete in accordance with ACI 301 and 546R.
 - 3.12.2 Shotcrete shall be considered defective for the following reasons:
 - 3.12.2.1 Mean compressive strength of each set of three unreinforced cores is less than 85 percent of specified compressive strength, or with an individual core less than 75 percent of specified compressive strength.
 - 3.12.2.2 Mean compressive strength of each set of three unreinforced cubes is less than design compressive strength or an individual cube less than 88 percent of specified compressive strength.
 - 3.12.2.3 Shotcrete shows cracks, pour joints, rock pockets, voids, spalls, fins, discoloration, or other defects that, in the opinion of MID, could adversely affect shotcrete structural adequacy or architectural integrity. For such cases, collect and grade cores per ACI 506.2 to determine if finish product is defective. Number and location of samples shall be selected by MID.
 - 3.12.3 Defective shotcrete shall be subject to removal and replacement by the Contractor at no additional cost to MID unless MID determines repairs and patching are feasible.
 - 3.12.4 Defective areas larger than 48 square inches or 2 inches deep shall be removed and replaced.
 - 3.12.5 Shotcrete that is delaminated or exhibits laminations, voids, or sand/rock pockets exceeding limits for specified core grade of shotcrete shall be removed and replaced.
 - 3.12.5.1 Remove unsound or loose materials and contaminants that may inhibit bond of shotcrete repairs.
 - 3.12.5.2 Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 3/4 inch deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders.
 - 3.12.5.3 Dampen surfaces and apply new shotcrete.

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3.12.6 All repairs shall be made within 1 week from the time the deficiency is discovered. All unacceptable materials shall be removed and repaired by the following procedures:

3.12.6.1 Minor patching may be accomplished with a dry-pack mixture, or with materials as accepted by MID. Patches that exceed 0.1 cubic foot in volume shall receive a brush coat of accepted epoxy resin meeting ASTM C881, 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.

3.12.6.2 Core holes shall be filled solid with a dry-pack mixture after being cleaned and thoroughly dampened.

3.13 QUALITY CONTROL

3.13.1 In addition to the information specified in ASTM C94 to be provided on the delivery ticket with each batch of shotcrete, the Contractor shall provide the following information on the same ticket:

- Reading of the revolution counter at the first addition of aggregates to the mixer.
- Times of day at which cement and aggregates are first intermingled, and at which water and cement are first intermingled.
- Signature or initials of ready-mix representative.
- Type, brand, and amount of cement.
- Amount of water added at batch plant.
- Amount, if any, of water added at the jobsite.
- Weights of fine and coarse aggregate.
- Maximum size of aggregate.

3.13.2 Air content, temperature, and slump tests shall be performed in accordance with the following test schedule and acceptance limits unless otherwise noted by MID.

Table 1 – Air Content, Temperature, and Slump			
Property	Location Sampled	Specified value	Allowable Range
Slump	Delivery Point	3”	2” – 4”
Temperature	Delivery Point	N/A	55°F - 85°F 55°F - 75°F (in “cold weather”)
Air Content	Delivery Point	7.5%	6% - 9%

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3.13.2.1 Air content test shall conform to ASTM C173/C173M, volumetric method or ASTM C231, pressure method; one test for each compressive-strength test for each mixture of air-entrained, wet-mix shotcrete measured before pumping.

3.13.2.2 Shotcrete temperature test shall conform to ASTM C1064/C1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive-strength specimens.

3.13.3 Test Panels: Make a test panel, without reinforcing, for each shotcrete mixture and for each workday or for every 50 cu. yd. of shotcrete placed, whichever is less. Produce test panels with dimensions of 12 by 12 inches minimum and of average thickness of shotcrete, but not less than 4-1/2 inches. If panel forms are made of wood, pre-dampen test panel forms to saturated surface dry state before shooting. Test specimens shall be obtained from each test panel in accordance with ASTM C 42. Prior to placing shotcrete over the prepared test panel surfaces, provide a direct bond tensile testing per ASTM 1583 with minimum acceptable tensile value 175 psi, averaged over all test panels.

Table 2 – Strength Test For Info And Shotcrete Material Acceptance					
# of specimens from 12” x 12” test panel	Curing	Testing	Reason	When to make	Reporting
2 cores	Standard	7 Days	Information	Always	All Parties
3 cores	Standard	28 Days	Acceptance	Always	All Parties

3.13.3.1 The test panels shall be standard initial cured in the field at 70 degree F +/- 10 degree F in an insulated storage box until they are brought back to the lab the following day for standard curing.

The daily minimum and maximum temperature in the storage box shall be recorded and shall appear on the test panel core test record.

3.13.3.2 After standard initial curing, test panels shall be standard cured at the testing lab’s facility.

3.13.3.3 Compressive Strength Testing: One set of three un-reinforced specimens. Test each set of un- reinforced specimens for compressive strength according to ASTM C1140 and construction testing requirements in ACI 506.2.

3.13.3.4 Should 7-day tests indicate the strength to be consistently less than 50 percent or more than 70 percent of the specified 28-day value, correct any of the methods or processes that are deemed to contribute to this variance from the normal strength-gain relationship.

3.13.3.5 Strength of shotcrete will be considered satisfactory according to the following:

3.13.3.5.1 Specimen Cores: Mean compressive strength of each set of three unreinforced cores equals or exceeds 85 percent of specified compressive strength, with no individual core less than 75 percent of specified

compressive strength.

- 3.13.3.5.2 Specimen Cubes: Mean compressive strength of each set of three unreinforced cubes shall equal or exceed design compressive strength with no individual cube less than 88 percent of specified compressive strength.

- 3.13.3.6 Visual Core Grading: If required by MID, extract reinforced cores from the structure(s) for visual inspection. Visually inspect each set of reinforced shotcrete cores and determine mean core grades according to ACI 506.2.
 - 3.13.3.6.1 Shotcrete shall achieve mean core grades not exceeding 2.5 in accordance with ACI 506.2, with no single core grade exceeding 3.0.

- 3.13.4 Changes in Materials or Proportions: If during the progress of work, it is determined that shotcrete of the required properties cannot be obtained with the materials or proportions being furnished, the Contractor will make changes in proportions or materials or both as necessary. No adjustments shall be made to the accepted shotcrete mixes without MID acceptance.

- 3.13.5 When tests of concrete cylinders indicate that the strength of the shotcrete is less than the specified strength, the Contractor shall, in subsequent work, correct any of the methods or processes that are deemed as contributing to the cause of such failure in attaining the specified strength.

- 3.13.6 When tests of concrete cylinders indicate that the strength of shotcrete is less than the specified design strength, core specimens will be required. Core specimens shall be taken in accordance with ASTM C42. When the strength of said cores is less than 90 percent of the specified strength, the Contractor shall provide additional curing of the shotcrete by such means and for such length of time that may result in the shotcrete's attaining the specified length. If additional curing will not obtain the strength of at least 85 percent of that specified, the Contractor shall replace, reinforce, or otherwise remedy the defective shotcrete as directed by MID.

END OF SECTION

PART 1: GENERAL

1.1 SCOPE

1.1.1 This section includes specifications for work to install soil nail ground anchors. Work to be performed under the specification section includes drilling, furnishing, installing, and testing permanent soil nails at locations indicated on the Drawings.

1.2 REFERENCES

1.2.1 All Work shall be performed by Contractor in accordance with applicable standards, including:

1.2.1.1	ASTM	American Society for Testing of Materials
	ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
	ASTM C39	Standard Method of Test for Compressive Strength of Cylindrical Concrete Specimens
	ASTM C150	Specification for Portland Cement
	ASTM C494	Specification for Chemical Admixtures for Concrete
	ASTM D1784	Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
1.2.1.2	ACI	American Concrete Institute
	ACI 301	Specification for Standard Concrete for Buildings
1.2.1.3	PTI	Recommendations for Prestressed Rock and Soil Anchors, 2004
1.2.1.4	AASHTO	American Association of State Highway and Transportation Officials
	AASHTO T 106	Standard Method of Test for Compressive Strength of Hydraulic Cement Mortar

1.3 QUALITY ASSURANCE

1.3.1 Contractor, drilling operators, and foreman shall have a minimum of five years recent experience in the installation of soil nails, and shall have demonstrated capability with similar projects.

1.4 SUBMITTALS

1.4.1 Submit the following items to MID for acceptance prior to the start of construction unless otherwise noted.

1.4.2 Contractor's construction plan and written procedure including:

1.4.2.1 Proposed drilling methods and equipment including methods to prevent hole collapse, loss of drilling fluid (if used), difficult drilling due to soft or hard rock, intersection of drilled

- holes, and failure to develop design loads.
- 1.4.2.2 Measures to ensure wall and slope stability during various stages of wall construction and excavation where discontinuous rows of nails will be installed (if applicable); information on space requirements for installation equipment; and temporary shoring plans (if applicable).
- 1.4.3 Grout mix designs
 - 1.4.3.1 Previous test results for the proposed grout mix completed within one year of the start of work may be submitted for initial verification of the required compressive strengths for installation of pre-production verification test nails and initial production nails.
- 1.4.4 Plan describing grout placement procedures and equipment.
- 1.4.5 Proposed nail load testing methods and equipment, including:
 - 1.4.5.1 Jacking frame and bracing.
 - 1.4.5.2 Methods of isolating test nails during shotcrete application (i.e., methods to prevent bonding of the soil nail bar and the shotcrete facing during testing).
 - 1.4.5.3 Methods of providing temporary unbonded length of test nails and of grouting the temporary unbonded length after completion of testing.
 - 1.4.5.4 Method and equipment for measuring nail elongation during testing.
 - 1.4.5.5 Serial numbers and certified calibration records for each test jack, pressure gauge, and load cell to be used. Jack and pressure gauge shall be calibrated as a unit. Calibration records shall include the date tested, device identification number, and the calibration test results and shall be certified for an accuracy of at least 2 percent of the applied certification loads by a qualified independent testing laboratory within 90 days prior to submittal
- 1.4.6 Manufacturer Certificates of Compliance for the soil nail centralizers and encapsulation, as appropriate.
- 1.4.7 Upon delivery of soil nail bars to the project site, the Contractor shall provide certified mill test results from each supplier specifying the ultimate strength, yield strength, elongation, and composition.

PART 2: PRODUCTS

2.1 SOIL NAILS

2.1.1 Solid Bar Nail Bar

- 2.1.1.1 ASTM A615, Grade 75 deformed bar, continuous without splices or welds, new, straight, undamaged, encapsulated as shown on the Drawings.
- 2.1.1.2 Threaded a minimum of 6 inches on the wall anchorage end to allow proper attachment of bearing plate and nut. Threading may be continuous spiral deformed ribbing provided by the bar deformations (e.g., Dywidag or Williams continuous threadbars) or may be cut into a reinforcing bar. If threads are cut into a reinforcing bar, provide the next larger bar number designations from those shown on the Drawings at no additional cost.

2.1.2 Encapsulation

- 2.1.2.1 Encapsulated bars with double corrosion protection are required as shown on the Drawings.
- 2.1.2.2 The bar shall be encapsulated in a corrugated HDPE or PVC plastic sheath with a minimum wall thickness of 40 mils (0.040 inch) conforming to ASTM D1784, Class 13464 B.
- 2.1.2.3 The bar shall be centralized and grouted inside the sheath and shall provide at least 0.2 inches of grout cover over the nail bar.
- 2.1.2.4 Encapsulation shall be resistant to ultra violet light degradation, normal handling stresses, and grouting pressures. Factory fabrication of the encapsulation is preferred. Upon MID's acceptance, the encapsulation may be field fabricated if done in strict accordance with the manufacturer's recommendations.

2.1.3 Centralizers

- 2.1.3.1 Centralizers shall be fabricated from material which is non-detrimental to the nail steel or corrosion protection system and shall permit grout to flow freely up the drill hole.
- 2.1.3.2 Centralizers shall position the bar in the drill hole in such a manner that the deviation of the center of the bar and the center of the hole is not more than 0.5 inch. Centralizers shall be of sufficient strength to support the weight of the bar in the drilled hole and provide a minimum of 0.5 inch of grout cover.
- 2.1.3.3 Centralizers shall be located no more than 3 feet from the top and bottom of the drill hole, and shall be spaced at no more than 10 feet on-center.

2.1.4 Soil Nail Grout

- 2.1.4.1 Grout shall consist of a pumpable mixture of Portland cement, Type II or Type III (ASTM C150), water, and admixtures. Water to cement (W/C) ratio shall not exceed 0.50 by weight of grout.
- 2.1.4.2 Grout shall attain a cube strength (AASHTO T 106) of 1,500 psi at 3 days and 3,500 psi at 7 days.
- 2.1.4.3 Chemical additives which can control bleed or retard set may be used with nail grout. Other admixtures conforming to ASTM C494 may be used if accepted by MID.
- 2.1.4.4 If used, additives shall be mixed in accordance with manufacturer's recommendations. The suitability of admixtures shall be verified with trial mixes, and if two or more admixtures are proposed for a mix, the compatibility of each shall be verified and the manufacturers of each shall be consulted.
- 2.1.4.5 Additives shall not contain chlorides or materials corrosive to steel.
- 2.1.4.6 Additives that reduce the sulfate resistance of Type II cement shall not be used.
- 2.1.4.7 Accelerators shall not be used.
- 2.1.4.8 Use of organic materials (i.e. wood shavings, rice hulls, etc.) to reduce or eliminate grout loss shall not be used.
- 2.1.4.9 Water for grout shall be clean and contain no substances deleterious to the concrete or steel.

2.1.5 Anchorage Hardware

- 2.1.5.1 All anchorage hardware including bearing plates, headed studs, washers, and nuts shall be provided by the manufacturer of the bar.
- 2.1.5.2 Hardware including couplers, nuts, and washers, shall be capable of developing at least 95 percent of the guaranteed minimum ultimate tensile strength of the bar.

- 2.1.5.3 Bearing plates shall conform to ASTM A36, unless otherwise agreed to by the Engineer. The bearing plates shall be placed such that it is perpendicular to the bar longitudinal axis within plus/minus 3 degrees, and the bar shall not be bent in order to enable the bearing plate to bear flush against the surface. Where load cells are used, bearing plates must be smooth and flat to ensure 100 percent bearing surface on the load cell.

PART 3: EXECUTION

3.1. WALL LAYOUT

- 3.1.1.1. The Contractor will be responsible for laying out the soil nail locations and limits of shotcrete facing in accordance with the Drawings.
- 3.1.1.2. Where necessary for stability of the existing wall face, the Contractor may place a sealing layer ("flashcoat") of unreinforced shotcrete or fiber-reinforced shotcrete.

3.2. NAIL INSTALLATION

- 3.2.1. Nail pullout resistance shall be verified in a timely fashion by proof and verification testing. Neither excavation nor installation of production nails shall proceed more than one row beyond a row of nails for which the pullout resistance has been tested and has been accepted by MID.
- 3.2.2. Production nails shall be installed before the application of the reinforced shotcrete facing unless MID has provided prior written acceptance for an alternative construction sequence. Where the facing is installed prior to drilling, the Contractor shall provide a blockout through the shotcrete facing at drill hole locations using PVC pipe or other suitable material, to prevent damage to the facing during drilling. As part of the required construction submittals, the Contractor shall provide the Engineer with acceptable structural design calculations demonstrating that the facing structural capacity will not be reduced and that the bearing plates are adequate to span the nail drill hole blockout through the construction facing. If this requires larger size bearing plates and/or additional reinforcement beyond that detailed on the Drawings, the extra cost shall be borne by the Contractor.
- 3.2.3. MID may specify the addition, elimination, modification or relocation of test nails or production nails to accommodate actual field conditions, determined from field observations and proof and verification testing.
- 3.2.4. Contractor shall schedule the drilling of holes, and installation, stressing, and grouting of nails in such a way that the sequence of operations is not detrimental to other holes and soil nails in the immediate vicinity.
- 3.2.5. Drilling
 - 3.2.5.1. The holes for the soil nails shall be drilled at the locations, orientations, and lengths shown on the Drawings. The drilled hole shall extend a minimum of 0.25 feet beyond the nail length to be installed.
 - 3.2.5.2. Drilling equipment shall be suitable for the anticipated site conditions and sized to meet scheduling requirements. Holes shall be drilled by either the rotary or percussion drilling method. Drilling difficulties may include, but are not limited to, 1) hole collapse, 2) encountering very hard rock, 3) loose fill with rock blocks, 4) loss of air pressure due to intersection with other drilled holes, or open fractures.

- 3.2.5.3. The diameter of the hole shall be large enough to provide a minimum 1 inch grout cover over bare or epoxy coated bars or a minimum 0.5 inch grout cover over the encapsulation of encapsulated nails. A minimum required hole diameter is shown on the Drawings.
- 3.2.5.4. The hole shall remain open and free of obstructions until grouting begins. Casing may be necessary to maintain an open hole.
- 3.2.5.5. Immediately prior to placing each nail the Contractor shall clean the hole of all drill cuttings and other debris. Use of drilling muds such as bentonite slurry to assist in drill cutting removal is not allowed but air may be used.
- 3.2.5.6. Contractor shall achieve the minimum bonded and unbonded lengths for test nails indicated on the Drawings.

3.2.6. Nail Bar Installation

- 3.2.6.1. Bars shall be free from dirt, detrimental rust, or other deleterious substances. Prior to installation, the bars shall be handled and stored to avoid corrosion and physical damage.
- 3.2.6.2. Inspect each bar before installation and repair or replace damaged bars to the satisfaction of MID.
- 3.2.6.3. Securely attach centralizers to the bar so they will not shift during handling or insertion into the drill hole yet will still allow grout tremie pipe insertion to the bottom of drill hole and allow grout to flow freely up the hole.
- 3.2.6.4. Insert bars with centralizers into the drill hole to the required length without difficulty and in a way that prevents damage to the drill hole or bar. Do not drive or force partially inserted nails into the hole. Remove nails which cannot be fully inserted to the design depth and clean the drill hole to allow unobstructed installation.
- 3.2.6.5. Nail head locations may deviate from plan design location by 1 foot in any direction. Nail inclination may deviate from plan inclination by + or 3 degrees.
- 3.2.6.6. Location deviations within specified tolerances are allowable in isolated instances as accepted by MID, but shall not be applied accumulatively over multiple nail spacings.

3.2.7. Grouting

- 3.2.7.1. Grouting equipment shall be capable of continuous mechanical mixing and produce a uniform and thoroughly mixed grout free of lumps and undispersed cement.
- 3.2.7.2. Size the grouting equipment to enable the entire nail to be grouted in one continuous operation. Place the grout within 60 minutes after mixing or within the time recommended by the admixture manufacturer, if admixtures are used. Grout not placed in the allowed time limit shall not be used.
- 3.2.7.3. Grout the drill hole in a timely fashion after installation of the nail bar. Each drill hole shall be grouted within 36 hours of completion of drilling, unless otherwise accepted by MID.
- 3.2.7.4. Grout shall be injected at the lowest point of the drill hole. The grout may be placed using grout tubes, casing, or drill rods. Grouting shall proceed such that the hole is filled progressively from the bottom to top to prevent air voids. To prevent the creation of voids keep the outlet end of the conduit delivering the grout below the surface of the grout as the conduit is withdrawn.

3.2.7.5. With the exception of test nails, as shown on the Drawings, completely fill the drill hole in one continuous operation. Drill holes may be topped off where grout shrinkage occurs. Cold joints in the grout column are not allowed except at the top of the test bond length of proof tested production nails. At the Contractor's option, the grout tube may remain in the hole provided it is filled with grout.

3.2.7.6. During casing removal for drill holes advanced by either cased or hollow stem auger methods, maintain sufficient grout level within the casing to offset the external groundwater/soil pressure and prevent hole caving. Maintain grout head or grout pressures sufficient to ensure that the drill hole will be completely filled with grout and to prevent unstable soil or groundwater from contaminating or diluting the grout.

3.2.7.7. The quantity of grout placed in each hole used shall be recorded in the Contractor's daily records and provided to MID at the end of each work day.

3.2.7.8. The nails shall remain undisturbed until the grout has acquired the specified 3-day strength.

3.2.8. Grout Testing

3.2.8.1. Two grout cubes shall be made from each batch of grout and moist cured onsite. Testing of the cubes shall be done in accordance with AASHTO T106/ASTM C109 by a certified testing laboratory. Test results shall be forwarded to MID promptly for review and acceptance.

3.3. NAIL TESTING

3.3.1. Contractor shall notify MID at least 48 hours prior to stressing each soil nail. Soil nails should not be tested until the nail grout and shotcrete facing have achieved the minimum specified 3-day compressive strength.

3.3.2. Nail testing in less than 72 hours will only be allowed if the Contractor submits compressive strength test results, performed by an independent testing laboratory, verifying that the nail grout and shotcrete mixes being used will provide the specified 3-day compressive strengths in the lesser time.

3.3.3. Soil nail stressing equipment shall be capable of applying and holding a load at least equivalent to the ultimate capacity of the soil nail, and shall include appropriate gauges or load cells to indicate the load applied.

3.3.4. Loading increments shall be read using either a load cell or a calibrated pressure gauge; however, only one monitoring system shall be used throughout. A dial gauge or vernier scale capable of measuring to 0.001 inches shall be used to measure nail movement.

3.3.5. A hydraulic jack and pump shall be used to apply the test load. The jack and pressure gauge shall be calibrated by a certified independent testing agency as a pair. The calibration shall have been performed within 45 working days of the date submitted. The pressure gauge shall be graduated in 100-psi increments or less.

3.3.6. A calibrated reference pressure gauge shall also be kept at the site. The reference gauge shall have been calibrated with the test jack and pressure gauge. The reference pressure gauge shall be placed in series with the pressure gauge during each test. If the load determined by the gauges differs by more than 10 percent, the jack and gauges shall be recalibrated at no expense to MID.

3.3.7. Verification Tests

- 3.3.7.1. Verifications tests shall be performed on sacrificial nails located between production nails as shown on the Drawings. Test nails shall have both bonded and temporary unbonded lengths. Prior to testing, only the bonded length of the test nail shall be grouted. The temporary unbonded length of the test nail shall be as shown on the Drawings.
- 3.3.7.2. The allowable bar structural load during testing shall not be greater than 80 percent of the yield strength for Grade 75 bars. The Contractor shall provide larger verification test bar sizes, if required to safely accommodate the verification test load.
- 3.3.7.3. Construct verification test nails using the same equipment, installation methods, nail inclination, and drill hole diameter as for the production nails. Changes in drilling or installation method may require additional verification testing as determined by MID and shall be provided at no additional cost.
- 3.3.7.4. Verification test nails shall be incrementally loaded to a maximum test load of 200 percent of the Design Test Load (DTL) specified on the Drawings in accordance with the following loading schedule. The soil nail movements shall be recorded at each load increment.

VERIFICATION TEST LOADING SCHEDULE

<u>LOAD</u>	<u>HOLD TIME</u>
AL (0.05 DTL)	Until Stable
0.25 DTL	Until Stable
0.50 DTL	Until Stable
0.75 DTL	Until Stable
1.00 DTL	Until Stable
1.25 DTL	Until Stable
1.50 DTL (Creep Test)	60 minutes
1.75 DTL	Until Stable
2.00 DTL (Max Test Load)	Until Stable

- 3.3.7.5. The alignment load (AL) should be the minimum load required to align the testing apparatus and should not exceed 10 percent of the Design Test Load (DTL). Dial gauges should be set to "zero" after the alignment load has been applied.
 - 3.3.7.6. All load increments shall be maintained within 5 percent of the intended load. The jack maybe re-pumped as necessary in order to maintain a constant load.
 - 3.3.7.7. Each load increment shall be held long enough to obtain a stable reading. The verification test nail shall be monitored for creep at the 1.50 DL load increment. Nail movements during the creep portion of the test shall be measured and recorded at 1, 2, 3, 5, 6, 10, 20, 30, 40, 50, and 60 minutes after application of the creep load. The load during the creep test shall be maintained within 5 percent of the intended load.
 - 3.3.7.8. The Contractor shall provide MID a plot of the nail movement versus load for each load increment in the test schedule above.
- 3.3.8. Proof Tests
- 3.3.8.1. Proof tests shall be performed on production soil nails where indicated on the Drawings, but on no less than 5 percent (1 in 20) of the production nails in each row and a minimum of 1 per row and 1 per distinct soil/rock type. The proof test locations shall be accepted by MID.
 - 3.3.8.2. Proof test nails shall have both bonded and temporary unbonded lengths, as shown on the Drawings.

Prior to testing, only the bonded length of the test nails shall be grouted.

3.3.8.3. The applied tensile load during testing shall not be greater than 80 percent of the yield strength for Grade 75 bars.

3.3.8.4. Proof tests shall be performed by incrementally loading the proof test nail to a maximum test load of 150 percent of the Design Test Load (DTL). The nail movement at each load shall be measured and recorded by MID in the same manner as for verification tests. The test load shall be monitored by a jack pressure gauge with a sensitivity and range meeting the requirements of pressure gauges used for verification test nails. At load increments other than maximum test load, the load shall be held long enough to obtain a stable reading. Incremental loading for proof tests shall be in accordance with the following loading schedule. The nail movements shall be recorded at each load increment.

PROOF TEST LOADING SCHEDULE

<u>LOAD</u>	<u>HOLD TIME</u>
AL (0.05 DTL)	Until Stable
0.25 DTL	Until Stable
0.50 DTL	Until Stable
0.75 DTL	Until Stable
1.00 DTL	Until Stable
1.25 DTL	Until Stable
1.50 DTL (Creep Test, Max Test Load)	See Below

3.3.8.5. The alignment load (AL) should be the minimum load required to align the testing apparatus and should not exceed 5 percent of the Design Test Load (DTL). Dial gauges should be set to "zero" after the alignment load has been applied.

3.3.8.6. All load increments shall be maintained within 5 percent of the intended load. The jack maybe re-pumped as necessary in order to maintain a constant load.

3.3.8.7. The creep period shall start as soon as the maximum test load is applied and the nail movement shall be measured and recorded at 1, 2, 3, 5, 6, and 10 minutes. Where the nail movement between 1 minute and 10 minutes exceeds 0.04 inch, the maximum test load shall be maintained an additional 50 minutes and movements shall be recorded at 20 minutes, 30, 50, and 60 minutes. The load during the creep test shall be maintained within 5 percent of the intended load.

3.3.8.8. The Contractor shall provide MID a plot of the nail movement versus load for each load increment in the proof test.

3.3.9. Acceptance Criteria

3.3.9.1. A proof-tested nail with a 10 minute hold is acceptable if the following are achieved:

3.3.9.1.1. The nail carries the maximum test load with less than 0.04 inches of movement between 1 minute and 10 minute.

3.3.9.1.2. The total movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the unbonded length.

3.3.9.2. A verification or proof tested nail with a 60 minute hold is acceptable if the following are achieved:

- 3.3.9.2.1. The nail carries the maximum test load at a creep rate that does not exceed 0.08 inches of movement for the last log cycle of time.
- 3.3.9.2.2. The total movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the unbonded length.
- 3.3.9.3. Arrangements of measuring devices shall be accepted by MID, and MID shall have access to observe the instrumentation during the test period. Test results shall be forwarded to MID promptly for review. MID shall be notified immediately when any nail cannot meet the specified tests.
- 3.3.9.4. If the total movement of the nails at the maximum test load does not exceed 80 percent of the theoretical elastic elongation of the unbonded length, the Contractor shall determine cause of low elongation and replace the soil nail at no additional cost to MID. Nails with a creep rate greater than 0.08 inches per log cycle of time can be incorporated in the finished work at a load equal to one half the load at which the creep rate is less than 0.08 inches for one log cycle of time.
- 3.3.9.5. When a nail fails to meet the acceptance criteria, the Contractor may propose modifications to the design and/or the construction procedures. These modifications may include, but are not limited to, installing replacement soil nails, reducing the design load by increasing the number of nails, modifying the installation methods, increasing the bond length or changing the nail type.

END OF SECTION

PART 1: GENERAL

1.1 SCOPE

1.1.1 Work to be performed under the specification section includes drilling, furnishing, installing, and testing of rock anchors as specified by the Drawings or the Engineer.

1.1.2 Work to be performed under the specification section includes drilling, furnishing, installing, and testing of wire rope and threaded bar anchors as specified by the Drawings or the Engineer.

1.2 REFERENCES

1.2.1 All Work shall be performed by Contractor in accordance with applicable standards, including:

- 1.2.1.1. ASTM American Society for Testing of Materials
 - ASTM A36 Specification for Structural Steel
 - ASTM A722 Standard Specification for High-Strength Steel Bars for Prestressed Concrete
 - ASTM C39 Standard Method of Test for Compressive Strength of Cylindrical Concrete Specimens
 - ASTM C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
 - ASTM C150 Specification for Portland Cement
 - ASTM C494 Specification for Chemical Admixtures for Concrete
 - ASTM D1784 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
- 1.2.1.2. ACI American Concrete Institute
 - ACI 301 Specification for Standard Concrete for Buildings
- 1.2.1.3. PTI Recommendations for Prestressed Rock and Soil Anchors, 2014
- 1.2.1.4. AASHTO American Association of State Highway and Transportation Officials
 - AASHTO T 106 Standard Method of Test for Compressive Strength of Hydraulic Cement Mortar
- 1.2.1.5. Federal Specification RR-W-410G for Wire Rope and Strand

1.3 QUALIFICATIONS

SECTION 313236b: GROUND ANCHORS

- 1.3.1 Workers, including supervisors, foremen, personnel, and equipment operators shall be fully qualified to perform the work. The Contractor shall have a minimum of five (5) years of experience in installation of similar ground anchor systems. All personnel shall have at least five (5) years of experience in similar work.
- 1.4 SUBMITTALS
- 1.4.1 A minimum of 3 weeks prior to the start of construction, submit 2 copies of items below in writing to MID for review and acceptance. MID shall provide review comments within 10 days of submittal.
- 1.4.1.1 Documentation of Contractor's qualifications in accordance with article 1.3.1.
 - 1.4.1.2 Proposed construction access and staging plan.
 - 1.4.1.3 Proposed anchor drilling methods and equipment.
 - 1.4.1.4 Anchor grout mix design including:
 - 1.4.1.4.1 Type of Portland cement.
 - 1.4.1.4.2 Aggregate source and gradation.
 - 1.4.1.4.3 Proportions of mix by weight and water cement ratio.
 - 1.4.1.4.4 Manufacturer, brand name, and technical literature for proposed admixtures.
 - 1.4.1.5 Proposed anchor grout placement procedures and equipment.
 - 1.4.1.6 Proposed anchor testing methods and equipment setup including:
 - 1.4.1.6.1 Details of the jacking frame and bracing
 - 1.4.1.6.2 Equipment list
 - 1.4.1.7 Proposed methods to address drilling difficulties which may be encountered during construction. Drilling difficulties may include, but are not limited to, 1) hole collapse, 2) encountering very hard rock, 3) loose fill with rock blocks, 4) loss of air pressure due to intersection with other drilled holes, or open fractures.
 - 1.4.1.8 Identification number and certified calibration records for each test jack, pressure gauge to be used. Jack and pressure gauge shall be calibrated as a unit. Calibration records shall include the date tested, device identification number, and the calibration test results.
 - 1.4.1.9 Manufacturer Certificates of Compliance for the anchors. Also see Paragraph 2.8 'Certificate of Compliance.'
- 1.4.2 Changes or deviations from the approved submittals must be resubmitted for approval. No adjustments in contract time will be allowed due to incomplete submittals.
- 1.5 The Contractor shall preserve and protect existing facilities, including but not limited to, environmentally sensitive areas and other improvements and facilities related to this project.

PART 2: PRODUCTS

SECTION 313236b: GROUND ANCHORS

- 2.1. Unless noted otherwise, all exposed steel elements shall be galvanized in accordance with ASTM designation A123 or A153.
- 2.2. Wire Rope Anchors
 - 2.2.1. All wire ropes shall be galvanized structural cables conforming to ASTM A586.
 - 2.2.2. All wire rope clamps (commonly referred to as clips) shall be galvanized Type I, Class 1, single grip and saddle with U-bolts, nuts, and a steel saddle per Federal Specification FF- C-450E.
 - 2.2.3. All wire rope thimbles shall be Type III, Finish Code Z, heavy for wire rope per Federal Specification FF-T-276C.
- 2.3. Rock Anchor Bar
 - 2.3.1. ASTM A722, Grade 150 galvanized deformed bar, continuous without splices or welds, new, straight, and undamaged.
 - 2.3.2. Threaded a minimum of 6 inches on the anchorage end to allow proper attachment of bearing plate and nut. Threading may be continuous spiral deformed ribbing provided by the bar deformations (e.g., Dywidag or Williams continuous threadbars) or may be cut into a reinforcing bar. If threads are cut into a reinforcing bar, ensure reduced bar area satisfies the requirements shown on the Drawings.
 - 2.3.3. All anchorage hardware including bearing plates, washers, and nuts shall be galvanized and provided by the manufacturer of the bar.
 - 2.3.4. Hardware including couplers, nuts, and washers, shall be capable of developing at least 95 percent of the guaranteed minimum ultimate tensile strength of the bar.
 - 2.3.5. Bearing plates shall conform to ASTM A36, unless otherwise agreed to by the Engineer. The bearing plates shall be placed such that it is perpendicular to the bar longitudinal axis within plus/minus 3 degrees, and the bar shall not be bent in order to enable the bearing plate to bear flush against the surface.
- 2.4. Centralizers
 - 2.4.1. Centralizers shall be fabricated from material which is non-detrimental to the steel or corrosion protection system and shall permit grout to flow freely up the drill hole.
 - 2.4.2. Centralizers shall position the anchor in the drill hole in such a manner that the deviation of the center of the anchor and the center of the hole is not more than 0.5 inch. Centralizers shall be of sufficient strength to support the weight of the anchor in the drilled hole and provide a minimum of 0.5 inch of grout cover.
 - 2.4.3. Centralizers shall be located no more than 3 feet from the top and bottom of the drill hole, and shall be spaced at no more than 10 feet on-center.
- 2.5. Grout
 - 2.5.1. Grout shall consist of a pumpable mixture of Portland cement, Type II or Type III (ASTM C150), water, and admixtures. Water to cement (W/C) ratio shall not exceed 0.50 by weight of grout.
 - 2.5.2. Grout shall attain a cube strength (AASHTO T 106) of 1,500 psi at 3 days and 3,500 psi at 7 days.
 - 2.5.3. Chemical additives which can control bleed or retard set may be used with grout. Other admixtures conforming to ASTM C494 may be used if accepted by MID.

SECTION 313236b: GROUND ANCHORS

- 2.5.4. If used, additives shall be mixed in accordance with manufacturer's recommendations. The suitability of admixtures shall be verified with trial mixes, and if two or more admixtures are proposed for a mix, the compatibility of each shall be verified and the manufacturers of each shall be consulted.
- 2.5.5. Additives shall not contain chlorides or materials corrosive to steel.
- 2.5.6. Additives that reduce the sulfate resistance of Type II cement shall not be used.
- 2.5.7. Accelerators shall not be used.
- 2.5.8. Use of organic materials (i.e. wood shavings, rice hulls, etc.) to reduce or eliminate grout loss shall not be used.
- 2.5.9. Water for grout shall be clean and contain no substances deleterious to the concrete or steel.
- 2.6. Water: Water shall be clean, fresh, potable, and contain no substance deleterious to the concrete or steel.
- 2.7. Materials Handling and Storage
 - 2.7.1. The Contractor shall store cement in a manner that prevents moisture degradation and partial hydration. Cement that has become caked or lumpy shall not be used.
 - 2.7.2. Damage to the anchors as a result of abrasion, cuts, nicks, welds, and weld splatter shall be cause for rejection. Protect anchor steel from dirt, rust, and other deleterious substances prior to installation.
- 2.8. Certificate of Compliance
 - 2.8.1. The Contractor shall provide the Engineer with Certificate(s) of Compliance from the anchor manufacturer(s). The certificate shall be signed by the manufacturer of the material or the manufacturer of assembled materials and shall state that the materials involved comply in all respects with the requirements of the Specifications and Drawings. A Certificate of Compliance shall be furnished with each lot of material delivered to the work and the lot so certified shall be clearly identified in the certificate.
 - 2.8.2. Materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating material in the work which conforms to the requirements of the Drawings and Specifications, and any material not conforming to the requirements will be subject to rejection whether in place or not.

PART 3: INSTALLATION AND TESTING

- 3.1. Equipment
 - 3.1.1. Drilling equipment shall be suitable for the anticipated site conditions and sized to meet scheduling requirements. Drilling in the anchorage area may be done by rotary or percussion drilling, however, the chosen method of drilling shall limit vibrations due to construction to the extent practicable.
 - 3.1.2. Grouting equipment shall be capable of continuous mechanical mixing and produce a uniform and thoroughly mixed grout.
 - 3.1.3. Anchor testing equipment shall be capable of applying and holding the maximum load specified on

the plans, and shall include appropriate gauges or load cells to indicate the load applied.

- 3.2. Contractor shall schedule the drilling, installation, and grouting of anchors in a sequence of operations that is not detrimental to other holes and anchors in the immediate vicinity. Drill holes shall extend a minimum of 3 inches beyond the anchor length. Prior to placing anchors inside drill holes, the drill holes shall be free of standing water and debris prior to acceptance by the Engineer and placing anchors.
- 3.3. Anchor Grouting
 - 3.3.1. Each drill hole shall be grouted within 36 hours of completion of drilling, unless otherwise approved by Engineer.
 - 3.3.2. Inject the grout after insertion of the anchor rope at the lowest point of each drill hole through a grout tube. To prevent the creation of voids, keep the outlet end of the conduit delivering the grout below the surface of the grout as the conduit is withdrawn. Completely fill the drill hole in one continuous operation. Drill holes may be topped off where grout shrinkage occurs.
- 3.4. Ground Anchor Testing: Perform proof testing on at least one anchor at a location determined by the Engineer.
 - 3.4.1. Anchor proof testing shall be performed against a temporary yoke or load frame. No part of the yoke or load frame shall bear within 12 inches of the anchor.
 - 3.4.2. Proof tests shall be performed by incrementally loading the proof test anchor to a maximum test load of 200 percent of the Design Test Load (DTL).
 - 3.4.3. The anchor head movement at each load shall be measured and recorded by the Engineer. Incremental loading for proof tests shall be in accordance with the following loading schedule. The proof test loading increments shall be as follows:

PROOF TEST LOADING SCHEDULE

<u>LOAD</u>	<u>HOLD TIME</u>
AL (.05DTLmax.)	Until Stable
0.25 DTL	Until Stable
0.50 DTL	Until Stable
0.75 DTL	Until Stable
1.00 DTL	10 minutes
1.25 DTL	Until Stable
1.50 DTL	Until Stable
1.75 DTL	Until Stable
2.00 DTL (Max. Test Load)	Until Stable

- 3.4.4. The alignment load (AL) should be the minimum load required to align the testing apparatus and should not exceed 5 percent of the Design Test Load (DTL). Dial gauges should be set to "zero" after the alignment load has been applied.
- 3.4.5. Each load increment shall be held long enough to obtain a stable reading. The test anchor shall be monitored for creep at the 1.00 DTL load increment. Anchor movements during the creep portion of the test shall be measured and recorded at 1, 2, 3, 5, 6, and 10 minutes. The load during the creep test shall be maintained within 2 percent of the intended load.

3.5. Acceptance Criteria

- 3.5.1. Pullout failure is defined as a condition in which an anchor is incapable of sustaining increased load, or the anchor undergoes excessive movement prior to achieving a stable load.
- 3.5.2. An anchor that holds 2 times the design load without pullout failure is considered passing.
- 3.5.3. Arrangements of measuring devices shall be accepted by MID's Representative prior to use, and MID shall have access to observe the instrumentation during the test period. Test results shall be forwarded to MID promptly for review. MID shall be notified immediately when any test anchor undergoes pullout failure.
- 3.5.4. All failed production anchors shall be reinstalled or replaced and retested. The Contractor shall coordinate with the Engineer to determine modification to the design or construction method, if necessary.

END OF SECTION

SECTION 313313: SCALING

PART 1: GENERAL

1.1 SCOPE

1.1.1 This section includes specifications for accessing the slope below the Powerhouse Access Road as shown on the Drawings, and (1) identifying and removing loose or potentially unstable rock blocks and debris from the slope that could adversely impact worker safety and/or the facility during/following construction; (2) clearing rock blocks and debris from the slope as necessary to complete the work shown on the Drawings; and (3) hauling and disposing of excess spoils and debris at locations designated by MID.

1.1.2 The key areas identified for removal of loose or potentially unstable rock blocks and debris are as follows:

1.1.2.1 In the areas above and below Retaining Walls A and B as shown on Drawing Sheet 4 and 5.

1.1.2.2 In the rock outcrop area located between Retaining Walls A and B as shown on Drawing Sheet 4.

1.1.2.3 Within the limits of the new soil nail wall shown on Drawing Sheet 8.

1.1.3 The contractor should anticipate rock blocks up to approximately 6 feet in the longest dimension. Large rock blocks may require localized splitting/breaking into smaller fragments for handling purposes.

1.1.4 The Contractor is responsible for protecting all existing improvements from rockfall damage caused during the scaling/debris removal operation. In addition, the Contractor is responsible for containing scaled debris and preventing it from entering the Merced River.

1.1.5 For the purposes of this Section, the terms “Engineer” and “Geologist” shall be synonymous.

1.2 GENERAL PROVISIONS

1.2.1 The Contractor is responsible for meeting all Federal, State, and local safety code requirements.

1.2.2 Prior to any work, the Contractor shall familiarize itself with site conditions, locating and verifying all environmentally sensitive areas, improvements and facilities related to this project, and any utilizes, so that proper precautions may be taken not to damage environmental areas, improvements and utilizes. In the event of conflicts between such and the work of this Specification, promptly notify the Engineer who will provide clarifications.

1.3 QUALITY ASSURANCE

1.3.1 Workers, including supervisors, foreman, scaling personnel, and equipment operators shall be fully experienced to perform the work.

1.3.2 Contractor shall not sublet the whole or any part of this work without the express written permission of MID.

1.4 SUBMITTALS

1.4.1 The Contractor shall make all submittals in accordance with Section 013300, “Submittal Procedures.”

1.4.2 The Contractor shall submit the following:

SECTION 313313: SCALING

1.4.2.1 Scaling plan and written procedure including equipment, methods, and safety precautions for accessing the work area and performing scaling.

1.4.2.2 Temporary facility protection measures, including, but not limited to, equipment, methods, and safety precautions for preventing scaled materials from damaging equipment and the facility; and preventing scaled materials from traveling downslope and into the Merced River.

1.4.2.3 Designated scaling supervisor. Furnish documentation confirming that the scaling supervisor has the minimum experience outlined in the previous Article.

1.4.3 The Engineer will review and accept or reject the Contractor's submittals within 10 working days after receipt of a complete submission. The Contractor will not be allowed to begin scaling operations until the submittal requirements are satisfied and found acceptable to the Engineer and MID. Changes or deviations from the approved submittals must be re-submitted for approval. No adjustments in contract time will be allowed due to incomplete submittals.

PART 2: PRODUCTS

2.1 Contractor shall furnish all labor, materials, equipment, appurtenances, and facilities as required for the scaling and debris removal.

PART 3: EXECUTION

3.1 GENERAL

3.1.1 Prior to commencing slope work, the Contractor shall schedule and conduct a pre-scaling site meeting, attended by MID and the Engineer. At a minimum, the meeting shall cover the following items:

3.1.1.1 Specific discussion of all elements of the scaling plan required per Paragraph 1.4.2.1;

3.1.1.2 Temporary facility protection measures to be employed during scaling activities;

3.1.1.3 Designated scaling/debris removal areas;

3.1.1.4 Site communication measures to be employed during scaling/debris removal activities.

3.1.2 Scaling shall be performed according to the approved scaling plan.

3.1.3 Safety Scaling: Identify and remove loose or potentially unstable rock fragments, blocks, and debris that are not firmly fastened to the slopes within the limits areas identified on the Drawings to the satisfaction of the Engineer. Safety scaling shall primarily be accomplished with scaling bars and hand tools.

3.1.4 The trajectory of scaled material shall be controlled in a manner so as to direct and contain the material before reaching the Merced River.

3.1.5 If such scaling methods are used, the Contractor's facility protection provisions shall be sufficient to accommodate debris generated by such operations.

3.2 HAULING AND DISPOSAL

3.2.1 Blocks and debris generated during the scaling and debris removal activities shall be disposed of at the disposal area near the project site as designated by MID.

3.3 DAILY RECORDS

SECTION 313313: SCALING

3.3.1 Records of scaling and debris removal work shall be prepared daily, and submitted to the Engineer on the following day. Daily records shall include at a minimum:

3.3.1.1 Area scaled (location and actual square footage);

3.3.1.2 Scaling methods/equipment used for each area;

3.3.1.3 Scaling personnel;

3.3.1.4 Approximate volume and/or tonnage of loose rock fragments, blocks, and debris removed.

END OF SECTION

APPENDIX A - SAMPLE FORMS

BID BOND

We, _____, as Principal,

and _____, as Surety, jointly and severally, bind ourselves, our heirs, representatives, successors and assigns, as set forth herein, to the

(herein called District) for payment of the penal sum of _____

_____ Dollars (\$ _____),

lawful money of the United States. Principal has submitted the accompanying bid for the construction of the project. If the Principal is awarded the contract and enters into a written contract, in the form prescribed by the District, at the price designated by his bid, and files two bonds with the District, or substitute security in lieu thereof, one to guarantee payment for labor and materials and the other to guarantee faithful performance, in the time and manner specified by the District, and carries all insurance in type and amount which conforms to the contract documents and furnishes required certificates and endorsements thereof, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

Forfeiture of this bond, or any deposit made in lieu thereof, shall not preclude the District from seeking all other remedies provided by law to cover losses sustained as a result of the Principal's failure to do any of the foregoing.

Principal and Surety agree that if the District is required to engage the services of an attorney in connection with the enforcement of this bond, each shall pay District's reasonable attorney's fees incurred with or without suit.

Executed on _____, 20_____

PRINCIPAL

(Seal if Corporation)

By: _____

Title: _____

(signature must be notarized)

(Attach Acknowledgment of Authorized Representative of Principal)

Any claims under this bond may be addressed to:

_____ (name and address of Surety)

_____ (name and address of Surety's agent for service of process in California, if different from above)

_____ (telephone number of Surety's agent in California)

(Attach Acknowledgment)

SURETY

By: _____

(Attorney-in-Fact)

NOTICE:

No substitution or revision to this bond form will be accepted. Sureties must be authorized to do business in and have an agent for service of process in California. Certified copy of Power of Attorney must be attached.

PERFORMANCE BOND

We, _____, as Principal,

and _____, as Surety, jointly and severally, bind ourselves, our heirs, representatives, successors and assigns, as set forth herein, to the Merced Irrigation District (herein called District) for payment of the penal sum of

_____ Dollars (\$ _____),
lawful money of the United States. Principal has submitted the accompanying bid for the construction of

THE CONDITION OF THIS OBLIGATION IS SUCH that if the Principal shall in all things abide by and well and truly keep and perform the covenants, and agreements in the said contract, and any alteration thereof made as therein provided, on his part to be kept and performed at the time and in the manner therein specified, and shall faithfully fulfill the one-year guarantee of all materials and workmanship, and shall indemnify and save harmless the District, the Engineer/Architect, the District's Representative, and their consultants, and each of their directors, officers, employees, and agents, as therein stipulated, this obligation shall become null and void, otherwise, it shall be and remain in full force and effect.

Surety agrees that no change, extension of time, alteration, or addition to the terms of the contract, or the work to be performed there under, or the plans and specifications shall in any wise affect its obligation on this bond, and it does hereby waive notice thereof.

Principal and Surety agree that if the District is required to engage the services of any attorney in connection with the enforcement of this bond, each shall pay District's reasonable attorney's fees incurred, with or without suit, in addition to the above sum.

Executed in four original counterparts on

_____, 20 _____

PRINCIPAL

(Seal if Corporation)

By: _____

Title: _____

(signature must be notarized)

(Attach Acknowledgment of Authorized Representative of Principal)

Any claims under this bond may be addressed to:

_____ (name and address of Surety)

_____ (name and address of Surety's agent for service of
_____ process in California, if different from above)

_____ (telephone number of Surety's agent in California)

(Attach Acknowledgment)

SURETY

By: _____
(Attorney-in-Fact)

APPROVED:

Don Ouchley
Deputy General Manager- Energy Resources
NOTICE:

No substitution or revision to this bond form will be accepted. Sureties must be authorized to do business in and have an agent for service of process in California. Certified copy of Power of Attorney must be attached.

PAYMENT BOND

We, _____, as Principal,

and _____, as Surety,

jointly and severally, bind ourselves, our heirs, representatives, successors and assigns, as set forth herein, to the Merced Irrigation District (herein called District) for payment of the penal sum of

_____ Dollars (\$ _____),

lawful money of the United States. Principal has submitted the accompanying bid for the construction of

If Principal or any of his sub-contractors fails to pay any of the persons named in Section 3181 of the California Civil Code, or amounts due under the Unemployment Insurance Code with respect to work or labor performed under the contract or during the one-year guarantee period, or for any amounts required to be deducted, withheld, and paid over to the Franchise Tax Board from the wages of employees of the Contractor and his sub-contractors pursuant to Section 13020 of the Unemployment Insurance Code, with respect to such work and labor, then Surety will pay the same in an amount not exceeding the sum specified above, and also will pay, in case suit is brought upon this bond, such reasonable attorney's fees as shall be fixed by the court.

The bond shall inure to the benefit of any of the persons named in Section 3181 of the California Civil Code, so as to give a right of action to them or their assigns in any suit brought upon this bond.

Surety agrees that no change, extension of time, alteration, or addition to the terms of the contract, or the work to be performed there under, or the plans and specifications shall in any wise affect its obligation on this bond, and it does hereby waive notice thereof.

Principal and Surety agree that should District become a party to any action on this bond that, each will also pay District's reasonable attorney's fees incurred therein in addition to the sum above set forth.

Executed in four original counterparts on

_____, 20 _____

PRINCIPAL

(Seal if Corporation)

By: _____

Title: _____

(signature must be notarized)

(Attach Acknowledgment of Authorized Representative of Principal)

Any claims under this bond may be addressed to:

_____ (name and address of Surety)

_____ (name and address of Surety's agent for service of process in California, if different from above)

_____ (telephone number of Surety's agent in California)

(Attach Acknowledgment)

SURETY

By: _____

(Attorney-in-Fact)

APPROVED:

Don Ouchley,
Deputy General Manager- Electric Services

NOTICE: No substitution or revision to this bond form will be accepted. Sureties must be authorized to do business in and have an agent for service of process in California. Certified copy of Power of Attorney must be attached.

NOTICE OF AWARD

Project: _____

To: _____

The Owner represented by the undersigned has considered the proposal submitted by you for the above-described work in response to your bid for the _____ on _____, 20____.

If you fail to execute said contract and to furnish bonds and certificates within 10 calendar days from the date of delivery of this Notice, said Owner will be entitled to consider all your rights arising out of the Owner's acceptance of your Proposal as abandoned and to award the work covered by your Proposal to another, or to re-advertise the work or otherwise dispose thereof as the Owner may see fit.

SAMPLE

Dated this _____ day of _____ 20_____.

MERCED IRRIGATION DISTRICT
Owner:

By: _____
Jason Perez
Purchasing Agent-
Finance

ACCEPTANCE OF NOTICE:

Receipt of the above Notice of Award is hereby acknowledged this _____ day of _____, 20_____.

By: _____
(Signature)

By: _____
(Print Name)

NOTICE TO PROCEED

Project: **Powerhouse Access Road Improvements**

To:

You are hereby given Notice to Proceed with the construction of this project. This notice given this ____ day of _____, 20____ begins the first day of the construction period for this project, and unless amended as provided for in the specifications, work shall be completed within forty five (45) days after the date of this Notice to Proceed is executed.

Work required beyond the established date of completion for this project will be assessed liquidated damages at the rate of \$500.00 per day in conformance with the specifications.

By: _____

Title: Purchasing Agent-
Finance

Date:

CONTRACT

This agreement, made and concluded this ____ day of _____, 20____, between the Merced Irrigation District (District), party of the first part, and _____, CONTRACTOR, party of the second part.

Article I. Witnesseth, that for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the said party of the first part, and under the conditions expressed in the two bonds bearing even date with these presents, and hereunto annexed, said party of the second part agrees with the said party of the first part, at his own proper cost and expense, to do all the work, and furnish all the materials except such as are mentioned in the specifications to be furnished by said party of the first part, necessary to complete in a good, workmanlike and substantial manner the **Powerhouse Access Road Improvements** for the party of the first part, in accordance with the contract documents, specifications, plans, and per District specifications and regulations and Merced County specifications and regulations therefore which are hereby made a part hereof.

Article II. And the said CONTRACTOR agrees to receive and accept the following prices as full compensation for furnishing all materials and doing all the work contemplated and embraced in this agreement, also for all loss and damage arising out of the nature of the work aforesaid, or from the acts of the elements, or from any unforeseen difficulties of obstructions which may arise or be encountered in the prosecution of the work until its acceptance by the party of the first part, and for all risks of every description connected with the work; also for all expenses incurred by or in consequence of the suspension or discontinuance of work; and for well and faithfully completing the work, and the whole thereof, in the manner and according to the plans and specifications and requirements of the Engineer under them to wit:

BID ITEMS

BASE BID (everything included in the Contract Documents)

Powerhouse Access Road Improvements \$ _____

FOR THE SUM OF:

_____ **DOLLARS**
(\$ _____)

Article III. The said party of the first part hereby promises and agrees with the said CONTRACTOR to employ, and does hereby employ the said CONTRACTOR, to provide the materials and to do the work according to the terms and conditions herein contained and referred to, for the prices aforesaid, and hereby contracts to pay the same at the time, in the manner, and upon the conditions above set forth; and the said parties for themselves, their heirs, executors, administrators, successors, and assigns, do hereby agree to the full performance of the covenants herein contained.

Article IV. Construction of this project to begin upon the receipt of a "Notice to Proceed", and unless amended by Merced Irrigation District.

Work required beyond the established date of completion for this project will be assessed liquidated damages at the rate of \$1,000 per day.

Article V. It is further expressly agreed by and between the parties hereto that should there be any conflict between the terms of this instrument and the bid or proposal of said CONTRACTOR, then this instrument shall control, and nothing herein shall be considered as an acceptance of the said terms of said proposal conflicting herewith.

Article VI. By signature hereunder, Contractor certifies that he/she is aware of the provisions of Section 3700 of the California Labor Code which requires every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and he/she will comply with such provisions before commencing the performance of the work of this agreement. Contractor and sub-Contractor will keep workers' compensation insurance for their employees in effect during all work covered by this agreement.

Article VII. Permits required by governmental authorities will be obtained at Contractor's expense, and Contractor will comply with local, state and federal regulations and statues including the Cal/OSHA requirements.

In Witness Whereof, the parties to these presents have hereunto set their hands the year and date first above written.

MERCED IRRIGATION DISTRICT:

CONTRACTOR:

By: _____

By: _____

Title: Deputy General Manager-
Energy Resources

Title: _____

Date: _____

Date: _____

SAMPLE

APPENDIX B – SUBMITTAL REGISTRY

APPENDIX C – CONSTRUCTION DRAWINGS

CONSTRUCTION DRAWINGS

Sheet No	Description
1	TITLE SHEET
2	NOTES & ABBREVIATIONS
3	SITE PLAN
4	ANCHORED SHOTCRETE WALL - PARTIAL PLAN & SECTIONS
5	ANCHORED SHOTCRETE WALL - SECTION & DETAILS
6	SOLDIER PILE WALL - PARTIAL PLAN, SECTION & DETAILS
7	SOLDIER PILE WALL - DETAILS
8	SOIL NAIL WALL - DEVELOPED ELEVATION & SECTIONS
9	SOIL NAIL WALL - DETAILS