LAKE HAVASU CITY

INVITATION TO BID

CONTRACT DOCUMENTS

AND

TECHNICAL SPECIFICATIONS

ISLAND WWTP FILTER UPGRADE PROJECT

B26-PW-107026-500701

REVISED 7/28/2025

LAKE HAVASU CITY

CONTRACT DOCUMENTS
VOLUME 1

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DIVISION I – BID AND CONTRACT DOCUMENTS

DIVISION II – GENERAL CONDITIONS

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DIVISION IV – TECHNICAL SPECIFICATIONS

The following specifications are contained within this Invitation For Bids:

LHC 1210 - MEASUREMENT AND PAYMENT
ADDITIONAL SPECIFICATIONS

The remaining applicable specifications can be accessed at:
https://www.lhcaz.gov/public-works/engineering
Please scroll down to the bottom of the webpage and notice there are clickable page numbers to access all specification documents.

SECTION 00020

NOTICE INVITING BIDS

Lake Havasu City

PROJECT NO.: **B26-PW-107026-500701**

PROJECT NAME: **Island WWTP Filter Upgrade Project**

PRE-BID MEETING: A **NON-MANDATORY Pre-Bid Meeting** will be held at the Public Works Administration Building, 900 London Bridge Road Avenue, Lake Havasu City, AZ at 11:00 am, Arizona Time, on September 25, 2025.

BID DUE DATE: **October 8, 2025**

BID DUE TIME: **3:00 p.m., ARIZONA TIME**

PROJECT DESCRIPTION:

This project consists of the construction of concrete wall repairs, removal and installation of new traveling bridge system with related mechanical and electrical equipment, handrails, grating and effluent weir plate replacements. Installation of new electrical power disconnect panel with related conduit and wiring.

QUESTIONS: All questions that arise relating to this solicitation shall be directed in writing to purchasing@lhcaz.gov with a copy to hartj@lhcaz.gov . To be considered, written inquiries shall be received at the above-referenced email address by September 29, 2025, 3:00 p.m. Arizona Time. Inquiries received will then be answered in an Addendum.

Sealed bids for the project specified will be received by the **City Clerk's Office, 2330 N. McCulloch Boulevard, Lake Havasu City, Arizona, 86403** until the time and date stated. **Bids received by the correct time and date will be opened and read aloud immediately thereafter in Room 109 of Lake Havasu City Hall.** Public openings may be attended virtually by accessing the following video conferencing system:

To join the meeting on a computer or mobile phone:
https://tinyurl.com/3f94b2ww
Meeting ID: 270 366 031 956
Passcode: jcVbxK

Join with a video conferencing device
160264325@teams.bjn.vc
Video Conference ID: 112 219 692 0

Bids must be clearly addressed to the City Clerk's Office, 2330 McCulloch Blvd. N, Lake Havasu City, Arizona, 86403, and received no later than the exact time and date indicated above. Late bids will not be considered under any circumstances.

Bids must be submitted in a sealed envelope with the Project Number and the bidder's name and address clearly indicated on the envelope. All bids must be completed in ink or typewritten on a form to be obtained from the specifications and a complete Invitation for Bid returned along with the offer no later than the time and date cited above.

Bidders interested in taking advantage of the streamlined e-Bid and e-Bond process shall submit their bids electronically via the City's DemandStar Network at https://www.demandstar.com/app/buyers/bids/505268. Paper bids and paper bid bonds will continue to be accepted. Bidders submitting e-Bids will be required to scan and enclose their paper bid bond/cashier's check with their electronic bid submission. The apparent low bidder shall submit their original bid bond/cashier's check within three (3) business days following the Bid opening.

Bid documents and specifications are available on Lake Havasu City's website at www.lhcaz.gov or on DemandStar at www.demandstar.com. For documents obtained outside of DemandStar please contact purchasing@lhcaz.gov to be added to the planholders' list.

For technical information, contact Jason Hart, Project Manager, at hartj@lhcaz.gov with a copy to purchasing@lhcaz.gov .

BONDS:

Bid Bond:	10%
Labor and Material Bond:	100%
Faithful Performance Bond:	100%

Project Completion Date: 300 calendar days after Notice to Proceed.

Lake Havasu City reserves the right to accept or reject any or all bids or any part thereof and waive informalities deemed in the best interest of the City.

Pursuant to the Americans with Disabilities Act (ADA), Lake Havasu City endeavors to ensure the accessibility of all of its programs, facilities and services to all persons with disabilities. If you need an accommodation for this meeting, please contact the City Clerk's office at (928) 453-4142 at least 24 hours prior to the meeting so that an accommodation may be arranged.

Publication Dates: TODAY'S NEWS HERALD – September 10, 2025, and September 17, 2025

ARIZONA BUSINESS GAZETTE – September 11, 2025, and Sept. 18, 2025

** END OF SECTION **

SECTION 00040

INTENT TO BID NOTIFICATION

ITB NO.: B26-PW-107026-500701

ITB TITLE: Island WWTP Filter Upgrade Project

CLOSING DATE & TIME: October 8, 2025 at 3:00 PM, Arizona Time

LETTER OF INTENT TO BID SUBMITTAL

This is notification that it is our present intent to submit a bid in response to the above referenced ITB. Please add our company to your planholders list.

The individual to whom all information regarding this ITB should be transmitted is:

Company Name: _____

Contact Name: _____

Street Address: _____

City, State, & Zip: _____

Phone Number: Fax Number: _____

E-Mail Address: _____

Submit this Letter of Intent by the deadline for requests for clarification and protests, which must be physically received by **September 29, 2025 at 3:00 p.m., Arizona Time.**

Clarification/Protest/Question/Letter of Intent to Bid
ITB No.: B25-PW-107012-500701
Lake Havasu City
Administrative Services Department, Procurement
Email to: purchasing@lhcaz.gov

** END OF SECTION **

SECTION 00100
INFORMATION FOR BIDDERS

1. RECEIPT AND OPENING OF BIDS

The City of Lake Havasu City, Arizona, (hereinafter called the "Owner") invites Bids on the form attached hereto**.** All blanks must be appropriately filled in. The Bidder shall also complete and submit a form listing proposed subcontractors as enclosed herein. Any subcontractors proposed to be used on the project but not listed on this form shall not be considered when evaluating the Contractor's qualifications and ability to perform the work. Bids **Island WWTP Filter Upgrade Project, Project No. B26-PW-107026-500701** will be received by the **City Clerk's office, 2330 N. McCulloch Boulevard, Lake Havasu City, Arizona 86403 no later than 3:00 P.M., Arizona Time, October 8, 2025,** where said Bids will be publicly opened and virtually read aloud immediately thereafter in the Room 109 of Lake Havasu City Hall.

The Owner may consider informal any Bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities or reject any and all Bids. Any Bid may be withdrawn prior to the above scheduled time for the opening of Bids or authorized postponement thereof. Any Bid received after the time and date specified shall not be considered. No Bidder may withdraw a Bid within ninety (90) days after the actual date of the opening thereof.

Bidders interested in taking advantage of the streamlined e-Bid and e-Bond process shall submit their bids electronically via the City's DemandStar Network at https://www.demandstar.com/app/buyers/bids//details. Paper bids and paper bid bonds will continue to be accepted.

Bidders submitting e-Bids will be required to scan and enclose their paper bid bond/cashier's check with their electronic bid submission. The apparent low bidder shall submit their original bid bond/cashier's check within three (3) business days following the Bid opening.

2. PREPARATION OF BID

Each Bid must be submitted on the prescribed Form. Each Document must be submitted with an original signature of the Bidder, as well as all witnesses indicated therein. All blank spaces for Bid prices must be filled in, in ink or typewritten, in both words and figures.

Each Bid must be submitted in a sealed envelope bearing on the outside the name of the Bidder, the Bidder's address, and the name and number of the project for which the Bid is submitted. If forwarded by mail, the sealed envelope containing the Bid must be enclosed in another envelope addressed as specified in the Bid form.

3. FACSIMILE BIDS OR MODIFICATIONS

No facsimile ("FAX") Bids or bid modifications will be accepted. Any modifications to the Bid shall be made by an authorized representative of the bidding company in person.

4. QUALIFICATIONS OF BIDDER

The Owner may make such investigations as he deems necessary to determine the qualifications of and the ability of the Bidder to perform the Work, and the Bidder shall furnish the Owner such information and data for this purpose as the Owner may request. The Owner may request that the Bidder provide a list of key people for the project with their related work experience.

The Owner reserves the right to reject any Bid if the evidence submitted by or investigation of such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein in a timely manner. Conditional Bids will not be accepted.

All Bidders and listed subcontractors must be valid Arizona Licensed Contractors at the time of Bidding, approved by the Arizona State Registrar of Contractors to do the type and amount of work specified in these documents. In accordance with the Arizona State Registrar of Contractors, the Bidder must possess a minimum of a Class A Arizona Contractor's License to perform the type and amount of work specified in these documents. **Failure of any bidder to possess all contractors' licenses as listed in the bid packet, at the time of bidding, shall result in the bid being considered non-responsive and not in substantial compliance, and any such bid shall not be considered.** Refer to Section 00420, page 3, item 13.

5. ARITHMETIC DISCREPANCIES IN THE BID

A. For the purpose of the evaluation of Bids, the following will be utilized in resolving arithmetic discrepancies found on the face of the Bid Schedule as submitted by Bidders:

1. Obviously misplaced decimal points will be corrected;
2. In case of discrepancy between unit price and extended price, the unit price will govern;
3. Apparent errors in extension of unit prices will be corrected;
4. Apparent errors in addition of lump sums and extended prices will be corrected; and
5. In case of discrepancy between words and figures in unit prices, the amount shown in words shall govern.

B. For the purpose of Bid evaluation, the Owner will evaluate the bids on the basis of the unit prices, extensions, and totals arrived at by resolution of arithmetic discrepancies as provided above.

6. INCOMPLETE BIDS

Failure to submit a Bid on all items in the Schedule will result in an incomplete Bid and the Bid may be rejected. **UNIT OR LUMP SUM PRICES MUST BE SHOWN FOR EACH BID ITEM WITHIN THE SCHEDULE.**

NOTE: FAILURE TO INDICATE UNIT OR LUMP SUM PRICES IN THE APPROPRIATE COLUMN, WITH THE EXTENSION OF THE PRICES IN THE FAR RIGHT COLUMN, WILL CAUSE THE BID TO BE "NON-RESPONSIVE".

All forms indicated in the Bid Proposal, Section 00300, must be completely filled out, executed, and submitted with the Bid. Failure to do so will render the bid "non-responsive" and the bid will not be accepted.

7. BID SECURITY

Each Bid must be accompanied by certified check, cashier's check, or a Bid Bond prepared on the form attached hereto or on a similar form acceptable to the Owner, duly executed by the Bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of ten percent (10%) of the Bid. Bid Bonds shall be valid for at least ninety (90) days after the date of the receipt of Bids. Such cash, check or Bid Bond will be returned to all except the three (3) lowest Bidders within fifteen (15) business days after the opening of Bids. The remaining checks, or Bid Bonds will be returned promptly after the Owner and the accepted Bidder have executed the Contract, or if no award has been made within ninety (90) days after the date of the opening of Bids, upon demand of the Bidder at any time thereafter, so long as he has not been notified of the acceptance of his Bid.

8. LIQUIDATED DAMAGES FOR FAILURE TO ENTER INTO CONTRACT

The successful Bidder, upon his failure or refusal to execute and deliver the Contract, Bonds, and certificates required within ten (10) calendar days from the date of the Notice of Award, shall forfeit to the Owner, as liquidated damages for such failure or refusal, the difference between his bid and the amount of the contract actually entered into with another party should he not enter into a contract at the bid price and provide the required payment and performance bonds and certificates of insurance. Liquidated damages for failure to enter into the contract shall not exceed the amount of the Bid Bond.

9. SECURITY FOR FAITHFUL PERFORMANCE AND PAYMENT

Simultaneously with his delivery of the executed Contract, the Bidder shall furnish **on the forms provided herein**, in 100% of the amount of this Contract, 1) a surety bond as security for faithful performance of this Contract, and 2) a surety bond as security for the payment of all persons performing labor on the project under this Contract and persons furnishing materials in connection with this Contract, and 3) a listing of all subcontractors who will be performing or providing more than one-half percent (0.50%) of the contract work, as specified in the General Conditions included herein. The surety on such bond or bonds shall be a duly authorized surety company satisfactory to the Owner, listed on the Treasury Department's most current list (Circular 570 as amended), and authorized to transact business in the State of Arizona.

10. 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.

11. LAWS AND REGULATIONS

The Bidder's attention is directed to the fact that all applicable Federal Laws, State Laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout, and they will be deemed to be included in the Contract the same as though herein written out in full.

12. METHOD OF AWARD

A. The City will award the Contract on the basis of the Bid or Bids most advantageous to the City. In determining whether a Bid is most advantageous, in addition to price, the City may consider the following:

1. The ability, capacity, and skill of the Bidder to perform the Contract or provide the service indicated;
2. Whether the Bidder can perform the Contract or provide the service promptly, and within the time specified without delay or interference;
3. The character, integrity, reputation, judgment, experience, and efficiency of the Bidder;
4. The quality of performance on previous contracts;
5. The previous compliance with laws and ordinances by the Bidder;
6. The financial responsibility of the Bidder to perform under the Contract or provide the service;
7. The limitations of any license the Bidder may be required to possess;
8. The quality, availability, and adaptability of the product or service;
9. The ability of the Bidder to provide future maintenance and/or service;
10. The number and scope of any conditions attached to the Bid; and;
11. The life cycle, maintenance, and performance of the equipment or product being offered.

13. OBLIGATION OF THE BIDDER

At the time of the opening of Bids, each Bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the Plans and Contract documents (including all Addenda, if applicable). The failure or omission of the Bidder to examine any form, instrument or document, or site changes due to natural causes, shall in no way relieve any Bidder from any obligation in respect to his Bid. Site changes due to natural causes prior to Bid opening shall not be cause for Bid alteration or withdrawal.

14. TIME OF COMPLETION AND LIQUIDATED DAMAGES

The Bidder must agree to commence work on or before a date to be specified in a written "Notice to Proceed" from the Owner, and to complete the work within **300 calendar days** of the date of the Notice to Proceed.

The Bidder further agrees to pay as liquidated damages, the sum indicated in the following Schedule of Liquidated Damages for each consecutive calendar day thereafter, plus any additional costs incurred by the Engineer as provided in Section 17 of the General Conditions, that the Contract remains incomplete. For the purposes of determining the Liquidated Damages for the project, the Original Contract Amount shall be that which is included in the Contract between the Owner and the Contractor for the project.

SCHEDULE OF LIQUIDATED DAMAGES		
Original Contract Amount		Daily Charges
From More Than	To and Including	Calendar Day or Fixed Rate
0	25,000	210
25,000	50,000	250
50,000	100,000	280
100,000	500,000	430
500,000	1,000,000	570
1,000,000	2,000,000	710
2,000,000	5,000,000	1,070
5,000,000	10,000,000	1,420
10,000,000	---0---	1,780

15. CONDITIONS OF WORK

Each Bidder must inform himself fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful Bidder of his obligation to furnish all material and labor necessary to carry out the provisions of his Contract. Insofar as possible, the Contractor, in carrying out his work, must employ such methods or means as will not cause any interruption of or interference with the work of any other Contractor.

16. ADDENDA AND INTERPRETATIONS

All questions that arise relating to this solicitation shall be directed in writing to: purchasing@lhcaz.gov with a copy to engineeringinfo@lhcaz.gov.

Administrative Services Department, Procurement Division
Lake Havasu City
2330 McCulloch Blvd. North
Lake Havasu City, AZ 86403

To be considered, written inquiries shall be received by the above-referenced contact by **September 29, 2025, 3:00 p.m. Arizona Time**. Inquiries received will then be answered in an Addendum. Any and all such interpretations and any supplemental instructions will be in the form of written Addenda to the Specifications which, if issued, will be available to all prospective Bidders, not later than five (5) calendar days prior to the date fixed for the opening of Bids. Failure of any Bidder to incorporate any such Addendum or interpretation shall not relieve such Bidder from any obligation under his/her Bid as submitted. All Addenda so issued shall become part of the Contract documents.

No informal contact initiated by offerors on this solicitation will be allowed with members of City staff from the date of distribution of this solicitation until after the closing date and time for the submissions of quotations. All questions or issues related to this solicitation shall be submitted in writing.

17. CONFLICT OF INTEREST

Pursuant to A.R.S. Section 38-511, this Contract is subject to cancellation by Buyer if any person significantly involved initiating, negotiating, securing, drafting or creating the Contract on behalf of Lake Havasu City is, at any time while the Contract is in effect, an employee of any other party to the Contract in any capacity or a consultant to any other party of the Contract with respect to the subject matter of the Contract.

18. NO COLLUSION

The bidder will be required to complete, notarize and submit as part of this bid package the "No Collusion Affidavit" form, as attached herein. Failure of the bidder to submit a properly executed affidavit may be grounds for rejection of the bid.

19. EMPLOYMENT ELIGIBILITY VERIFICATION

The bidder will be required to complete, notarize and submit as part of this bid package the "Employer Verification of Employment Eligibility" form, as attached herein. Failure of the bidder to submit a properly executed verification of eligibility form may be grounds for rejection of the bid.

20. EXAMINATION OF THE PLANS AND SPECIFICATIONS

Each Bid shall be made in accordance with the Plans and Specifications which may be examined at the following locations:

A. Lake Havasu City, 2330 N. McCulloch Boulevard, Lake Havasu City, AZ 86403, 928.855.2116

B. Dodge Data & Analytics, 3315 Central Avenue, Hot Springs, AR, 71913,

871.375.2946, FAX 501.625.3544, www.construction.com, dodge.bidding@construction.com

C. Colorado River Building Industry Association, 2182 McCulloch Blvd, Suite 3, Lake Havasu City AZ 86403, 928.453.7755, FAX 928.453.3175, www.crbia.org, frontdesk@criba.org

D. Northern AZ Home Builders, 1500 E. Cedar Avenue, Suite 86, Flagstaff AZ 86004, 928.779.3071, FAX 928.779.4211, www.nazba.org, info@nazba.org

E. Performance Graphics Blueprinting, 4140 Lynn Drive, Suite 107, Fort Mohave, AZ, 86426, 928.763.6860, FAX 928.763.6835, prints@pgblueprinting.net

F. Construction Market Data, 30 Technology Parkway South, Suite 500, Norcross, GA 30092-2912, 800.876.4045, FAX 800.303.8629, www.cmdgroup.com, projects@cmdgroup.com

G. ISqFt, 3301 N 24th Street, Phoenix, AZ, 85016, 800.364.2059, FAX 800.792.7508, www.isqft.com, arizonaplanroom@isqft.com

H. Integrated Digital Technologies, LLC, 4633 E Broadway Blvd., Tucson, AZ 85711, PO Box 13086, Tucson AZ,85732, 520.319.0988, FAX, 520.319.1430,www.contractorsplanroom.com, content@idtplans.com

I. Yuma/Southwest Contractors Association, 350 W. 16th Street, Suite 207, Yuma, AZ 85364, Phone: 928-539-9035, Fax: 928-539-9036, www.yswca.com, plans@yswca.com

J. Arizona Builders Exchange, 1700 N. McClintock Drive, Tempe, AZ, 85281, (480) 227-2620, www.azbex.com, rkettenhofen@azbex.com

K. Construction Reports.com, 4110 N Scottsdale Road, Suite 335, Scottsdale, AZ, 85251, 480.994.0020, FAX 480.994.0030, www.constructionreports.com, jess@constructionreports.com

L. Construction Reporter, 1609 2nd Street NW, Albuquerque, NM, 87102, 505.243.9793, FAX 505.242.4758, www.constructionreporter.com, jane@constructionreporter.com

M. PlanRoom Central at A&E Reprographics, 1030 Sandretto Drive, Suite F, Prescott, AZ, 86305, 928.442.9116, www.a-erepro.com, planroom1@a-erepro.com

N. Shirley's Plan Service, 425 S. Plumer Ave, Tucson, AZ, 85719, 520.791.7436, FAX 520.882.9208, www.shirleysplanservice.com, bids@shirleysplanservice.com

O. Construction Notebook Nevada, 3131 Meade Ave, Suite B, Las Vegas, NV, 89102-7885, 702.876.8660, FAX 702.876.5683, www.constructionnotebook.com

P. The Blue Book Building & Construction Network, Jefferson Valley, NY 10535, 800.431.2584, www.thebluebook.com, info@thebluebook.com, tdizon@mail.thebluebook.com

Q. Integrated Marketing Systems (IMS), 945 Hornblend Street, Suite G, San Diego, CA 92109, 888.467.3151, FAX 858.490.8811, www.imsinfo.com , ims@imsinfo.com

** END OF SECTION **

SECTION 00300
BID PROPOSAL

Lake Havasu City, Arizona

The undersigned, as bidder, declares that we have received and examined the documents entitled " **Island WWTP Filter Upgrade Project, Project No. B26-PW-107026-500701**" and will contract with the Owner, on the form of Contract provided herewith, to do everything required for the fulfillment of the contract for the construction of the **Island WWTP Filter Upgrade Project, Project No. B26-PW-107026-500701** at the prices and on the terms and conditions herein contained.

We agree that the Contract Documents include Volumes I and II of the Contract Documents as well as the referenced documents.

We agree that the following shall form a part of this proposal and are included herein as our submittal:

		Enclosed
Section	**Title**	✓
00300	**Bid Proposal**	___
00310	**Bid Schedule**	___
00400	**Arizona Statutory Bid Bond**	___
00420	**Bidder's Statement of Qualifications**	___
00430	**Affidavit of Contractor Certifying That There Was No Collusion In Bidding For Contract**	___
00450	**Hazard Communication Program**	___
00460	**Employment Eligibility Verification**	___

We acknowledge that addenda numbers _____ through _____ have been received and have been examined as part of the Contract Documents.

We certify that our proposal is genuine, and not sham or collusive, nor made in the interest or behalf of any undisclosed person, organization, or corporation, and that we have not directly or indirectly induced or solicited any other bidder to put in a sham bid, or directly or indirectly inducted or solicited any other potential bidder to refrain from bidding, and that we have not in any manner sought by collusion to secure an advantage over any other bidder.

The bidder agrees that this Bid shall be good and may not be withdrawn for a period of ninety (90) calendar days after the scheduled closing time for receiving Bids.

Upon receipt of written notice of the acceptance of this bid, Bidder shall execute the formal Contract attached within 10 days and deliver a Performance Bond, Payment Bond, and Certificates of Insurance as required by Paragraph 25 of the General Conditions and the Special Provisions.

We hereby declare that we have visited the site and have carefully examined the Contract Documents relating to the work covered by the above bid or bids.
Enclosed herewith is a certified or cashier's check or bid bond, payable to Lake Havasu City, Arizona,

in the amount of ten percent (10%) of the total bid. This check or bond is submitted as a guarantee that we will enter into a Contract, and furnish the required bonds in the event a contract is awarded us. The bid security attached, without endorsement, is to become the property of Lake Havasu City, Arizona, in the event the Contract and Bonds are not executed within the time set forth, as liquidated damages for delay and additional work caused thereby.

We understand that Lake Havasu City, Arizona reserves the right to reject any and/or all bids, or to waive any informalities in any bid, deemed by them to be for the best interests of Lake Havasu City, Arizona.

Dated in _____ this _____ day of _____,___.

Respectfully Submitted By:

By: _____

Title: _____

Name of Firm:_____

Address: _____

Phone: _____ FAX: _____

Email Address: _____

Seal - If bid by a Corporation:

Arizona Contractor's License No.: _____Type: _____

Federal Tax ID No.:_____

** END OF SECTION **

BID SCHEDULE
LAKE HAVASU CITY

Island WWTP Filter Upgrade Project, Project No. B26-PW-107026-500701

Lake Havasu City Council
Lake Havasu City
2330 N. McCulloch Boulevard
Lake Havasu City, AZ 86403

The City Council:

Pursuant to request for bids to be opened the 16th of April, 2025, at 3:00 P.M., Arizona Time, at Room 109 of Lake Havasu City Hall, for the above project, the Contractor proposes to complete work, including furnishing all labor and materials, per the Specifications and Plans at the Following prices.

This Schedule of Items and Prices shall be completed in ink or typed by the Bidding Contractor. In case of discrepancy between the word and figure amount description, the word description shall control extensions.

Prices must be entered for each item and the appropriate subtotal and total blank shall be filled out. Bid prices shall include sales tax and all other applicable taxes and fees.

Bidder agrees to perform all the necessary work to complete the **Island WWTP Filter Upgrade Project, Project No. B26-PW-107026-500701.**

BID SCHEDULE – Island WWTP Filter Upgrade Project, Project No. B26-PW-107026-500701

BASE BID

ITEM NO.	DESCRIPTION	EST QTY	UNIT OF MEASURE	UNIT PRICE[1] (Word)		UNIT PRICE (Figure)		ITEM TOTAL[2] COSTS
1	Mobilization/Demobilization, Bonds, permitting and Insurance	1	L.S.		$		$	
2	Concrete damaged area repair work	150	S.F.		$		$	
3	Concrete Crack Repair	250	L.F.		$		$	
4	Removal and disposal of equipment and facilities as shown in drawings	1	L.S.		$		$	
5	Tertiary Filter upgrades including a new traveling bridge and associated components	1	L.S.		$		$	
6	Filter media replacement	1	L.S.		$		$	
7	Grating and handrails	1	L.S.		$		$	
8	Filter control panel replacement	1	L.S.		$		$	
9	Force Account	1	L.S.	Fifty Thousand Dollars	$		$	

BID TOTAL[3] + FORCE ACCOUNT $ _____

Above line items and totals shall include all work shown on the plans and specified herein, including taxes, insurance and bonding.

[1] The "Unit Price" column shall indicate unit or lump sum prices for each bid item and shall be indicated in written and numerical form.
[2] The "Item Total Costs" column shall indicate the extension of the unit prices, which is obtained by multiplying the "Estimated Quantity" column by the "Unit Price" column.
[3] The "Bid Total" amount shall be the sum of all costs listed in the "Item Total Costs" column.

The unit prices for **Island WWTP Filter Upgrade Project, Project No. B26-PW-107026-500701** shall include all labor, materials, water disposal, bailing, shoring, removal, disposal, overhead, profit, insurance, and all other related costs and work to cover the finished work of the several kinds called for. Changes in the Contract shall be processed in accordance with Paragraph 16 of the General Conditions.

Bidder understands that the Owner reserves the right to reject any or all Bids, or portions thereof, and to waive any informalities in the bidding.

The Bidder agrees that this Bid shall be good and may not be withdrawn for a period of ninety (90) calendar days after the scheduled closing time for receiving Bids.

Upon receipt of written notice of the acceptance of this Bid, Bidder shall execute the formal Contract attached within 10 days and deliver a Performance Bond, Payment Bond, and Certificates of Insurance as required by Paragraph 25 of the General Conditions and the Special Provisions.

The Bid security attached in the sum of $_____ is to become the property of the Owner in the event the Contract and Bond(s) are not executed and provided within the time above set forth, as liquidated damages for the delay and additional expense to the Owner caused thereby.

Bidder hereby acknowledges receipt of the following Addenda: ___, ___, ___.

RESPECTFULLY SUBMITTED BY:

BY: _____

TITLE: _____

FIRM: _____

ADDRESS: _____

_____

PHONE: _____FAX_____

EMAIL: _____

Seal - if Bid by a corporation

AZ Contractor's License No:_____Type_____

** END OF SECTION **

SECTION 00400

ARIZONA STATUTORY BID BOND

PURSUANT TO TITLES 28, 34 AND 41, ARIZONA REVISED STATUTES
(Penalty of this bond must not be less than 10% of the bid amount)

KNOW ALL MEN BY THESE PRESENTS:

That, _____(hereinafter "Principal"), as Principal, and _____, (hereinafter "Surety"), a corporation organized and existing under the laws of the State of _____, with its principal offices in the City of _____, holding a certificate of authority to transact surety business in Arizona issued by the Director of the Department of Insurance pursuant to Title 20, Chapter 2, Article 1, as Surety, are held and firmly bound unto Lake Havasu City, Arizona, (hereinafter "Obligee"), as Obligee, in the amount of Ten Percent (10%) of the amount of the bid of Principal, submitted by Principal to the Obligee for the work described below, for the payment of which sum, the Principal and Surety bind themselves, and their heirs, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for

Island WWTP Filter Upgrade Project, Project No. B26-PW-107026-500701

NOW, THEREFORE, if the Obligee shall accept the proposal of the Principal and the Principal shall enter into a contract with the Obligee in accordance with the terms of the proposal and give the bonds and certificates of insurance as specified in the standard specifications with good and sufficient surety for the faithful performance of the contract and for the prompt payment of labor and materials furnished in the prosecution of the contract, or in the event of the failure of the Principal to enter into the contract and give the bonds and certificates of insurance, if the Principal pays to the Obligee the difference not to exceed the penalty of the bond between the amount specified in the proposal and such larger amount for which the Obligee may in good faith contract with another party to perform the work covered by the proposal then this obligation is void. Otherwise it remains in full force and effect provided, however, that this bond is executed pursuant to the provisions of Section 34-201, Arizona Revised Statutes, and all liabilities on this bond shall be determined in accordance with the provisions of that section to the extent as if it were copied at length herein.

Witness our hands this ___day of_____, _____.

PRINCIPAL SEAL	SURETY SEAL
By: _____	By: _____
Principal	Attorney-in-Fact
Its: _____	_____
Principal's Title	Agency of Record
	_____
	Agency Address

SECTION 00420
BIDDER'S STATEMENT OF QUALIFICATIONS

The Undersigned certifies the truth and correctness of all statements and of all answers to questions made hereinafter.

SUBMITTED TO: Lake Havasu City, Arizona
2330 N. McCulloch Boulevard
Lake Havasu City, AZ 86403

SUBMITTED BY: NAME:_____

ADDRESS:_____

PRINCIPAL OFFICE: _____

[ ] Corporation
[ ] Partnership
[ ] Individual
[ ] Joint Venture
[ ] Other

(NOTE: Attach separate sheets as required)

1. How many years has your organization been in business as a Contractor?

2. How many years has your organization been in business under its present business name?

3. If a Corporation, answer the following:
Date of Incorporation: _____
State of Incorporation:_____
President: _____
Vice President(s): _____
_____
Secretary: _____
Treasurer: _____

4. If a Partnership, answer the following:
Date of organization: _____
Type of Partnership: _____
(General/Limited/Assoc.)
Name and Address of all partners.
_____
_____
_____

5. If other than a Corporation or Partnership, describe Organization and name Principals:
_____

What percent of the work do you normally perform with your own forces?

List trades:

_____ _____ _____

_____ _____ _____

Have you ever failed to complete any work awarded to you? If so, indicate when, where and why:

_____

_____

_____

8. Has any Officer or Partner of your Organization ever been an Officer or Partner of another Organization that failed to complete a construction contract? _____If so, state circumstances:

_____

_____

9. List major construction projects your Organization has under contract on this date:

Project Name	Name, Email Address & Telephone Number of Owner	Project Location	Contract Amount	Contract Date	Percent Complete	Scheduled Completion

10. List similar construction projects your Organization has completed in the past five years:

Project Name	Name, Email Address & Telephone Number of Owner	Project Location	Contract Amount	Date Awarded	Date Completed	Percent with Own Forces

11. List the construction experience of the principal individuals in your Organization:

Individual's Name	Construction Experience - Years	Within Your Organization		
		Present Position & Years Experience	Dollar Volume Responsibility	Previous Position & Years Experience

12. List states and categories in which your Organization is legally qualified to do business:

_____
_____
_____

13. List all Arizona Contractor licenses currently held by your Organization; the status of each license; and provide a photocopy of each license with your bid proposal.

License Class / # Status

1. _____ _____
2. _____ _____
3. _____ _____
4. _____ _____

Please attach a list of additional Arizona Contractor licenses, if any.

14. Bank References:

_____
_____
_____

15. Trade References:

_____
_____
_____

16. Name of Bonding and Insurance Companies and Name and Address of Agents: Maximum Bonding Capacity _____

17. The Undersigned agrees to furnish, upon request by the Owner, within seven days after

the Bid Opening, a current Statement of Financial Conditions, including Contractor's latest regular dated financial statement or balance sheet which must contain the following items:

Current Assets: (Cash, joint venture accounts, accounts receivable, notes receivable, accrued interest on notes, deposits, and materials and prepaid expenses), net fixed assets and other assets.

Current Liabilities: (Accounts payable, notes payable, accrued interest on notes, provision for income taxes, advances received from owners, accrued salaries, accrued payroll taxes), other liabilities, and capital (capital stock, authorized and outstanding shares par values, earned surplus).

Date of statement or balance sheet: _____

Name of firm preparing statement: _____

By: _____
(Agent and Capacity)

18. List of Subcontractors. In accordance with paragraph 1.0 of Instructions to Bidders, the following is a breakdown of all subcontractors anticipated to be used for completing this project and their approximate percentage of work to be performed.

The Bidder certifies that all Subcontractors listed are eligible to perform Work on public works projects pursuant to ARS 34-241.

Subcontractor	Description of Work	% of Total Project
	Total % of all Subcontractor's work on project	
	Total % for Prime Contractor	

19. Dated at _____ this _ day of _____, _____

Name of Organization: _____

By: _____

Title: _____

** END OF SECTION **

SECTION 00430

AFFIDAVIT OF CONTRACTOR CERTIFYING THAT THERE WAS NO COLLUSION IN BIDDING FOR CONTRACT

STATE OF)
) ss
CITY OF)

(NAME OF INDIVIDUAL)

BEING DULY SWORN, DEPOSES AND SAYS:

THAT HE IS_____
(TITLE)

OF _____
(NAME OF BUSINESS)

THAT PURSUANT TO SECTION 34-253 OF THE ARIZONA REVISED STATUTES, HE CERTIFIES AS FOLLOWS:

THAT NEITHER HE NOR ANYONE ASSOCIATED WITH SAID

_____
(NAME OF BUSINESS)

HAS DIRECTLY, OR INDIRECTLY, ENTERED INTO ANY CONTRACT, PARTICIPATED IN ANY COLLUSION OR OTHERWISE TAKEN ANY ACTION IN RESTRAINT OF FREE COMPETITIVE BIDDING IN CONNECTION WITH THIS PROJECT.

_____
NAME

_____
TITLE

_____
NAME OF BUSINESS

SUBSCRIBED AND SWORN TO BEFORE ME THIS __ DAY OF _____, _____

MY COMMISSION EXPIRES: _____

NOTARY PUBLIC: _____

** END OF SECTION **

SECTION 00450
HAZARD COMMUNICATION PROGRAM
Lake Havasu City
SECTION 00440
COMPLIANCE WITH FAIR SHARE POLICY

This project is funded in whole or in part with funds provided by Water Infrastructure Finance Authority of Arizona (WIFA). WIFA provides financial assistance from the state and federally funded Clean Water Revolving Fund (CWRF) and the Drinking Water Revolving Fund (DWRF). As a recipient of benefits from state or federal funds through WIFA, the CITY must comply with the requirements of the Fair Share Policy.

The Fair Share Policy helps ensure that recipients of WIFA financial assistance award a fair share of contracting opportunities to minority business enterprises (MBEs), woman business enterprises (WBEs), and small businesses in rural areas (SBRAs). This Fair Share Policy is a requirement of the State of Arizona and the federal government. The Fair Share Policy applies to all prime contracts and sub-contracts for construction, equipment, supplies, and services.

The CONTRACTOR must document their meaningful actions to comply with the "Good Faith Effort" requirements. The CONTRACTOR will not be penalized if actual participation is below the set goals nor will they be relieved of continuing to make "Good Faith Efforts" if the goal is reached.

In order to comply with the Good Faith Effort, the CONTRACTOR must:

- Place qualified MBE/WBE/SBRA enterprises on solicitation lists.
- Assure that MBE/WBE/SBRA enterprises are solicited whenever they are potential sources.
- Divide project tasks, when economically feasible, into small tasks or quantities to permit maximum participation by MBE/WBE/SBRA enterprises.
- Establish delivery schedules when the requirements of the work permit, which will encourage participation by MBE/WBE/SBRA enterprises.
- Use the services and assistance of the Small Business Administration, the Minority Business Development Agency, and the Department of Commerce as resources to locate and contact MBE/WBE/SBRA enterprises.

A business qualifies as a MBE or WBE if it is:

- Certified as MBE or WBE by the Small Business Administration or other federal agency or certified by a State or State agency or
- An independent business concern that, although not certified, is at least 51 percent owned by one or more minority group members or women and whose daily business operations are managed and directed by one or more of the minority or women owners or
- In the case of a publicly owned business, at least 51 percent of the stock is owned by one or more minority group members or women and whose daily business operations are managed and directed by one or more of the minority or women owners.

A business qualifies as a SBRA if it is:

- A business concern that is physically located outside any standard metropolitan statistical area (SMSA) within Arizona.

SECTION 00450
HAZARD COMMUNICATION PROGRAM
Lake Havasu City

CERTIFICATION OF POSITIVE EFFORT - MBE/WBE/SBRA ENTERPRISE PARTICIPATION

Name of Prime Contractor:-

_____

:

_____ has made a Good Faith Effort to facilitate MBE/WBE/SBRA
(Contractor)

participation in this construction contract by satisfactorily following the affirmative action steps:

- Place qualified MBE/WBE/SBRA enterprises on solicitation lists.
- Assure that MBE/WBE/SBRA enterprises are solicited whenever they are potential sources.
- Divide project tasks, when economically feasible, into small tasks or quantities to permit maximum participation by MBE/WBE/SBRA enterprises.
- Establish delivery schedules when the requirements of the work permit, which will encourage participation by MBE/WBE/SBRA enterprises.
- Use the services and assistance of the Small Business Administration, the Minority Business Development Agency, and the Department of Commerce as resources to locate and contact MBE/WBE/SBRA enterprises.

CONTRACTOR shall maintain documentation related to MBE/WBE/SBRA Good Faith Effort, sub-contractor selection, and MBE/WBE/SBRA participation, in the project files and make available upon request by the CITY.

I, the undersigned representative of _____ hereby
(Contractor)

certify that all of the information provided herein is correct to the best of my knowledge and belief.

_____ _____
(Signature of Authorized Representative) *(Date)*

_____
(Type or Print Name of Authorized Representative)

Please list any MBE/WBE/SBRA enterprises selected to provide services, equipment, or supplies for this project on the following sheet (if any).

SECTION 00450
HAZARD COMMUNICATION PROGRAM
Lake Havasu City

The following MBE/WBE/SBRA enterprises have been selected to provide services, equipment, or supplies for the listed project:

____ MBE WBE SBRA
(Name of Company) *(Circle if applicable)*

____ MBE WBE SBRA
(Name of Company) *(Circle if applicable)*

____ MBE WBE SBRA
(Name of Company) *(Circle if applicable)*

____ MBE WBE SBRA
(Name of Company) *(Circle if applicable)*

____ MBE WBE SBRA
(Name of Company) *(Circle if applicable)*

____ MBE WBE SBRA
(Name of Company) *(Circle if applicable)*

____ MBE WBE SBRA
(Name of Company) *(Circle if applicable)*

____ MBE WBE SBRA
(Name of Company) *(Circle if applicable)*

____ MBE WBE SBRA
(Name of Company) *(Circle if applicable)*

____ MBE WBE SBRA
(Name of Company) *(Circle if applicable)*

____ MBE WBE SBRA
(Name of Company) *(Circle if applicable)*

____ MBE WBE SBRA
(Name of Company) *(Circle if applicable)*

____ MBE WBE SBRA
(Name of Company) *(Circle if applicable)*

____ MBE WBE SBRA
(Name of Company) *(Circle if applicable)*

____ MBE WBE SBRA
(Name of Company) *(Circle if applicable)*

____ MBE WBE SBRA
(Name of Company) *(Circle if applicable)*

HAZARD COMMUNICATION PROGRAM FOR_____
(*Name of Company*)
The purpose of this program is to ensure that potential hazards and hazard control measures for chemicals used by this company are understood by company employees.

The written program is available for employee review at any time. It is located _____. A copy of the program will be provided to any employee or employee representative, upon request.

CONTAINER LABELING:
_____ will verify that all containers received for use by this company will: (name/title of individual)

* be clearly labeled as to the contents, matching identification on MSDS;
* note the appropriate hazard warnings;
* List the name and address of the manufacturer.

No containers will be released for use until the above data is verified.

MATERIAL SAFETY DATA SHEETS:
Copies of MSDS's for all hazardous chemicals to which employees may be exposed will be kept
_____.
_____ will be responsible for ensuring that:
(name/title of individual)

* MSDS's for the new chemicals are available;
* MSDS's will be available for review to all employees during each work shift;
* Copies will be available on request.

EMPLOYEE TRAINING AND INFORMATION:
Each employee will be provided the following information and training before working in areas where hazardous chemicals exist. In addition, if a new hazardous material is introduced into the workplace, affected employees will be given new information and training concerning that material.

A. Minimum Information Provided:

(1) All operations and locations in the work area where hazardous chemicals are present.

GENERAL INDUSTRY

A. Minimum Information Provided:

(1) The location and availability of the written hazard communication program, including list(s) of hazardous chemicals used and related material safety data sheets;
(2) The method the company will use to inform employees of potential hazards of non-routine tasks (jobs that are not routine for an individual because of infrequency, location or type.)

B. Minimum Training Provided:

(1) Methods and observations used to detect the presence or release of a hazardous chemical in the work area (such as company monitoring programs, continuous monitoring device, visual appearance, odor or to other characteristics of hazardous chemicals;

(2) The physical and health hazards of chemicals in the assigned work area;

(3) The measures to take to protect against such hazards, including specific company procedures concerning work practices, emergencies and care and use of protective equipment.

(4) Details of the company hazard communication program, including explanation of the labeling system, the material safety data sheets, and how to obtain and use the appropriate hazard information.

(OPTIONAL) Upon completion of the training, each employee will sign a form acknowledging receipt of the written hazard communication program and related training.

HAZARDOUS NON-ROUTINE TASKS: (If applicable.)
If company employees are required to do hazardous non-routine tasks, such as welding in confined spaces, or cleaning of tanks, the employer must address how the employees doing the work will be informed about the specific hazards to which they will be exposed, what personal protective equipment will be provided and who will be responsible to oversee the operation or operations. If the company does not have any hazardous non-routine tasks, line through this section and state "NO HAZARDOUS NON-ROUTINE TASKS".

CHEMICALS IN UNLABELED PIPES: (If applicable.)
If the company has chemicals in unlabeled pipes, the company must inform the employees of the hazards associated with those chemicals. If the company does not have any chemicals in unlabeled pipes, line through this section and state "NO CHEMICALS IN UNLABELED PIPES".

INFORMING CONTRACTORS:
Providing contractors and their employees with the following information is the responsibility of _____.

(Name/title of individual)

(1) Hazardous chemicals to which they may be exposed while on the job site;
(2) Measures the employees may take to lessen the possibility of exposure;
(3) Steps the company has taken to lessen the risks;
(4) Where the MSDS's are for chemicals to which they may be exposed;
(5) Procedures to follow if they are exposed.

CONTRACTORS INFORMING EMPLOYERS:
Contractors entering this workplace with hazardous materials will supply this employer with MSDS's covering those particular products the contractor may expose this company's employees to while working at this site.

LIST OF HAZARDOUS CHEMICALS IN THIS WORKPLACE
_____
_____
_____
_____

CONTRACTOR:
By: _____

Name: _____

Title: _____

Address: _____

END OF SECTION

LAKE HAVASU CITY
EMPLOYMENT ELIGIBILITY VERIFICATION & FORM

INSTRUCTIONS FOR COMPLETION OF EMPLOYMENT ELIGIBILITY VERIFICATION FORM

WHO MUST COMPLETE THIS FORM:
In accordance with Lake Havasu City Code Chapter 3.30, Employment of Unauthorized Aliens, all contractors and subcontractors furnishing labor, time, or effort for construction or maintenance of any structure, building, transportation facility, or improvements of real property must complete this form.

Contractors or subcontractors, as described above, must certify that they have complied, in good faith, with the applicable requirements of the Federal Immigration Control and Reform Act with respect to the hiring of covered employees. This certification must be executed by an authorized representative.

WHEN THIS FORM MUST BE COMPLETED:
This form must be completed by all contractors and subcontractors and submitted to the City department awarding the contract, license agreement, or lease no later than notification of successful direct selection, bid, request for proposals, request for qualification, or any similar competitive or noncompetitive procurement or bidding process.

LAKE HAVASU CITY
EMPLOYMENT ELIGIBILITY VERIFICATION & FORM

LIST OF ACCEPTABLE DOCUMENTS:

LIST A		LIST B		LIST C
Documents that Establish Both		**Documents that Establish**		**Documents that Establish**
U.S. Passport (unexpired or expired)	**OR**	Driver's license or ID Card issued by a state or outlying possession of the United States provided it contains a photograph or information such as name date of birth	**AND**	U.S. social security card issued by the Social Security Administration
Certificate of U.S. Citizenship		ID card issued by a federal, state or local government agencies or entities, provided it contains a photograph or information		Certification of Birth Abroad issued by the Department of State
Certificate of Naturalization		School ID card with photograph		Original or certified copy of a birth certificate issued by a state, county, municipal authority or outlying
Unexpired foreign passport with I-551 stamp or attached federal Form I-94		Voter's registration card		Native American tribal document
Permanent Resident Card or Alien		U.S. Military card or draft record		U.S. Citizen ID Card
Unexpired Temporary		Military dependent's ID card		ID Card for the use of Resident Citizen in the
Unexpired Employment		U.S. Coast Guard Merchant Mariner Card		Unexpired employment authorization document issued by DHS
Unexpired Reentry		Native American tribal		
Unexpired Refugee Travel Document		Driver's license issued by a		
Unexpired Employment Authorization Document issued by DHS that contains a		**For persons under age 18 who are unable to present a document listed above:** School record or report card; Clinic,		

EMPLOYER VERIFICATION OF EMPLOYMENT ELIGIBILITY & FORM

The undersigned attests under penalty of perjury, that they have reviewed the documents presented to them by their employees, and that the documents provided to the undersigned by their employees, as more particularly identified in the attached exhibit entitled "list of acceptable documents" appear to be genuine and appear to relate to the employee name, and to the best of the undersigned's knowledge, the employee is eligible to work in the United States based upon the undersigned's review of the documents presented.

Signature of Authorized Representative of Covered Employer/Contractor/ Subcontractor	**Print Name**	**Title**
Business or Organization Name	**Business Phone Number**	**Date (month/date/year)**
Address (Street Name and Number)		
City, State, Zip Code		

SECTION 00500
CONTRACT

THIS CONTRACT is entered into by and between LAKE HAVASU CITY, ARIZONA, a municipal corporation ("OWNER"), and _____a(n) ARIZONA corporation,
Federal I.D. # ("CONTRACTOR").

WHEREAS, OWNER has developed plans for and desires to commence the South Intake Influent Screen B25-PW-107012-500644 ("PROJECT"); and

WHEREAS, CONTRACTOR represents that it possesses the experience, competence, equipment and financing to properly complete the PROJECT, and has formally proposed to do so, and to furnish all necessary labor, materials, and equipment and services therefore in accordance with said plans, and subject to the terms and conditions hereof.

NOW, THEREFORE, in consideration of these promises and the mutual covenants herein, it is hereby agreed as follows:

1. CONTRACTOR shall commence and complete the construction of the PROJECT;

2. CONTRACTOR shall furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the PROJECT.

3. CONTRACTOR shall commence the PROJECT in accordance with the CONTRACT DOCUMENTS within TEN (10) calendar days after the date of the Notice to Proceed. Final completion of the PROJECT shall occur within **[XXX] calendar days** of the date of the Notice to Proceed. The period for completion may be extended through the authorized and approved change order process.

4. Liquidated Damages: OWNER and CONTRACTOR recognize that time is of the essence of this CONTRACT and that OWNER will suffer financial loss if the PROJECT is not completed within the time specified in paragraph 3 above, plus any extensions thereof allowed in accordance with the General Conditions. They also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual losses or damages (including special, indirect, consequential, incidental and any other losses or damages) suffered by OWNER if a complete acceptable PROJECT is not delivered on time.

   Accordingly, and instead of requiring proof of such losses or damages, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty) CONTRACTOR shall pay the OWNER **$XXX** for each calendar day that expires after the time specified in paragraph 3 for delivery of acceptable Bid Items, plus any costs incurred by the Engineer as provided in Section 17 of the General Conditions.

5. CONTRACTOR agrees to complete the PROJECT in accordance with all of the terms and conditions of the CONTRACT DOCUMENTS for the sum of **$XXXXX** as shown

in the Bid Schedule.

6. CONTRACTOR shall submit a completed Section 00450 entitled Hazard Communication Program with the executed copy of this CONTRACT.

7. The term "CONTRACT DOCUMENTS" means and includes the following:
00020 Notice Inviting Bids
00100 Information for Bidders
00300 Bid Proposal
00310 Bid Price Schedule
00400 Bid Bond
00420 Bidder's Statement of Qualifications
00430 Bidder's Affidavit of No Collusion
00450 Hazard Communication Program
00460 Employment Eligibility Verification
00500 CONTRACT
00500A Indemnification and Insurance Requirements
00500B Contractor Claim Handling Procedure
00510 Arizona Statutory Performance Bond
00520 Arizona Statutory Payment Bond
00670 Notice of Award
00680 Notice to Proceed
00685 Certificate of Substantial Completion
00690 Certificate of Final Completion
00700 General Conditions
00800 Special Provisions
Technical Specifications and Details
Construction Contract Drawings
Change Orders
Lien Releases (Conditional and Final)
Addenda

8. OWNER shall pay CONTRACTOR in the manner and at such times as set forth in the General Conditions and in such amounts as required by the CONTRACT DOCUMENTS.

9. In the event CONTRACTOR fails to perform any portion of the PROJECT or satisfy any term or condition of the CONTRACT DOCUMENTS, OWNER may at its sole discretion file notice and/or claim of such failure with CONTRACTOR'S surety.

10. Israel. If applicable, Contractor certifies that it is not currently engaged in, and agrees for the duration of this Contract that it will not engage in, a boycott of goods and services from Israel, as defined in A.R.S. § 35-393.

11. Conflict of Interest. The Contract may be cancelled in accordance with Arizona Revised Statutes Section 38-511.

12. Forced Labor of Ethnic Uyghurs Certification. If applicable, Contractor certifies that it does not currently, and agrees for the duration of the Contract that it will not, use: (1) the forced labor of ethnic Uyghurs in the People's Republic of China; (2) any goods or services produced by the forced labor of ethnic Uyghurs in the People's Republic of China; or (3) any contractors, subcontractors, or suppliers that use the forced labor or any goods or services produced by the forced labor of ethnic Uyghurs in the People's Republic of China. If Contractor becomes aware it is not in compliance with this certification, it shall notify the City within five business days after becoming aware. This Contract will terminate upon failure to remedy the noncompliance within 180 days of the notification. (A.R.S. § 35-394)

13. Export Administration Act. The CONTRACTOR warrants compliance with the Export Administration Act.

14. Recyclable Products. The CONTRACTOR shall use recyclable products and products which contain recycled content to the maximum extent economically feasible in the performance of the work set forth in the CONTRACT.

15. Asbestos License. The CONTRACTOR shall possess an asbestos abatement license if required under A.R.S. Title 32 or 49.

16. Assignment. No right or interest in this CONTRACT shall be assigned by CONTRACTOR without prior, written permission of the OWNER signed by the City Manager; and no delegation of any duty of CONTRACTOR shall be made without prior written permission of the OWNER signed by the City Manager. Any attempted assignment or delegation by CONTRACTOR in violation of this provision shall be a breach of this CONTRACT by CONTRACTOR.

[SIGNATURES ON FOLLOWING PAGE]

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this CONTRACT in two (2) copies, each of which shall be deemed an original. The last date of signature shall be the effective date of this CONTRACT.

OWNER:
Lake Havasu City, Arizona

By: _____ Date: _____

Name: _____
Title: _____

APPROVED AS TO FORM:
Lake Havasu City Attorney's Office

By: _____ Date: _____

CONTRACTOR:

By: _____ Date: _____

Name/Title: _____

Address: _____

ATTEST:

BY: _____

Name/Title: _____

** END OF SECTION **

LAKE HAVASU CITY CONSTRUCTION CONTRACT
INDEMNIFICATION AND INSURANCE REQUIREMENTS
(long form)

I. INDEMNIFICATION

CONTRACTOR agrees to indemnify, defend, save, and hold harmless the CITY, its departments, agencies, boards, commissions, officers, officials, agents, volunteers, and employees ("CITY") from and against any and all claims, actions, liabilities, damages, losses, or expenses (including court costs, attorney's fees, and costs of claim processing, investigation, and litigation) ("Claims") for bodily injury or personal injury (including death), or loss or damage to tangible or intangible property caused, or alleged to be caused, in whole or in part, by the CONTRACTOR or any of its owners, officers, directors, agents, employees, or contractors. This Indemnity includes any claim or amount arising out of or recovered under Workers' Compensation law or arising out of the failure of the CONTRACTOR to conform to any federal, state, or local law, statute, ordinance, rule, regulation, or court decree. It is the specific intention of the parties that the CITY shall, in all instances, except for Claims arising solely from the negligent or willful acts or omissions of the CITY, be indemnified by CONTRACTOR from and against any and all claims. It is agreed that CONTRACTOR will be responsible for primary loss investigation, defense, and judgment costs where this indemnification is applicable. The amount and type of insurance coverage requirements required by this Agreement will in no way be construed as limiting the scope of indemnity in this Section.

II. INSURANCE REQUIREMENTS

A. CONTRACTOR and its subcontractors shall procure and maintain until all of their obligations have been discharged, including any warranty periods under this CONTRACT, are satisfied, insurance against claims for injury to persons or damage to property which may arise from or in connection with the performance of the work hereunder by the CONTRACTOR, its agents, representatives, employees or subcontractors.

B. The insurance requirements herein are minimum requirements for this CONTRACT and in no way limit the indemnity covenants contained in this CONTRACT. City in no way warrants that the minimum limits contained herein are sufficient to protect the CONTRACTOR from liabilities that might arise out of the performance of the work under this CONTRACT by the CONTRACTOR, its agents, representatives, employees or subcontractors, and CONTRACTOR is free to purchase additional insurance.

C. MINIMUM SCOPE AND LIMITS OF INSURANCE: CONTRACTOR shall provide coverage with limits of liability not less than those stated below.

1. **Commercial General Liability – Occurrence Form**
   Policy shall include bodily injury, property damage, personal injury and broad form contractual liability coverage.
   a. General Aggregate $2,000,000
   b. Products – Completed Operations Aggregate $1,000,000
   c. Personal and Advertising Injury $1,000,000
   d. Blanket Contractual Liability – Written and Oral $1,000,000

e. Fire Legal Liability $ 50,000
f. Each Occurrence $1,000,000

i. The policy shall be endorsed to include the following additional insured language: ***"Lake Havasu City, its departments, agencies, boards, commissions, and its officers, officials, agents, volunteers and employees shall be named as additional insureds with respect to liability arising out of the activities performed by or on behalf of the CONTRACTOR".***

ii. Policy shall contain a waiver of subrogation against Lake Havasu City, its departments, agencies, boards, commissions, and its officers, officials, agents, volunteers and employees for losses arising from work performed by or on behalf of the CONTRACTOR.

iii. Completed operations coverage shall remain effective for at least two years following expiration of CONTRACT.

2. **Business Automobile Liability**

a. Bodily Injury and Property Damage for any owned, hired, and/or non-owned vehicles used in the performance of this CONTRACT.

Combined Single Limit (CSL) $1,000,000

i. The policy shall be endorsed to include the following additional insured language: "Lake Havasu City, its departments, agencies, boards, commissions, and its officers, officials, agents, volunteers and employees shall be named as additional insureds with respect to liability arising out of the activities performed by or on behalf of the CONTRACTOR, involving automobiles owned, leased, hired or borrowed by the CONTRACTOR."

ii. Policy shall contain a waiver of subrogation against Lake Havasu City, its departments, agencies, boards, commissions, and its officers, officials, agents, volunteers and employees for losses arising from work performed by or on behalf of the CONTRACTOR.

3. **Workers' Compensation and Employers' Liability**

a. Workers' Compensation Statutory

b. Employers' Liability Each Accident $ 500,000
Disease – Each Employee $ 500,000
Disease – Policy Limit $1,000,000

i. Policy shall contain a waiver of subrogation against Lake Havasu City, its departments, agencies, boards, commissions, and its officers, officials, agents, volunteers and employees for losses arising from work performed by or on behalf of the CONTRACTOR.

ii. This requirement shall not apply if exempt under A.R.S. Section 23-901.

4. **Professional Liability (Errors and Omissions Liability)***
***If Applicable**

a. Each Claim $1,000,000
b. Annual Aggregate
$2,000,000

i. In the event that the professional liability insurance required by this CONTRACT is written on a claims-made basis, CONTRACTOR warrants that any retroactive date under the policy shall precede the effective date of this CONTRACT; and that either continuous coverage will be maintained or an extended discovery period will be exercised for a period of two (2) years beginning at the time work under this CONTRACT is completed.

ii. The policy shall cover professional misconduct or lack of ordinary skill for those positions defined in the Scope of Work of this CONTRACT.

5. **Indemnity–Patents, Copyright, and Trademark.**

Contractor agrees to defend City, mayor, council, appointed boards and commissions, officers, officials, employees, and agents its departments, agencies, boards, commissions, officers, officials, agents, volunteers, and employees individually and collectively at Contractor's own expense, in all suits, actions, or proceedings in which Contractor is made a defendant for actual or alleged infringement of any United States of America or foreign letters patents resulting from Contractor's use of the goods, service, or finished end product purchased as a result of this Procurement (Invitation To Bid (ITB) or Request For Proposal (RFP)) and subsequent Contract. Contractor further agrees to pay and discharge any and all judgments or decrees which may be rendered in any such suit, action, or proceedings against City. Contractor agrees to indemnify and hold harmless the City from any and all license, royalty and proprietary fees or costs, including legal costs, which may arise out of City's purchase and use of goods, service, or finished end product supplied by the Contractor. Contractor will indemnify City against all claims for damages to persons or property resulting from defects in materials or workmanship. It is expressly agreed by Contractor that these covenants are irrevocable and perpetual.

6. **Contractor's Personal Property**

CONTRACTOR and each of its subcontractors and suppliers shall be solely responsible for any loss or damage to its or their personal property and that of their employees and workers, including, without limitation, property or materials created or provided pursuant to this CONTRACT, any subcontract or otherwise, its or their tools, equipment, clothing, fencing, forms, mobile construction equipment, scaffolding, automobiles, trucks, trailers or semi-trailers including any machinery or apparatus attached thereto, temporary structures and uninstalled materials, whether owned, used, leased, hired or rented by CONTRACTOR or any subcontractor, consultant or supplier or employee or worker (collectively, "Personal Property"). CONTRACTOR and its subcontractors, consultants and suppliers, at its or their option and own expense, may purchase and maintain insurance for such Personal Property and any deductible or self-insured

retention in relation thereto shall be its or their sole responsibility. Any such insurance shall be CONTRACTOR's and the subcontractors', suppliers' volunteers and employees' and workers' sole source of recovery in the event of loss or damage to its or their Personal Property. Any such insurance purchased and maintained by CONTRACTOR and any subcontractor, consultant or supplier shall include a waiver of subrogation as to Owner. CONTRACTOR waives all rights of recovery, whether under subrogation or otherwise, against all such parties for loss or damage covered by CONTRACTOR's property insurance. CONTRACTOR shall require the same waivers from all subcontractors and suppliers and from the insurers issuing property insurance policies relating to the Work or the Project purchased and maintained by all subcontractors and suppliers. The waivers of subrogation referred to in this subparagraph shall be effective as to any individual or entity even if such individual or entity (a) would otherwise have a duty of indemnification, contractual or otherwise, (b) did not pay the insurance premium, directly or indirectly, and (c) whether or not such individual or entity has an insurable interest in the property which is the subject of the loss or damage.

7. **Theft, Damage, or Destruction of Work**

In the event of theft, damage or destruction of the Work, CONTRACTOR will re-supply or rebuild its Work without additional compensation and will look to its own resources or insurance coverages to pay for such re-supply or rebuilding. CONTRACTOR will promptly perform, re-supply or rebuild, regardless of the pendency of any claim by CONTRACTOR against any other party, including Owner, that such party is liable for damages, theft or destruction of CONTRACTOR's Work. This subparagraph shall apply except to the extent that the cost of re-supply or rebuilding is paid by Owner's builder's risk insurance; in such event, Owner waives (to the fullest extent permitted by the builder's risk policy) all rights of subrogation against CONTRACTOR and each of its subcontractors to the extent of such payment by Owner's builder's risk insurer.

D. ADDITIONAL INSURANCE REQUIREMENTS: The policies shall include, or be endorsed to include, the following provisions:

1. Lake Havasu City, its departments, agencies, boards, commissions and its officers, officials, agents, volunteers and employees wherever additional insured status is required. Such additional insured shall be covered to the full limits of liability purchased by the CONTRACTOR, even if those limits of liability are in excess of those required by this CONTRACT.
2. The Contractor's insurance coverage shall be primary insurance with respect to all other available sources.
3. Coverage provided by the Contractor shall not be limited to the liability assumed under the indemnification provisions of this CONTRACT.

E. NOTICE OF CANCELLATION: Each insurance policy required by the insurance provisions of this CONTRACT shall not be suspended, voided, cancelled, reduced in coverage or in limits without ten (10) business days written notice to City. Such notice shall be mailed directly to Lake Havasu City, Administrative Services Department, Procurement Division, 2330

McCulloch Blvd. North, Lake Havasu City, AZ, 86403 and shall be sent by certified mail, return receipt requested.

F. ACCEPTABILITY OF INSURERS**:** Insurance is to be placed with duly licensed or approved non-admitted insurers in the state of Arizona with an "A.M. Best" rating of not less than A-VII. CITY in no way warrants that the above-required minimum insurer rating is sufficient to protect the CONTRACTOR from potential insurer insolvency.

G. VERIFICATION OF COVERAGE**:**

1. CONTRACTOR shall furnish CITY with certificates of insurance as required by this CONTRACT. The certificates for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf and the Project/contract number and project description shall be noted on the certificate of insurance.
2. All certificates and endorsements are to be received and approved by CITY at least ten (10) days before work commences. Each insurance policy required by this CONTRACT must be in effect at or prior to commencement of work under this CONTRACT and remain in effect for the duration of the Project. Failure to maintain the insurance policies as required by this CONTRACT, or to provide evidence of renewal, is a material breach of contract.
3. All renewal certificates required by this CONTRACT shall be sent directly to Lake Havasu City, Administrative Services Department, Procurement Division, 2330 McCulloch Blvd. North, Lake Havasu City, AZ, 86403. The Project/contract number and project description shall be noted on the certificate of insurance. CITY reserves the right to require complete, certified copies of all insurance policies required by this CONTRACT at any time**.**

H. SUBCONTRACTORS**:** CONTRACTOR's certificate(s) shall include all subcontractors as insureds under its policies **or** CONTRACTOR shall furnish to CITY separate certificates and endorsements for each subcontractor. All coverages for subcontractors shall be subject to the minimum requirements identified above.

I. APPROVAL**:** Any modification or variation from the insurance requirements in this CONTRACT must have prior approval from the CITY's Human Resources/Risk Management Division, whose decision shall be final. Such action will not require a formal CONTRACT amendment, but may be made by administrative action.

J. EXCEPTIONS**:** In the event the CONTRACTOR or sub-contractor(s) is/are a public entity, then the Insurance Requirements shall not apply. Such public entity shall provide a Certificate of Self-Insurance.

SECTION 00500B
CONTRACTOR Claim Handling Procedure

1. Claimant is to submit in writing to the OWNER or their REPRESENTATIVE the details of the claim to include the where, when, and how of the claim, and an estimate of damage, if applicable.

2. OWNER or their REPRESENTATIVE will forward the claim directly to the CONTRACTOR for handling. The CONTRACTOR is to respond to the claimant, in writing, within 30 calendar days of receipt with copies to:

   Lake Havasu City Human Resources/Risk Management Division
   Lake Havasu City Administrative Services Department
   OWNER'S REPRESENTATIVE, if applicable

   If the CONTRACTOR denies the claim, the reasons for such denial must be included in the response to the claimant.

SECTION 00510
ARIZONA STATUTORY PERFORMANCE BOND

PURSUANT TO TITLES 28, 34, AND 41, ARIZONA REVISED STATUTES
(Penalty of this bond must be 100% of the Contract amount)

KNOW ALL MEN BY THESE PRESENTS THAT: _____ (hereinafter "Principal"), as Principal, and _____ (hereinafter "Surety"), a corporation organized and existing under the laws of the State of _____ with its principal office in the City of _____, holding a certificate of authority to transact surety business in Arizona issued by the Director of Insurance pursuant to Title 20, Chapter 2, Article 1, as Surety, are held and firmly bound unto Lake Havasu City, Arizona (hereinafter "Obligee") in the amount of **WRITTEN AMOUNT AND 00/100** (Dollars) (**$#,###,###.##-NUMERIC AMOUNT**), for the payment whereof, Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the ____ day of _____, _____, to furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of

Island WWTP Filter Upgrade Project, Project No. B26-PW-107026-500701

which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THE OBLIGATION IS SUCH, that if the Principal faithfully performs and fulfills all of the undertakings, covenants, terms, conditions and agreements of the contract during the original term of the contract and any extension of the contract, with or without notice of the Surety, and during the life of any guarantee required under the contract, and also performs and fulfills all of the undertakings, covenants, terms, conditions and agreements of all duly authorized modifications of the contract that may hereafter be made, notice of which modifications to the Surety being hereby waived, the above obligation is void. Otherwise it remains in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Title 34, Chapter 2, Article 2, Arizona Revised Statutes, and all liabilities on this bond shall be determined in accordance with the provisions of Title 34, Chapter 2, Article 2, Arizona Revised Statutes, to the same extent as if it were copied at length in this agreement.

The prevailing party in a suit on this bond shall recover as part of the judgment reasonable attorney fees that may be fixed by a judge of the court.

Witness our hands this ____ day of _____ , _____.

_____

PRINCIPAL SEAL

_____ BY:_____

AGENCY OF RECORD

_____ _____

AGENCY ADDRESS SURETY SEAL

BY:_____

** END OF SECTION **

SECTION 00520
ARIZONA STATUTORY PAYMENT BOND
PURSUANT TO TITLES 28, 34, AND 41, ARIZONA REVISED STATUTES
(Penalty of this bond must be 100% of the Contract amount)

KNOW ALL MEN BY THESE PRESENTS THAT: _____

(hereinafter "Principal"), as Principal, and _____

_____

(hereinafter Surety), a corporation organized and existing under the laws of the State of with its principal office in the City of _____

_____,

holding a certificate of authority to transact surety business in Arizona issued by the Director of the Department of Insurance pursuant to Title 20, Chapter 2, Article 1, as Surety, are held and firmly bound unto Lake Havasu City, Arizona (hereinafter "Obligee") in the amount of **WRITTEN AMOUNT AND 00/100 (Dollars) (($#,###,###.##-NUMERIC AMOUNT)** for the payment whereof, Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the _____ of _____, _____, to furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of

Island WWTP Filter Upgrade Project, Project No. B26-PW-107026-500701

which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFOR, THE CONDITION OF THE OBLIGATION IS SUCH, that if the Principal promptly pays all monies due to all persons supplying labor or materials to the Principal or the Principal's subcontractors in the prosecution of the work provided for in the contract, this obligation is void. Otherwise it remains in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Title 34, Chapter 2, Article 2, Arizona Revised Statues, and all liabilities on this bond shall be determined in accordance with the provisions, conditions and limitations of Title 34, Chapter 2, Article 2, Arizona Revised Statutes, to the same extent as if it were copied at length in this agreement.

The prevailing party in a suit on this bond shall recover as part of the judgment reasonable attorney fees that may be fixed by a judge of the court.

Witness our hands this ___ day of _____, _____.

_____
PRINCIPAL SEAL

_____ BY:_____
AGENCY OF RECORD

_____ _____
AGENCY ADDRESS SURETY SEAL

BY:_____

** END OF SECTION **

SECTION 00670

NOTICE OF AWARD

TO: **DATE:**

PROJECT DESCRIPTION: Island WWTP Filter Upgrade Project, Project No. B26-PW-107026-500701

The OWNER has considered the BID submitted by you for the above described WORK in response to its Advertisement for BIDS dated [DATE BID FIRST ADVERTISED], and Information for Bidders.

You are hereby notified that your BID has been accepted for items in the amount of $, to include: [LIST BID ITEMS AWARDED]

You are required by the Information for Bidders to execute the Contract and furnish the required CONTRACTOR'S Performance Bond, Payment Bond, and Certificates of Liability, Vehicular, and Workmen's Compensation Insurance within ten (10) calendar days from the postmark date when this notice was sent by U.S. Mail.

If you fail to execute said Contract and to furnish said BONDS within ten (10) days from the date of this Notice, said OWNER will be entitled to consider all your rights arising out of the OWNER'S acceptance of your BID as abandoned and as a forfeiture of your BID BOND. The OWNER will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this NOTICE OF AWARD to the OWNER.

Dated this [DATE] day of [MONTH], 20##.

Lake Havasu City, Arizona

BY: _____

NAME: Lynette Singleton

TITLE: Procurement Official

Acceptance of Notice

(NOTE: The contractor shall return a signed copy of this notice to the owner.)

Receipt of this NOTICE OF AWARD is hereby acknowledged by:

Contractor

This the ____ day of _____, 20##.

BY: _____ TITLE: _____

** END OF SECTION **

REV 3/30/16

SECTION 00685
CERTIFICATE OF SUBSTANTIAL COMPLETION

I hereby state that the degree of completion of:

Island WWTP Filter Upgrade Project,
Project No. B26-PW-107026-500701

Provides the full-time use of the project, or defined portion of the project, for the purposes for which it was intended and is the commencement of the Guarantee Period.

"Substantial Completion" shall not be considered as final acceptance.

Lake Havasu City, Arizona

Date: _____

By: _____

Name: _____

Title: _____

ACCEPTANCE OF NOTICE

(NOTE: The Contractor shall return a signed copy of this Notice to the Owner)

Receipt of the above **CERTIFICATE OF SUBSTANTIAL COMPLETION** is hereby acknowledged this the _____ day of _____, _____.

By: _____

Name: _____

Title: _____

E-original: [CONTRACTOR]
E-copy: Procurement (Purchasing@lhcaz.gov)
Lake Havasu City, City Clerk (CityClerk@lhcaz.gov)

CERTIFICATE OF COMPLETION

I hereby state that all goods and services required by:

Island WWTP Filter Upgrade Project, Project No. B26-PW-107026-500701

have been delivered in conformance with the Contract, and all activities required by the Contractor under the Contract were completed as of _____.
(Date)

Lake Havasu City, Arizona

By: _____

Name:_____

Title: _____

E-original: [CONTRACTOR]
E-copy: Procurement (Purchasing@lhcaz.gov)
City Clerk (CityClerk@lhcaz.gov)

SECTION 00700
GENERAL CONDITIONS

This section of the Contract Documents is pre-printed. Any modifications to the following Articles, as may be required for this Project, are made in the Special Provisions.

1.0 DEFINITIONS

Wherever in the Contract Document the following terms are used, the intent and meaning shall be interpreted as follows:

1.1 Addenda

Written or graphic instruments issued prior to the opening of Bids which modify or interpret the Contract Documents, Drawings and Specifications, by additions, deletions, clarifications or corrections.

1.2 As Approved

The words "as approved," unless otherwise qualified, shall be understood to be followed by the words "by the Owner."

1.3 As Shown, and as Indicated

The words "as shown" and "as indicated" shall be understood to be followed by the words "on the Drawings" or "in the Specifications."

1.4 Award

The acceptance, by the Owner, of the successful Bidder's proposal.

1.5 Bid

The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

1.6 Bidder

Any individual, firm partnership or corporation, or combination thereof submitting a proposal for the Work contemplated, acting directly or through a duly authorized representative.

1.7 Bonds

Bid, Performance, and Payment Bonds and other instruments of security, furnished by the Contractor and its surety in accordance with the Contract Documents.

1.8 Calendar Day

Every day shown on the calendar, measured from midnight to the next midnight.

1.9 Change Order

A written order to the Contractor, signed by the Owner, covering changes in the Plans, Specifications, or proposal quantities and establishing the basis of payment and contract time adjustment, if any, for the Work affected by such changes.

If the Change Order increases the existing Contract Amount, the Builder's Risk Insurance limit must be increased to the adjusted Contract Amount.

1.10 Contract

The "Contract" is the written Contract covering the performance of the Work and the furnishing of labor, materials, incidental services, tools, and equipment in the construction of the Work. It includes Supplemental Contracts amending or extending the Work contemplated in the manner hereinafter described and which may be required to complete the Work in a substantial and acceptable manner to the Owner. The Contract may include Contract Change Orders.

1.11 Contract Documents

The "Contract Documents" consist of the Bidding Requirements, Contract Forms, Conditions of the Contract including General and/or Supplemental General Conditions, Special Provisions, the Technical Specifications, and the Drawings, including all Addenda and modifications thereafter incorporated into the Documents before execution and including all other requirements incorporated by specific reference thereto.

1.12 Contract Price

The total monies payable by Owner to the Contractor under the terms and conditions of the Contract Documents.

1.13 Contract Time

The number of calendar days stated in the Contract Documents for the completion of the Work.

1.14 Contractor

The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the Work contracted for and the payment of all legal debts pertaining to the Work who acts directly or through lawful agents or employees to complete the Contract Work.

1.15 Days

Unless otherwise specifically stated, the term "days" will be understood to mean calendar days.

1.16 Drawings

The term "Drawings," also described as "Plans," refers to the official drawings, profiles, cross sections, elevations, details, and other working drawings, and supplementary drawings, or reproductions thereof, which show the locations, character, dimensions, and details of the Work to be performed. Drawings may either be bound in the same book as the balance of the Contract Documents or bound in separate sets, and are a part of the Contract Documents, regardless of the method of binding.

1.17 Engineer

The individual, partnership, firm, or corporation duly authorized by the Owner (sponsor) to be responsible for the Engineering of the contract Work and acting directly or through an authorized representative.

1.18 Field Order

A written order effecting a change in the Work not involving an adjustment in the Contract Price or an extension of the Contract Time, issued by the Engineer to the Contractor during construction.

1.19 Final Acceptance

Upon due notice from the Contractor of presumptive completion of the entire project, the Owner will make an inspection. If all construction provided for and contemplated by the contract is found completed to the Owner's satisfaction and all requirements of the contract have been met, that inspection shall constitute the final inspection and the Owner will make the final acceptance and issue the Certificate of Completion.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory or that all requirements of the contract have not been met, the Owner will give the Contractor the necessary instructions for correction or completion, and the Contractor shall immediately comply with and execute the instructions. Upon correction of the work, completion of contract requirements, and notification to Owner, another inspection will be made which shall constitute the final inspection provided the work has been satisfactorily completed and all requirements of the contract met. In such event, the Owner will make the final acceptance and issue the Certificate of Completion.

1.20 Inspector

An authorized representative of the Owner assigned to make all necessary inspections and/or tests of the Work performed or being performed, or of the materials furnished or being furnished by the Contractor.

1.21 Methodology and Quality of Workmanship

The manner and sequence of construction which considered to be the acceptable standard in which to perform the Work.

1.22 Notice

The term "notice" or the requirement to notify, as used in the Contract Documents or applicable State or Federal statutes, shall signify a written communication delivered in person or by certified or registered mail to the individual, or to a member of the firm, or to an officer of the corporation for whom it is intended. Certified or registered mail shall be addressed to the last business address known to him who gives the notice.

1.23 Notice of Award

The written notice of the acceptance of the Bid from the Owner to the successful Bidder.

1.24 Notice to Proceed

Written communication issued by the Owner to the Contractor authorizing him to proceed with the Work and establishing the date of commencement of the Work.

1.25 Or Equal

The phrase "or equal" shall be understood to indicate that the "equal" product is the same or better than the product names in function, performance, reliability, quality, and general configuration. Determination of equality in reference to the project design requirements will be made by the Owner.

1.26 Owner

The term "Owner" shall be understood to be Lake Havasu City, Arizona.

1.27 Payment Bond

The approved form of security furnished by the Contractor and its surety as a guaranty that it will pay in full all bills and accounts for materials and labor used in the construction of Work.

1.28 Performance Bond

The approved form of security furnished by the Contractor and its surety as a guarantee that the Contractor will complete the Work in accordance with the terms of the Contract and guarantee the Work for a period of one (1) year after the date of Certificate of Substantial Completion.

1.29 Plans

Plans shall have the same meaning as "Drawings," see Section 1.16.

1.30 Project

The undertaking to be performed as provided in the Contract Documents, see Section 1.11.

1.31 Proposal

The offer of the Bidder for the Work when made out and submitted on the prescribed proposal form, properly signed and guaranteed.

1.32 Proposal Guarantee

The cash, or cashier's check or certified check, or bidder's bond accompanying the Proposal submitted by the Bidder, as a guarantee that the Bidder will enter into a contract with the Owner for the construction or doing of the Work, if it is awarded to it, and will provide the contract bonds and insurance required.

1.33 Shop Drawings

All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, a Subcontractor, manufacturer, supplier or distributor, which illustrate how specific portions of the Work shall be fabricated or installed.

1.34 Specifications

The directions, provisions and requirements pertaining to the method and manner of performing the Work or to the quantities and qualities of the materials to be furnished under the Contract, together with all other directions, provisions and requirements, plus such amendments, deletions from or additions which may be provided for by Supplemental Contract or Change Orders.

1.35 Subcontractor

A Subcontractor is a person or entity who has a direct or indirect contract with a Contractor to perform any of the Work at the site. For convenience, the term Subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender but includes the plural and feminine gender and includes a Sub-Subcontractor or an authorized representative thereof. The term Subcontractor does not include any separate Contractor or its Subcontractors.

1.36 Substantial Completion

"Substantial Completion" shall be that degree of completion of the project or a defined portion of the project, sufficient to provide the Owner, at its discretion, the full-time use of the project or defined portion of the project for the purposes for which it was intended. "Substantial Completion" shall not be considered as final acceptance.

1.37 Supplemental General Conditions

Modifications to General Conditions required by a Federal Agency for participation in the Project and approved by the agency for participation in the Project and approved by the agency in writing prior to inclusion in the Contract Documents and such requirements that may be imposed by applicable state laws. The term also includes modifications or additions to the General Conditions required by the Owner or Engineer.

1.38 Supplier

Any person or organization who supplies materials or equipment for the Work, including that fabricated to a special design, but who does not perform labor at the site.

1.39 Surety

The corporation, partnership, or individual, other than the Contractor, executing Payment, or Performance Bonds which are furnished to the Owner by the Contractor.

1.40 Work

The word "Work" within these Contract Documents shall include all material, labor, tools, utilities, and all appliances, machinery, transportation, and appurtenances necessary to perform and complete the Contract, and such additional items not specifically indicated or described which can be reasonably inferred as belonging to the item described or indicated and as required by good practice to provide a complete and satisfactory system or structure.

1.41 Working Day

A working day shall be any day, other than a legal holiday, Saturday or Sunday, on which the normal working forces of the Contractor may proceed with regular work.

2.0 NOTICE TO PROCEED

2.1 After the Owner has issued the Notice Of Award, the Contractor shall provide the Performance Bond, the Payment Bond, the Certificate Of Insurance, the Work Schedule, the monthly cash flow, and a signed Contract within ten (10) calendar days. The Owner's attorney will review each document and, if they are found to be acceptable, the Owner will sign and

execute the Contract. Within a period of sixty (60) calendar days after executing the Contract, the Owner will issue the Notice To Proceed. Within ten (10) calendar days of the postmark date of the Notice To Proceed, the Work shall commence. The Contractor shall not commence any Work until such time that the Notice To Proceed has been issued.

3.0 ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS

3.1 The Engineer may furnish additional instructions to the Contractor by means of Drawings or otherwise, during the progress of the Work as necessary to make clear or to define in greater detail the intent of the Specifications and Contract Drawings.

The additional drawings and instruction thus supplied will become a part of the Contract Documents. The Contractor shall carry out the Work in accordance with the additional detail drawings and instructions.

4.0 SCHEDULES, REPORTS AND RECORDS

4.1 The Contractor shall submit to the Owner payrolls, reports, estimates, records and other data where applicable as are required by the Contract Documents for the Work to be performed.

4.2 The Contractor, after the Contract award and prior to the Pre-Construction Conference, shall prepare for submittal to the Engineer for review, a detailed progress schedule. The progress schedule shall be brought up to date and submitted to the Engineer prior to each progress payment request, and at such other time intervals as the Engineer may request.

A. Progress Schedule

The schedule shall be a time-scaled critical path progress schedule showing in detail the proposed sequence of activity. The critical path analysis shall consist of a graphic network diagram and shall clearly show start and completion dates and percentage of work completed.

4.3 The Contractor shall also forward to the Engineer, prior to each progress payment request, an itemized report of the delivery status of major and critical items of purchased equipment and material, including Shop Drawings and the status of shop and field fabricated work. These progress reports shall indicate the date of the purchase order, the current percentage of completion, estimated delivery, and cause of delay, if any.

4.4 If the completion of any part of the Work or the delivery of materials is behind the approved schedule, the Contractor shall submit in writing a plan acceptable to the Engineer for bringing the Work up to schedule.

4.5 The Owner shall have the right to withhold progress payments for the Work if the Contractor fails to update and submit the progress schedule and reports as specified, and such withholding shall not constitute grounds for additional claims by the Contractor against the Owner.

4.6 The Contractor shall submit an estimated monthly cash flow, based upon the progress schedule with the bonds, schedules, and Certificate Of Insurance.

5.0 DRAWINGS AND SPECIFICATONS

5.1 The intent of the Drawings and Specifications is that the Contractor shall furnish all labor, materials, tools, equipment, utilities, and transportation necessary for the proper execution of the Work in accordance with the Contract Documents and all incidental work necessary to complete the Project in an acceptable quality and manner, ready for use, occupancy or operation by the Owner.

5.2 In case of conflict between the Drawings and Specifications, the Specifications shall govern. Figure dimensions on Drawings shall govern over scale dimensions, and detailed Drawings shall govern over general Drawings.

5.3 Any discrepancies found between the Drawings and Specifications and site conditions or any inconsistencies or ambiguities in the Drawings or Specifications shall be immediately reported verbally and within 24 hours of such a discovery, in writing to the Engineer, who shall promptly correct such inconsistencies or ambiguities in writing. Work done by the Contractor after his discovery of such discrepancies, inconsistencies or ambiguities shall be done at the Contractor's risk, and the Contractor shall assume full responsibility therefor and shall bear all costs attributable thereto, if not acceptable to the Owner.

6.0 SHOP DRAWINGS

6.1 The Contractor shall provide seven (7) copies of the Shop Drawings as specified or as may be necessary for the prosecution of the Work as required by the Contract Documents. All drawings and schedules shall be submitted sufficiently in advance to allow the Engineer not less than 20 regular working days for checking the submittal. The Engineer's approval of any Shop Drawings shall not release the Contractor from responsibility for deviations from the Contract Documents.

6.2 When submitted for the Engineer's review, Shop Drawings shall bear the Contractor's certification by means of a signed Stamp, that he has reviewed, checked and approved the Shop Drawings and that they are in conformance with the requirements of the Contract Documents. Shop Drawings, which in the opinion of the Engineer are incomplete or unchecked by the Contractor, will be returned to the Contractor for resubmission in the proper form.

If Shop Drawings or submittals are rejected by the Engineer, all costs incurred by the Engineer Or The Owner for reviewing the resubmittals shall be charged to the Contractor, and the Owner has the right to deduct such costs from any monies owed the Contractor by the Owner.

6.3 When Shop Drawings have been reviewed by the Engineer, two sets of submittals will be returned to the Contractor appropriately stamped. If major changes or corrections are necessary, the Shop Drawing may be rejected and one set will be returned to the Contractor with such

changes or corrections indicated, and the Contractor shall correct and resubmit the Shop Drawings. No changes shall be made by the Contractor to resubmitted Shop Drawings other than those changes indicated by the Engineer, unless such changes are clearly described in a letter accompanying the resubmitted Shop Drawings.

6.4 The review of such Shop Drawings and catalog cuts by the Engineer shall not relieve the Contractor from responsibility for corrections of dimensions, fabrication details, and space requirements, or for deviations from the Contract Drawings or Specifications, unless the Contractor has called attention to such deviations in writing by a letter accompanying the Shop Drawings and the Engineer approves the change or deviation in writing at the time of submission; nor shall review by the Engineer relieve the Contractor from the responsibility for errors in the Shop Drawings. When the Contractor does call such deviations to the attention of the Engineer, the Contractor shall state in his letter whether or not such deviations involve any deduction or extra cost adjustment.

6.5 Portions of the Work requiring a Shop Drawing or sample submission shall not begin until the Shop Drawing or submission has been approved by the Engineer. A copy of each approved Shop Drawing and each approved sample shall be kept in good order by the Contractor at the site and shall be available to the Engineer.

7.0 RECORD DRAWINGS

7.1 During construction, the Contractor shall keep an accurate record of the following:

A. Deviations between the Work as shown on the Plans and the Work as actually installed.

B. The specific locations of piping, valves, electric conduits, duct work, equipment, and other such work which was not located on the Plans. The Record Drawings shall show distances to these locations from known points on the Plans.

C. Equipment schedules indicating manufacturer's names and model numbers. When all revisions showing work as installed are made, the corrected set of plans shall be delivered to the Engineer before the final pay request is processed. These plans shall be clearly marked "Record Drawings."

7.2 Nothing contained in this section shall be construed as authorizing any deviation in the Work as shown on the Contract Drawings without a written Change Order or written authority to the Contractor from the Engineer.

8.0 MATERIALS, SERVICES, AND FACILITIES

8.1 It is understood that, except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete, and deliver the Work within

the specified time.

8.2 The Contractor shall furnish the Owner a list of materials and the source of supply of each of the materials on the list. The source of supply of each of the materials shall be approved by the Owner before the delivery of said materials is started. Only materials conforming to these Specifications and approved by the Owner shall be used in the Work. All materials proposed for use may be inspected or tested at any time during their preparation and use. After trial, if it is found that sources of supply which have been approved do not furnish a uniform product, or if the product from any source proves unacceptable at any time, the Contractor shall furnish approved material from other approved sources. No material which, after approval, has in any way become unfit for use shall be used in the Work.

8.3 The Contractor warrants to the Owner and Engineer that the materials and equipment furnished under the Contract will be new and of a quality equal to that specified or approved and, that all Work will be of good quality, free from faults and defects and in conformance with the Contract Documents. Mechanical and electrical equipment shall be the products of manufacturers of established good reputations and regularly engaged in the fabrication of such equipment. Unless otherwise noted, any equipment offered shall be current models which have been in successful regular operation under comparable conditions for a period of at least two years. This time requirement, however, does not apply to minor details nor to thoroughly demonstrated improvements in design or in material of construction. Work shall be done and completed in a thorough and workmanlike manner and if required by Engineer, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment used.

8.4 All materials which the Engineer or its authorized Inspector has determined do not conform to the requirements of the Plans and Specifications will be rejected. They shall be removed immediately from the vicinity of the Work by the Contractor at his own expense, unless otherwise permitted by the Engineer. No rejected material, the defects of which have been subsequently corrected, shall be used in the Work, unless approval in writing has been given by the Engineer. Upon failure of the Contractor to comply promptly with any order of the Engineer made under the provisions in this section, the Engineer shall have authority to cause the removal and replacement of rejected material and to deduct the cost thereof from any monies due or to become due the Contractor.

8.5 If any part or portions of the Work done or material furnished under this Contract shall prove defective or non-conforming with the Drawings and Specifications, and if the imperfection in the same shall not be of sufficient magnitude or importance as to make the Work dangerous or unsuitable, or if the removal of such Work will create conditions which are dangerous or undesirable, the Engineer shall have the right and authority to retain such Work but shall make such deductions in the final payment therefor as may be just and reasonable. Such adjustment shall be effected whether or not final payment has been made.

8.6 Materials and equipment shall be so stored as to insure the preservation of their quality and fitness for the Work. Stored materials and equipment to be incorporated in the Work shall be located so as to facilitate prompt inspection.

8.7 Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.

8.8 Materials, supplies or equipment to be incorporated into the Work shall not be purchased by the Contractor or the Subcontractor subject to a chattel mortgage or under a conditional sale contract or other Contract by which an interest is retained by the seller.

9.0 INSPECTION AND TESTING

9.1 All material and equipment used in the construction of the Project shall be subject to adequate inspection and testing in accordance with generally accepted standards, as required and defined in the Contract Documents.

9.2 The Owner shall provide all inspection and testing services not required by the Contract Documents.

9.3 The Contractor shall provide at its expense the testing and inspection services required by the Contract Documents.

9.4 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to specifically be inspected, tested, or approved by someone other than the Contractor, the Contractor will give the Engineer timely notice of readiness, the minimum of which shall be forty-eight (48) hours. The Contractor will then furnish the Engineer the required certificates of inspection, testing or approval.

9.5 Inspections, tests or approvals by the Engineer or others shall not relieve the Contractor from its obligations to perform the Work in accordance with the requirements of the Contract Documents.

9.6 The Engineer and its representatives will at all times have access to the Work. In addition, authorized representatives and agents of any participating Federal or State agency shall be permitted to inspect all Work, materials, payrolls, records of personnel, invoices of materials, and other relevant data and records. The Contractor will provide proper facilities for such access and observation of the Work and also for any inspection, or testing thereof.

9.7 If any Work is covered contrary to the written instructions of the Engineer or prior to inspection, if must, if requested by the Engineer, be uncovered for his observation and replaced at the Contractor's expense.

9.8 If the Engineer considers it necessary or advisable that Work that has already been approved be inspected or tested by the Engineer or others, the Contractor, at the Engineer's

request, will uncover, expose or otherwise make available for observation, inspection or testing as the Engineer may require, that portion of the Work in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such Work is defective, the Contractor will bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction. If, however, such Work is not found to be defective, the Contractor will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction and an appropriate Change Order shall be issued.

10.0 SUBSTITUTIONS

10.1 Whenever a material, article or piece of equipment is identified on the Drawings or Specifications by reference to brand name or catalogue number, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality and function shall be considered. The Contractor may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the Contract Documents by reference to brand name or catalogue number, and if, in the opinion of the Engineer, such material, article, or piece of equipment is of equal substance and function to that specified, the Engineer may approve its substitution and use by the Contractor. Any cost differential shall be deductible from the Contract Price and the Contract Documents shall be appropriately modified by Change Order. The Contractor warrants that if substitutes are approved, no major changes in the function or general design of the Project will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the Contractor without a change in the Contract Price or Contract Time. Any substitutions not properly approved and authorized by the Engineer may be considered defective and the Engineer may require the Contractor to remove the substituted material, article or piece of equipment and the Contractor shall bear any and all costs associated with the removal of the substituted item, including all engineering, inspection, testing or surveying costs incurred by the Owner or the Engineer.

10.2 Determination of equality in reference to the project design requirements will be made by the Owner. "Equal" products shall not be purchased or installed by the Contractor without the Owner's written approval. Contractor shall have fourteen (14) days after issuance of Notice to Proceed for submission of data substantiating a request for substitution of an "or equal" item.

11.0 PATENTS

11.1 The Contractor shall pay all applicable royalties and license fees. The Contractor shall defend all suits or claims for infringement of any patent rights and indemnify and hold the Owner and Engineer harmless from loss on account thereof, except that the Owner shall be responsible for any such loss when a particular process, design, or the product of a particular manufacturer or manufacturers is specified, however if the Contractor has reason to believe that the design, process or product specified is an infringement of a patent, it shall be responsible for such loss unless it promptly gives such information to the Engineer.

12.0 SURVEYS, PERMITS, REGULATIONS

12.1 The Owner shall furnish all boundary surveys and establish all base lines for locating the principal component parts of the Work together with a suitable number of bench marks adjacent to the Work as shown in the Contract Documents. The Contractor shall satisfy itself as to the accuracy of all measurements before constructing any permanent structure and shall not take advantage of any errors which may have been made in laying out the Work. From the information provided by the Owner, unless otherwise specified in the Contract Documents, the Contractor shall develop and make all detail surveys needed for construction such as slope stakes, batter boards, stakes for pile locations and other working points, lines, elevations and cut sheets.

12.2 Such stakes and markings as the Engineer may set for either its own or the Contractor's guidance shall be scrupulously preserved by the Contractor. In the event the Contractor, or its employees, destroy or otherwise remove or obliterate such stakes or markings, an amount equal to the cost of replacing the same may be deducted from subsequent estimates due the Contractor at the discretion of the Owner.

12.3 Permits and licenses of a temporary nature necessary for the prosecution of the Work shall be secured and paid for by the Contractor unless otherwise stated in the Supplemental General Conditions. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the Owner, unless otherwise specified. The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the Work as drawn and specified. If the Contractor perceives that the Contract Documents are at variance therewith, he shall promptly notify the Engineer in writing, and any necessary changes shall be adjusted as provided in Section 16. Changes In The Work. If the Contractor performs and works knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Engineer, he shall assume full responsibility therefore and shall bear all costs attributable thereto.

13.0 PROTECTION OF WORK, PROPERTY AND PERSONS

13.1 The Contractor shall have sole responsibility for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to, all employees on the Work and other persons who may be affected thereby, all the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and other items not designated for removal, relocation or replacement in the course of construction.

13.2 The Contractor shall comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. The Contractor shall erect and maintain, as required by the conditions and progress of the Work, all necessary safeguards for safety and protection. The Contractor shall notify Owners of adjacent utilities when prosecution of the Work may affect them. The Contractor shall remedy all damage, injury or loss to any property caused, directly or

indirectly, in whole or in part, by the Contractor, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them be liable, except damage or loss attributable to the fault of the Contract Documents or to the acts or omissions of the Owner or the Engineer or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the Contractor.

13.3 In emergencies affecting the safety of persons or the Work or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the Engineer or Owner, shall act to prevent threatened damage, injury or loss. He shall give the Engineer prompt Written Notice of any significant changes in the Work or deviations from the Contract Documents caused thereby, and a Change Order shall thereupon be negotiated and issued covering the changes and deviations involved, as provided in Section 16.0, Changes in the Work.

13.4 The Contractor shall designate a responsible member of its organization at the site whose duty shall be the prevention of accidents and the safety of all those at the site. The person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and the Engineer. The Engineer will not be responsible for safety precautions and programs in connection with the Work or for the Contractor's failure to properly perform its responsibilities with respect to initiating, maintaining and supervising all safety precautions and programs.

14.0 PUBLIC SAFETY

14.1 Whenever the Contractor's operations create a condition hazardous to traffic or to the public, it shall furnish at its own expense, and without cost to the Owner, such flagmen and guards as are necessary to give adequate warning to the public of any dangerous conditions to be encountered and he shall furnish, erect, and maintain such fences, barricades, lights, signs, and other devices as are necessary to prevent accidents and avoid damage or injury to the public.

14.2 Should the Contractor appear to be neglectful or negligent in furnishing warning and protective measures as above provided, the Engineer may direct attention to the existence of a hazard and the necessary warning and protective measures shall be furnished and installed by the Contractor at its own expense without cost to the Owner. Should the Engineer point out the inadequacy of warning and protective measures, such action on the part of the Engineer shall not relieve the Contractor from responsibility for public safety or abrogate his obligation to furnish and pay for these devices.

14.3 Should the Contractor fail to, be neglectful, or be negligent in furnishing or maintaining warning and protective facilities as required herein, the Owner may furnish or maintain such facilities and charge Contractor therefor by deducting the cost thereof from periodic progress payments due the Contractor as such costs are incurred by Owner.

14.4 No material or equipment shall be stored where it will interfere with the free and safe passage of public traffic, and at the end of each day's Work and at other times when construction

operations are suspended for any reason, the Contractor shall remove all equipment and other obstructions from that portion of the right-of-way open for use by public traffic.

15.0 SUPERVISION BY CONTRACTOR

15.1 The Contractor shall supervise and direct the Work, using its best skill and attention. The Contractor shall be solely responsible for the means, methods, techniques, sequences and procedures of construction. The Contractor shall employ and maintain on the Work a qualified supervisor or superintendent who shall have been designated in writing by the Contractor as the Contractor's representative at the site, and who shall have been approved by the Engineer, which approval shall not be unreasonably withheld. The supervisor shall have full authority to act on behalf of the Contractor and all communications given to and by the supervisor shall be as binding as if given to and by the Contractor. The supervisor shall be present on the site at all times. The Contractor shall be responsible to the Owner for the acts and omissions of the employees, subcontractors, and the agents and employees, and other persons performing any other Work under the Contract with the Contractor.

16.0 CHANGES IN THE WORK

16.1 The Owner may at any time, as the need arises, order changes within the scope of the Work without invalidating the Contract. If such changes increase or decrease the amount due under the Contract Documents, or in the time required for performance of the Work, an equitable adjustment shall be authorized by Change Order.

16.2 The Engineer, also, may at any time, by issuing a Field Order, make changes in the details of the Work. The Contractor shall proceed with the performance of any changes in the Work so ordered by the Engineer unless the Contractor believes that such Field Order entitles him to a change in Contract Price or Time, or both, in which event he shall give the Engineer Written Notice thereof within seven (7) days after the receipt of the ordered change. Thereafter the Contractor shall document the basis for the change in Contract Price or Time within fourteen (14) days. The Contractor shall not execute such changes pending the receipt of an executed Change Order or further instruction from the Owner.

16.3 If the Contractor wishes to make a claim for an increase in the Contract sum, it shall give the Engineer written notice thereof within fourteen (14) days after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the Work, except in an emergency endangering life or property, in which case Contractor shall proceed in accordance with the provisions of the Contract. No such claim shall be valid unless so made. If the Owner and Contractor cannot agree on the amount of adjustment in the Contract sum, it shall be determined by the Engineer. Any change in the Contract sum resulting from such claim shall be authorized in a Change Order.

16.4 The value of any Work covered by a Change Order shall be determined by one or more of the following methods in the order of precedence listed below:

A. Unit prices previously approved.
B. An agreed lump sum.
C. Cost plus percentage.

17.0 TIME FOR COMPLETION AND LIQUIDATED DAMAGES

17.1 The date of beginning and the time for completion of the Work are essential conditions of the Contract Documents and the Work embraced shall be commenced on a date specified in the Notice To Proceed.

17.2 The Contractor shall proceed with the Work at such rate of progress to insure full completion within the Contract Time. It is expressly understood and agreed, by and between the Contractor and the Owner, that the Contract Time for the completion of the Work described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the Work.

17.3 The Contractor shall only work an eight (8) hour day consisting of Monday through Friday, between 6:00 a.m. to 6:00 p.m., and do not include local municipal holidays. If the Contractor desires to carry on Work more than eight (8) hours each day, or work at night or outside the regular hours, it shall give timely notice (72 hours) to the Engineer and receive the Owner's written approval to allow satisfactory arrangements to be made for inspecting the Work in progress. Should the prosecution of the Work be discontinued for any reason, the Contractor shall notify the Engineer at least 24 hours in advance of resuming operations. The Contractor shall be responsible for any extra compensation due or costs incurred as a result of Contractor's desire to carry out Work beyond an eight (8) hour day, or at night or outside regular hours, including but not limited to, any additional costs or compensation due the Engineer And Owner or its employees or agents as a result of having to be present at the site. The costs or extra compensation necessitated by the Contractor's Work beyond an eight (8) hour day, or at night or outside regular business hours may be deducted or withheld from progress payment or any other payments due to Contractor.

17.4 If for any reason a suspension of the work should occur; the Contractor, at its own expense, shall do all the Work necessary to provide a safe, smooth and unobstructed passageway through construction for use by public traffic or to provide for the proper and efficient operation of sewer, drainage and other facilities within the site of the Work, during the period of such suspension. In the event that the Contractor fails to perform the Work specified in this Subsection, the Owner will perform such Work and the cost thereof will be deducted from periodic progress payments due the Contractor.

17.5 During inclement weather and other conditions, the Contractor shall pursue only such portions of the Work as shall not be damaged thereby. No portions of the Work which satisfactory quality or efficiency will be affected by an unfavorable condition shall be constructed while these conditions remain, unless by special means or precautions, approved by the Engineer, the Contractor is able to overcome them.

17.6 Delays in delivery of equipment or material purchased by the Contractor or its Subcontractor, including Engineer-selected equipment, shall not be considered as a just cause for delay as this is not beyond the control of the Contractor. The Contractor shall be fully responsible for the timely ordering, scheduling, expediting, delivery, and installation of all equipment and materials.

17.7 In case of failure on the part of the Contractor to complete the Work within the time affixed in the Contract, or such extension thereof as may be allowed by Engineer or Owner, the Contract shall by that fact be terminated by written notice. The Owner shall not thereafter pay or allow the Contractor any further compensation for any Work done by it under said Contract, and the Contractor and its sureties shall be liable to the Owner for all loss or damage which it may suffer by reason of his failure to complete the Contract within such time. Failure to prosecute the Work diligently shall be grounds for termination by the Owner pursuant to this paragraph.

In the event the Contract should be terminated, the Owner shall have the right to take over the Work and to proceed with the same until it is completed, either by performing said Work itself directly or by contracting it out to some other person or persons, and in such event the Owner may take possession of and utilize, in completing the Work, such materials, appliances and plant as may be on the site of the Work and necessary for its completion. Nothing herein contained shall be deemed to limit the right of the Owner in the event of any breach of Contract by the Contractor; but all rights herein given to the Owner are and shall be deemed to be additional to any other rights or remedies which the Owner shall have under any provision of law.

17.8 Should the Contractor fail to complete the Work, or any part thereof, in the time agreed upon in the Contract or within such extra time as may have been allowed for delays by extensions granted as provided in the Contract, the Contractor shall reimburse the Owner for the additional expense and damage for each calendar day that the Contract remains uncompleted after the Contract completion date. It is agreed that the amount of such additional expense and damage incurred by reason of failure to complete the Work is the per diem rate, as stipulated in Section 15, Information For Bidders, plus any costs incurred by the Engineer including, but not limited to: the Engineer's costs for additional inspection, testing or surveying as a result of the Contractor's failure to complete the Work in the time agreed upon. The said amounts are agreed upon as liquidated damages for the loss to the Owner on account of expense due to the employment of Engineers, inspectors, and other employees after the expiration of the time of completion, and on account of the value of the operation of the Works dependent thereon. It is expressly understood and agreed that this amount is not to be considered in the nature of a penalty, but as liquidated damages which have accrued against the Contractor. The Owner shall have the right to deduct such damages from any amount due, or that may become due the Contractor, or the amount of such damages shall be due and collectible from the Contractor or its Surety.

17.9 The Contractor shall not be charged with liquidated damages or any excess costs when the delay in completion of the Work is due to any of the reasons set forth below provided the Contractor has given Written Notice of the delay within three (3) days of the occurrence of the cause of the delay to the Owner or Engineer. In the event notice is not given as provided, liquidated damages may be assessed.

A. To unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to: acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a separate contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather.

18.0 CORRECTION OF WORK

18.1 The Contractor shall promptly correct all work rejected by the engineer as defective or as failing to conform to the contract documents, whether observed before or after substantial completion and whether or not fabricated, installed or completed. Contractor shall bear all costs of correcting such rejected work, including compensation for the engineer's additional services made necessary thereby. Contractor shall also bear the costs of making good all work of the Owner or separate Contractor destroyed or damaged by such correction or removal.

18.2 All removal and replacement work shall be done at the Contractor's expense. If the Contractor does not take action to remove such rejected work within ten (10) days after receipt of Written Notice, the Owner may remove such work and store the materials at the expense of the Contractor, including compensation for the engineer's additional services made necessary thereby.

19.0 SUBSURFACE CONDITIONS

19.1 The Contractor shall promptly, and before such conditions are disturbed, except in the event of an emergency, notify the Owner by Written Notice of:

A. Subsurface or latent physical conditions at the site differing materially from those indicated in the Contract Documents; or

B. Unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in the Contract Documents.

19.2 The Owner shall promptly investigate the conditions, and if it finds that such conditions do so materially differ and cause an increase or decrease in the cost of, or in the time required for, performance of the Work, an equitable adjustment shall be made and the Contract Documents shall be modified by a Change Order. Any claim of the Contractor for adjustment hereunder shall not be allowed unless he has given the required Written Notice; provided that the Owner may, if he determines the facts so justify, consider and adjust any such claims asserted before the date of final payment.

20.0 SUSPENSION OF WORK, TERMINATION AND DELAY

20.1 The Owner may suspend the Work or any portion thereof for a period of not more than

ninety (90) days or such further time as agreed upon by the Contractor, by Written Notice to the Contractor and the Engineer which notice shall fix the date on which Work shall be resumed. The Contractor shall resume that Work on the date so fixed. The Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension.

20.2 In addition to any other reasons for termination provided in the Contract, the Contractor shall be considered in default of the Contract and such default will be considered as cause for the Owner to terminate the Contract for any of the following reasons if the Contractor:

A. Fails to begin the Work under the Contract within the time specified in the "Notice To Proceed," or

B. Fails to perform the Work or fails to provide sufficient workers, equipment or materials to assure completion of Work in accordance with the terms of the Contract, or

C. Performs the Work unsuitably or neglects or refuses to remove materials or to perform such new Work as may be rejected as unacceptable and unsuitable, or

D. Discontinues the prosecution of the Work, or

E. Fails to resume Work which has been discontinued within a reasonable time after notice to do so, or

F. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or

G. Allows any final judgment to stand against him unsatisfied for a period of 10 days, or

H. Makes an assignment for the benefit of creditors, or acceptable manner, or

I. Is otherwise in breach of the Contract and has failed to remedy the breach within ten (10) days of written notice of the existence of such breach, or

J. Fails to provide safe conditions for its workers and/or the general public.

Should the Owner consider the Contractor in default of the Contract for any reason above, he shall immediately give Written Notice to the Contractor and the Contractor's surety as to the reasons for considering the Contractor in default and the Owner's intentions to terminate the Contract.

If the Contractor or Surety, within a period of 10 days after Written Notice, does not proceed in accordance therewith, then the Owner shall have, upon written notification of the facts of such

delay or neglect, the power and authority without violating the Contract, to take the prosecution of the Work out of the hands of the Contractor. The Owner may appropriate or use any or all materials and equipment that have been mobilized for use in the Work and are acceptable and may enter into an Contract for the completion of said Contract according to the terms and provisions thereof, or use such other methods as in the opinion of the Owner will be required for the completion of said Contract in an acceptable manner.

All costs and charges incurred by the Owner, together with the cost of completing the Work under Contract, will be deducted from any monies due or which may come due the Contractor. If such expense exceeds the sum which would have been payable under the Contract, then the Contractor and the Surety shall pay to the Owner the amount of such excess.

20.3 Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of monies due Contractor by Owner will not release Contractor from liability.

20.4 Upon seven days Written Notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, elect to terminate the Contract. In such case, Contractor shall be paid (without duplication of any items):

20.4.1 for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such work;

20.4.2 for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead on such expenses;

20.4.3 for reasonable costs incurred in settlement of terminated contracts with Subcontractors, Suppliers and others; and

20.4.4 for reasonable expenses directly attributable to termination.

Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

20.5 If the Work should be stopped under an order of any court or other public authority for a period of more than ninety (90) days, through no act or fault of the Contractor or of anyone employed by him, or if the Owner should fail to pay the Contractor within 45 days after the time specified in the Payments To Contractor, Section 22.0, then the Contractor may, upon 15 days Written Notice to the Owner, stop Work until payment of the amount owing has been received.

20.6 The Owner may terminate the Contract or a portion thereof if conditions encountered during the progress of the Work make it impossible or impracticable to proceed with the Work or

a local or national emergency exists.

When Contracts, or any portion thereof, are terminated before completion of all Work in the Contract, adjustments in the amount bid for the pay items will be made on the actual quantity of Work performed and accepted, or as mutually agreed for pay items of Work partially completed or not started. No claim for loss of anticipated profits will be considered.

Termination of the Contract or any portion thereof shall not relieve the Contractor of its responsibilities for the completed work nor the surety of its obligation for and concerning any just claims arising out of the Work performed.

21.0 ISSUANCE OF NOTICE OF COMPLETION AND FINAL ACCEPTANCE BY OWNER

21.1 Upon completion of the Project, a Final Inspection shall be requested by the Contractor in writing and the Owner will make an inspection within seven (7) days. If all construction provided for and contemplated by the contract is found completed to his satisfaction, that inspection shall constitute the final inspection and the Owner will make the final acceptance and issue a Certificate Of Completion to the Contractor.

If, however, the inspection discloses any Work, in whole or in part, as being unsatisfactory, the Owner will give the Contractor the necessary instructions for correction of same, and the Contractor shall immediately comply with and execute such instructions. Upon correction of the Work, another inspection will be made which shall constitute the final inspection provided the Work has been satisfactorily completed. In such event, the Owner will make the final acceptance and issue a Certificate Of Completion to the Contractor.

22.0 PAYMENTS TO CONTRACTOR

22.1 In addition to any documents required by the Engineer to be submitted to Engineer at the time a partial pay estimate is submitted, including partial lien released as specified in Section 22.9 of the General Conditions*,* the Contractor shall, at least ten (10) days before each progress payment falls due (but not more often than once a month), submit to the Engineer a partial payment estimate filled out and signed by the Contractor covering the Work performed during the period covered by the partial payment estimate and supported by such data as the Engineer may reasonably require. If payment is requested on the basis of materials and equipment not incorporated in the Work, title to such materials and equipment shall vest in the Owner, and Contractor shall supply, at the time of submission of payment estimate, supporting documents satisfactory to the Owner, to establish and protect Owner's interest in the materials and equipment, and Contractor shall maintain appropriate insurance on same until such time as actual possession by the Owner of the materials and equipment shall occur. The Engineer will, within seven (7) days after receipt of each partial payment estimate, either indicate in writing his approval of payment and present the partial payment estimate to the Owner or return the partial payment estimate to the Contractor indicating in writing his reasons for refusing to approve payment. In the latter case, the Contractor may make the necessary corrections and resubmit the partial payment estimate. The Owner will, within fourteen (14) days of presentation to him

of an approved partial payment estimate, pay the Contractor a progress payment on the basis of the approved partial payment estimate. The Owner shall retain ten (10) percent of the amount of each payment until final completion and acceptance of all Work covered by the Contract Documents. When the Contract is fifty percent completed, one-half of the amount retained shall be paid to the Contractor provided the Contractor makes a written request for the payment and the Contractor is making satisfactory progress on the Contract and there is no specific cause or claim requiring a greater amount to be retained. After the Contract is fifty per cent completed, no more than five per cent of the amount of any subsequent progress payments made under the Contract may be retained providing the Contractor is making satisfactory progress on the project, except that if at any time the Owner determines satisfactory progress is not being made, ten per cent retention shall be reinstated for all progress payments made under the Contract subsequent to the determination.

22.2 In lieu of ten percent (10%) retention provided for in paragraph 22.1, of this Article, the Owner shall, at the Contractor's option, accept as a substitute an assignment of any of the following:

A. Time certificates of deposit of banks licensed by the State of Arizona; or

B. Securities of or guaranteed by the United States of America; or

C. Securities of the State of Arizona, or any county, municipality or school district thereof; or

D. Shares of savings and loan institutions authorized to transact business in the State of Arizona.

Such assigned instruments shall have a face value in an amount equal to ten percent (10%) of the progress payment for which such instruments are tendered and shall be retained by the Owner as a guarantee for complete performance of the Contract.

In the event the Owner accepts substitute security as provided herein for the ten percent (10%) retention, the Contractor shall be entitled to all interest or income earned by such security, and all such security in lieu of retention shall be returned to the Contractor within sixty (60) days after final completion and acceptance of all material, equipment and work covered by the contract if the Contractor has furnished the Owner satisfactory receipts for all labor and material billed and waivers of liens from any and all persons holding claims against the work.

In no event shall the Owner accept a time certificate of deposit of a bank or shares of a savings and loan institution in lieu of the retention specified in paragraph 22.1 of this Article unless accompanied by a signed and acknowledged waiver of the bank or savings and loan institution of any right or power to set off against either the Owner or the Contractor in relationship to the certificates or shares assigned.

22.3 The Contractor shall promptly pay each Subcontractor, upon receipt of payment from the

Owner out of the amount paid to the Contractor on account of such Subcontractors' Work, the amount to which said Subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to the Contractor on account of such Subcontractors' Work. The Contractor shall, by an appropriate Contract with each Subcontractor, require each Subcontractor to make payments to his Sub-subcontractors in similar manner.

22.4 Prior to Substantial Completion, the Owner, with the approval of the Engineer and with the concurrence of the Contractor, may use any completed or substantially completed portions of the Work. Such use shall not constitute an acceptance of such portions of the Work.

22.5 The Owner shall have the right to enter the premises for the purpose of doing Work not covered by the Contract Documents. This provision shall not be construed as relieving the Contractor of the sole responsibility for the care and protection of the Work, or the restoration of any damaged Work except such as may be caused by agents or employees of the Owner.

22.6 Upon final completion and acceptance of the Work, the Engineer shall issue a certificate attached to the final payment request that the Work has been accepted under the conditions of the Contract Documents. No retention of payments may be delayed or retained without a specific written finding by the Engineer or Owner of the reasons justifying the delay in payment. The entire balance found to be due the Contractor, including the retained percentages, except the amount necessary to pay the expenses the Owner reasonably expected to incur in order to pay or discharge the expenses determined by the Engineer or Owner in the finding justifying the retention or delay, shall be paid to the Contractor, within sixty (60) days of completion or proper filing of the Notice of Completion.

22.7 The Contractor shall indemnify and save the Owner or the Owner's agents harmless from all claims growing out of the lawful demands of Subcontractors, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, tools, and all supplies, incurred in the furtherance of the performance of the Work. The Contractor shall, at the Owner's request, furnish satisfactory evidence, in the form of lien releases or other documents deemed appropriate by the Owner*,* that all obligations of the nature designated above have been paid, discharged, or waived. If the Contractor fails to do so the Owner may, after having notified the Contractor, either pay unpaid bills or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the Contractor shall be resumed, in accordance with the terms of the Contract Documents, but in no event shall the provisions of this sentence be construed to impose any obligations upon the Owner to either the Contractor, his Surety, or any third party. In paying any unpaid bills of the Contractor, any payment so made by the Owner shall be considered as a payment made under the Contract Documents by the Owner to the Contractor and the Owner shall not be liable to the Contractor for any such payments made in good faith.

22.8 If any payment to Contractor is delayed after the date due, interest shall be paid at the rate of one percent per month or fraction of a month on such unpaid balance as may be due. If the Owner fails to make payment sixty (60) days after final completion and acceptance, in addition

to other remedies available to the Contractor, interest shall be paid at the rate of one per cent per month or fraction of the month on such unpaid balance as may be due, except for that amount necessary to pay the expenses the Owner reasonably expects to incur in order to pay or discharge the expense determined by the Engineer or Owner in the finding justifying the retention or delay.

22.9 The Owner may require the Contractor to furnish partial releases or liens executed by all persons, firms and corporations who have furnished labor services or materials incorporated into the Work during the period of time for which the progress payment is due, releasing such lien rights as these persons, firms or corporations may have for that period.

23.0 ACCEPTANCE OF FINAL PAYMENT AS RELEASE

23.1 Following the Owner's acceptance of the Work, the Owner will issue a Notice of Completion to the Contractor. Sixty days after the issuing of the Notice of Completion, and upon receipt of the necessary Unconditional lien releases executed by all persons, firms and corporations who have furnished labor services or materials incorporated into the work evidencing that all liabilities have been fully discharged, the Owner will pay to the Contractor the entire sum so found to be due after deducting therefrom all previous payments and all amounts to be kept and all amounts to be retained under the provisions of the Contract. All previous prior partial estimates and payments shall be subject to correction in the final estimate and payment.

23.2 The acceptance by the Contractor of final payment shall be and shall operate as a release to the Owner of all claims and all liability to the Contractor other than claims in stated amounts as may be specifically excepted by the Contractor for all things done or furnished in connection with this Work and for every act and neglect of the Owner and others relating to or arising out of this Work. Any payment, however, final or otherwise, shall not release the Contractor or his sureties from any obligations under the Contract Documents or the Performance Bond and Payment Bonds.

24.0 INSURANCE

24.1 The Contractor shall give special attention to Section 00500-A of the Bid Documents when preparing a bid, which outline the insurance requirements of Owner and the Contractor shall consider these insurance requirements part of the Bid/Contract documents.

The Contractor shall purchase and maintain such insurance as will protect him from claims set forth below which may arise out of or result from the Contractor's execution of the Work, whether such execution be by itself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

A. Claims under worker's compensation, disability benefit and other similar employee benefit acts;

B. Claims for damages because of bodily injury, occupational sickness or disease, or death of his employees;

C. Claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees;

D. Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person; and

E. Claims for damages because of injury to or destruction of tangible property, including loss of use resulting therefrom.

The Contractor is responsible to respond to claims arising as a result of its work. See Section 500-B for specific procedures.

24.2 Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These Certificates shall contain a provision that coverages afforded under the policies will not be canceled unless at least ten (10) days prior Written Notice has been given to the Owner, "Attention: Contract Administrator, 2330 McCulloch Boulevard North, Lake Havasu City, AZ, 86403".

24.3 The Contractor shall procure and maintain, at its own expense, during the Contract Time, liability insurance as specified in Section 500-A, incorporated herein.

25.0 CONTRACT SECURITY

25.1 The Contractor shall within ten (10) days after the receipt of the Notice Of Award furnish the Owner with a Performance Bond and a Payment Bond in sums equal to the amount of the Contract PRICE, conditioned upon the performance by the Contractor of all undertakings, covenants, terms, conditions and Contracts of the Contract Documents, and upon the prompt payment by the Contractor to all persons supplying labor and materials in the prosecution of the Work provided by the Contract Documents. Such Bonds shall be executed by the Contractor and a corporate bonding company licensed to transact such business in the state in which the Work is to be performed and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570. The expense of these Bonds shall be borne by the Contractor. If at any time a surety on any such Bond is declared a bankrupt or loses its right to do business in the state in which the Work is to be performed or is removed from the list of Surety Companies accepted on Federal Bonds, Contractor shall within ten (10) days after notice from the Owner to do so, substitute an acceptable Bond (or Bonds) in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner. The premiums on such Bond shall be paid by the Contractor. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable Bond to the Owner.

26.0 ASSIGNMENTS

26.1 Neither the Contractor nor the Owner shall sell, transfer, assign or otherwise dispose of the Contract or any portion thereof, or of his right, title or interest therein, or his obligations thereunder, without written consent of the other party. Nor shall the Contractor assign any monies due or to become due to him hereunder without the previous written consent of the Owner.

26.2 The Owner and Contractor each bind itself, its partners, successors and assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party in respect to all covenants, Contracts and obligations contained in the Contract Documents.

27.0 INDEMNIFICATION

27.1 Contractor shall indemnify and hold harmless City, its officers and employees from and against any and all liabilities, damages, losses, and costs, including reasonable attorney's fees, but only to the extent caused by the negligence, recklessness, or intentional wrongful conduct of Contractor or other persons employed or used by the Contractor in the performance of this Contract. It is agreed that Contractor will be responsible for primary loss investigation, defense, and judgment costs where this indemnification is applicable.

27.2 In any and all claims against the Owner or the Engineer, or any of their agents or employees, by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation of benefits payable by or for the Contractor or any Subcontractor under worker's compensation acts, disability benefit acts or other employee benefits acts.

27.3 The obligation of the Contractor under this paragraph shall not extend to the liability of the Engineer, his agents or employees arising out of the preparation or approval of maps, DRAWINGS, opinions, reports, surveys, Change Orders, designs or Specifications.

28.0 SEPARATE CONTRACTS

28.1 The Owner reserves the right to let other contracts in connection with this Project. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their Work, and shall properly connect and coordinate its Work with theirs. If the proper execution or results of any part of the Contractor's Work depends upon the Work of any other Contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such Work that render it unsuitable for such proper execution and results.

28.2 The Owner may perform additional Work related to the Project by itself, or it may let other contracts containing provisions similar to these. The Contractor shall afford the other Contractors who are parties to such Contracts (or the Owner, if he is performing the additional Work himself),

reasonable opportunity for the introduction and storage of materials and equipment and the execution of Work, and shall properly connect and coordinate his Work with theirs.

28.3 If the performance of additional Work by other Contractors or the Owner is not noted in the Contract Documents prior to the execution of the Contract, written notice thereof shall be given to the Contractor prior to starting any such additional Work. If the Contractor believes that the performance of such additional Work by the Owner or others involves it in additional expense or entitles him to an extension of the Contract Time, it may make a claim therefore as provided in Sections 16 and 17.

29.0 SUBCONTRACTING

29.1 The Contractor may utilize the services of specialty Subcontractors on those parts of the Work which come under normal contracting practices or are typically performed by specialty Subcontractors, provided the Contractor, simultaneously with the delivery of the executed Contract, shall furnish to the Owner and the Engineer in writing the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work. The engineer will promptly reply to the Contractor in writing stating whether or not the Owner or the Engineer, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Owner or Engineer to promptly reply shall constitute notice of no reasonable objection. The Contractor shall not contract with any such proposed person or entity to whom the Owner or Engineer has made reasonable objection and the Contractor shall not be required to contract with anyone to whom he has a reasonable objection. If the Owner or Engineer has a reasonable objection to any proposed person or entity, the Contractor shall submit a substitute to whom the Owner or the Engineer has no reasonable objection. The Contractor shall make no substitution for any Subcontractor, person or entity previously selected if the Owner or Engineer makes reasonable objection to such substitution.

29.2 The Contractor shall not award Work to Subcontractor(s), in excess of forty-nine (49%) percent of the Contract Price, without prior written approval of the Owner.

29.3 The Contractor shall be fully responsible to the Owner for the acts and omissions of its Subcontractors, and of persons either directly or indirectly employed by them, as it is for the acts and omissions of persons directly employed by it.

29.4 The Contractor shall not employ any Subcontractors that are not properly licensed with Lake Havasu City and the State of Arizona. Changes of Subcontractors listed with the Proposal shall be made only with the approval of the Owner.

29.5 Nothing contained in these Contract Documents shall be construed as creating any contractual relationship between any Subcontractor and the Owner; the Contractor shall be as fully responsible to the Owner for the acts and omissions of Subcontractors, and of persons employed by them, as he is for the acts and omissions of persons directly employed by him.

29.6 The Contractor shall, without additional expense to the Owner, utilize the services of specialty Subcontractors on those parts of the Work which are specified or required by State or local laws to be performed by specialty Subcontractors.

29.7 The Contractor shall be responsible for the coordination of all trades, Subcontractors, material and people engaged upon this Work. The Owner will not undertake to settle any differences between the Contractor and his Subcontractors or between Subcontractors.

29.8 The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the Work to bind Subcontractors to the Contractor by the terms of the Contract Documents insofar as applicable to the Work of Subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the Contract Documents.

29.9 Nothing contained in this Contract shall create any contractual relation between any Subcontractor and the Owner.

30.0 ENGINEER'S AUTHORITY

30.1 The Engineer shall act as the Owner's representative during the construction period. The Engineer shall decide questions which may arise as to quality and acceptability of materials furnished and Work performed and shall interpret the intent of the Contract Documents in a fair and unbiased manner. The Engineer will make periodic visits to the site and determine if the Work is proceeding in accordance with the Contract Documents.

30.2 The Contractor will be held strictly to the intent of the Contract Documents in regard to the quality of materials, workmanship and execution of the Work. Inspections may be made at the factory or fabrication plant of the source of material supply.

30.3 The Engineer shall not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety precautions and programs in connection with the Work and will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Engineer shall not be responsible or have control or charge over the acts or omissions of the Subcontractors, or any of their agents or employees, or any other person performing any of the Work.

30.4 The Engineer shall promptly make decisions relative to interpretation of the Contract Documents.

30.5 The Engineer will have the authority to reject Work which does not conform to the Contract Documents. Whenever, in its opinion, it is considered necessary or advisable for the implementation of the intent of the Contract Documents, the Engineer will have authority to require special inspection or testing of the Work in accordance with the other terms of this Contract whether or not such Work be then fabricated, installed or completed.

31.0 LAND AND RIGHTS-OF-WAY

31.1 Prior to issuance of Notice To Proceed, the Owner shall obtain all land and rights-of-way necessary for carrying out and for the completion of the Work to be performed pursuant to the Contract Documents, unless otherwise mutually agreed.

31.2 The Owner shall provide to the Contractor information which delineates and describes the lands owned and rights-of-way acquired.

31.3 The Contractor shall provide at its own expense and without liability to the Owner any additional land and access thereto that the Contractor may desire for temporary construction facilities, or for storage of materials.

32.0 GUARANTEE

32.1 Except as otherwise specified, all Work shall be guaranteed by the Contractor against defects resulting from the use of inferior materials, equipment, or workmanship for a period of one (1) year from the date the Certificate of Substantial Completion is issued by the Owner, or within such longer period of time as may be prescribed by law or by the terms of any applicable special guarantee required by the Contract Documents.

32.2 If, within any guarantee period, repairs or changes are required in connection with guaranteed Work, which, in the opinion of the Owner, is rendered necessary as the result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the Contract, the Contractor shall, promptly upon receipt of notice from the Owner, and without expense, (1) place in satisfactory condition in every particular all of such guaranteed Work, correcting all defects therein; (2) make good all damage to the building, site or Work, or equipment or contents thereof, which in the opinion of the Owner, is the result of the use of materials, equipment, or workmanship which are inferior, defective, or not in accordance with the terms of the contract; and (3) make good any Work or material, or the equipment and contents of said building, site or Work disturbed in fulfilling any such guarantee. If the Contractor, after notice, fails to proceed promptly to comply with the terms of the guarantee, the Owner may have the defects corrected and the Contractor and his surety shall be liable for all expense incurred. The Performance Bond shall remain in full force and effect through the guarantee period.

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GUARANTEE

The Contractor agrees to execute, and to cause each Subcontractor to execute, a written guarantee to the Owner, in substantially the following form:

GUARANTEE FOR:

We hereby guarantee, both jointly and severally, that the improvement which we have installed for the Owner of Project, specifically described as:

Island WWTP Filter Upgrade Project, Project No. B26-PW-107026-500701

has been done in accordance with the Contract Drawings and Specifications.

We agree, both jointly and severally, to repair and replace any or all Work included in said improvement, together with any other adjacent work which may be displaced or damaged by so doing, that may prove to be defective in its workmanship or material within a period of one year from date of the Certificate of Substantial Completion, ordinary wear and tear and unusual abuse or neglect accepted.

In the event of our failure to comply with the above mentioned conditions within a reasonable period of time (as determined by the Owner) after being notified in writing by the Owner, we both jointly and severally, do hereby authorize the Owner to proceed to have said defects repaired and made good at our expense, and we will honor and pay the costs and charges therefore upon demand.

Signed _____

Countersigned _____

Local Representative to be contacted for service:

Name _____

Address _____

Phone No. _____

FAX _____

The guarantee form(s) shall be completed and returned with the acknowledgement of the Certificate of Completion.

The failure of the Contractor or any Subcontractor to execute, such guarantee shall not affect the right of the Owner to rely on and enforce the guarantee and the obligations respectively assumed by the Contractor and each Subcontractor under Subparagraph 32.1 and 32.2 hereof.

33.0 ARBITRATION

33.1 Provided both parties mutually agree, all claims, disputes and other matters in question arising out of, or relating to, the Contract Documents or the breach thereof, except for claims which have been waived by the making and acceptance of final payment as provided by Section 23, may be decided by arbitration in accordance with the American Arbitration Association or any other similar body. The foregoing Contract to arbitrate shall be specifically enforceable under the prevailing arbitration law (Arizona Revised Statutes Sections 12-1501, *et seq*.) of the State of Arizona. The award rendered by the arbitrators shall be final, and judgment may be entered upon it in any court having jurisdiction thereof.

33.2 Notice of the demand for arbitration shall be filed in writing with the other party to the Contract Documents and with the American Arbitration Association and a copy shall be filed with the Engineer. The party filing for arbitration may select which arbitration service to use. Demand for arbitration shall in no event by made on any claim, dispute or other matter in question which would be barred by the applicable statute of limitations.

33.3 The Contractor shall carry on the Work and maintain the progress schedule during any arbitration proceedings, unless otherwise mutually agreed in writing.

33.4 The provisions of the Contract pertaining to arbitration are not binding upon Engineer and Engineer cannot be compelled to participate against his will in an arbitration arising out of a dispute over the Contract or Contract Documents unless Engineer so consents in writing to be a party to the arbitration.

34.0 TAXES AND CHARGES

34.1 The Contractor shall pay all State and local sales and use taxes on items, and in a manner as required by the laws and statutes of the State of Arizona and its political subdivisions. The Contractor shall withhold and pay any and all withholding taxes, whether State or Federal, and pay all Social Security charges, State Unemployment Compensation charges, industrial insurance, workers' compensation charges, and pay or cause to be withheld, as the case may be, any and all taxes, charges, or fees, or sums whatsoever, which are now or may hereafter be required to be paid or withheld under any laws.

35.0 MISCELLANEOUS CONDITIONS

35.1 In the event that either party to the Contract is required to institute arbitration or litigation to enforce its rights under the terms of the Contract, then the prevailing party in the arbitration or litigation shall be entitled to recover all costs and attorney's fees incurred.

35.2 In the event that any provision contained in the Contract is found to be contrary to the applicable law, then it shall be severed and the remaining provisions of the Contract shall remain in full force and effect.

35.3 The Contract shall be governed by the laws of the State of Arizona.

36.0 CONFLICTS WITHIN THE PLANS OR SPECIFICATIONS

36.1 In the event that a conflict is discovered between sections of the Specifications or between the Plans and the Specifications, the following list of priority shall be used to resolve the conflict:

A. Executed Change Orders
B. Addenda
C. Contract
D. Special Provisions
E. General Conditions
F. Instructions to Bidders
G. Technical Specifications
H. Plans
I. Referenced Standard Specifications or Other Documents

37.0 NONDISCRIMINATION

37.1 The Contractor, with regard to the work performed pursuant to this contract, shall not discriminate on the grounds of race, color, sex, religion, creed, age, physical or mental disability, or national origin or ancestry in any contracts with the public and in the selection and retention of employees or subcontractors, nor in the procurement of materials and leases of equipment.

38.0 INTEGRATION

38.1 This Contract represents the entire Contract between the parties hereto and supersedes any and all prior negotiations or representations, either written or oral.

38.2 Amendments or modifications to the Contract shall be in writing, signed by both parties, or by Change Orders.

38.3 The Contract Documents shall not be construed to create any contractual relationship of any kind between the Engineer and the Contractor, but the Engineer shall be entitled to performance of obligations intended for his benefit, and to the enforcement thereof.

39.0 HAZARD COMMUNICATION PROGRAM

39.1 All contractors working on City projects shall submit a copy of their hazard communication plan to the Fire Prevention Office prior to commencement of work on any project. This will ensure that other individuals on the job site are not unknowingly exposed to a hazardous substance or chemical.

The Fire Prevention Office shall be provided a list of the hazardous substances and the material safety data sheets that are applicable to the work areas of those contract employees.

All contract labor within City facilities will be treated the same as regular employees with regard to this hazard communication standard.

** END OF SECTION **

LAKE HAVASU CITY

SPECIAL PROVISIONS

AND

TECHNICAL SPECIFICATIONS

Island WWTP Filter Upgrade Project, Project No. B26-PW-107026-500701

SPECIAL PROVISIONS

1.0 SCOPE

These Special Provisions supplement and modify the General Conditions, Technical Specifications, and Plans. All requirements and provisions of the General Conditions, Technical Specifications and Plans apply except where modified by these Special Provisions.

2.0 DEFINITION OF TERMS

Wherever in these documents the word "Engineer" appears, it shall be understood to mean Lake Havasu City Public Works Department, Engineering Division.

3.0 PRECONSTRUCTION CONFERENCE

Within ten (10) days after the Contract has been awarded, but before the start of construction, the Engineer will schedule a conference to be held at the site of the Project for the purpose of discussing such matters as Project supervision, onsite inspections, progress schedules and reports, payrolls, payments to Contractors, equal employment opportunity, contract change orders, insurance, safety, and any other items pertinent to the Project. The Contractor shall arrange to have all supervisory personnel connected with the Project on hand to meet with the representatives of the Owner and the Engineer.

4.0 DRAWINGS OF RECORD

Two sets of the Contract Documents are to be kept at the job site, maintained in good condition, and marked daily by the Contractor as the Work proceeds. The Contract Documents shall be kept available for inspection by the Owner at all times, and shall be kept up to date.

5.0 SURVEYS

The CONTRACTOR shall layout the WORK, in accordance with the drawings, shall establish all necessary lines, etc., required to complete the Work in accordance with the Contract Documents. The CONTRACTOR shall employ an experienced and competent Arizona Registered Land Surveyor (R.L.S.) satisfactory to the Owner to layout the WORK and to verify lines and elevations as the WORK progresses.

6.0 WEATHER CONDITIONS

In the event of temporary suspension of Work, or during inclement weather, or whenever the Owner shall direct, the Contractor will and will cause its Subcontractors to protect carefully their Work and materials against damage or injury from the weather. If, in the

opinion of the Owner, any Work or materials shall have been damaged or injured by reason of failure on the part of the Contractor or any of its Subcontractors to so protect its work, such materials shall be removed and replaced at the expense of the Contractor.

7.0 SUBMITTALS

Prior to construction and as soon as possible, the Contractor shall supply all submittals required by the Technical Specifications or as requested by the Owner.

8.0 INSPECTION OF THE WORK

The Owner intends to provide a full-time resident inspector for the Project. The resident inspector will be available for a forty (40) hour period during the week from Monday through Friday during the period of the Contract. In the event the Contractor elects to work outside the forty (40) hour week that occurs between Monday through Friday, such as Saturday, Sunday or legal holidays, in accordance with Article 17.0 of the General Conditions the Contractor will be responsible for all inspection, engineering, and testing costs incurred during that period. For any inspection work performed on Saturday, Sunday, or local municipal holidays the minimum chargeable time shall be four (4) hours. The Owner reserves the right to deduct these additional inspection, engineering, and testing costs directly from the Contractor's payments.

9.0 WATER AND POWER

A. WATER

Water is available from the Water Division at no cost to the Contractor. The Contractor shall make application and obtain a hydrant meter from the Water Division for the purpose of metering the use of water on the Project. The Contractor shall adhere to all conditions stated in the Meter Application, including payment of a deposit for the meter, return of the meter to the Water Division each month during the Project for reading, and notification to the Water Division prior to any change in the location of the hydrant meter. The maximum water to be drawn off a hydrant at any time is 200 gpm (water drawn from 4" hydrant whenever available). Water shall only be drawn off hydrants approved by the Lake Havasu City Water Superintendent or authorized representative.

B. POWER

All power for lighting, operation of Contractor's plant or equipment or for any other use as may be required for proper completion of the Work to be performed under the provisions of these Contract Documents, shall be provided by the Contractor at its sole cost and expense.

10.0 BURNING OF VEGETATION

No burning of vegetation will be allowed.

11.0 MATERIALS TESTING

A. CONSTRUCTION TESTING

All quality control testing must be provided by Contractor. The material and workmanship provided during construction will be tested on a regular basis by the Contractor. It shall be the responsibility of the Contractor, at no additional cost, to provide material samples for testing at the **Owner's** request.

The Contractor shall be responsible for charges resulting from failed tests, costs for retesting shall be based upon hourly and/or individual test rates. In the event any portion of the Project is rejected because of substandard work, all materials testing, engineering, and inspection costs associated with corrective measures shall be chargeable to the Contractor at the current respective rates.

B. PRELIMINARY MATERIALS TESTING

All preliminary materials testing and mix design testing required by the Specifications to ensure materials and mix designs are suitable for Project use will be the responsibility of the Contractor at no additional cost to the Owner.

12.0 CLEANUP AND POLLUTION CONTROL

A. GENERAL

The Contractor shall be responsible for the removal of all debris, litter and waste from the job site(s) and/or equipment maintenance area and the restoration of any and all areas affected, directly or indirectly by the construction, transportation of equipment or materials and/or by the acts of neglect or omission by its employees.

All debris, litter, etc., shall be disposed of in accordance with prevailing ordinance or law. Open burning of trash, debris, etc., will not be permitted.

Such clean-up operations shall be on a daily basis. All pavement, concrete, brush, rocks, excess materials, etc. accumulated or removed during the course of construction must be disposed of in those areas designated by the Engineer or authorized representative, including but not limited to the Lake Havasu City Landfill. All costs for disposal, including gate or tipping fees, etc. are the responsibility of the Contractor. This material must be disposed of within ten (10) days of time of removal. If the areas in question are not cleaned up to the

satisfaction of the Engineer, progress payments will be withheld until clean-up is completed and approved by the Engineer, or, in the case of private projects, other legal action will be taken.

B. TEMPORARY FACILITIES

The Contractor shall provide temporary mailboxes and traffic control signs where necessary until completion of backfilling and clean-up.

C. SOLID WASTES

All solid wastes shall be removed and disposed of in accordance with prevailing ordinance or law. Clean-up shall be completed on a daily basis. All costs for disposal shall be the responsibility of the Contractor, and shall be considered incidental to the costs of the various bid items.

All spilled paving material shall be removed and disposed of prior to final acceptance and payment.

D. MAINTENANCE AREAS

Maintenance areas shall be kept clean during construction and shall be free of litter at all times. All empty containers, debris, waste, etc., shall be removed and disposed of prior to final acceptance. Upon inspection by the Engineer, the Contractor may be required to dress the surface of the ground, dependent upon the extent of spillage of petroleum products on the surface. If so directed, such dressing shall consist of scarifying the surface to a depth of six (6) inches and moving and compacting the soil in such a way as to blend the spill areas into clean soil and restore the surface by partial compaction.

E. POLLUTION

The Contractor shall be held responsible for acts leading to pollution of water, air or land by any means.

Open burning of trash, debris, etc., will not be permitted anywhere in the City limits.

The discharge of any pollutants upon the surface of the ground, or into any stream, ravine, wash or body of water which may result in pollution of the public water supply, or of groundwater contributory thereto, will not be permitted.

Violation of these conditions will be cause for the termination of Work, and possible legal action.

F. REMOVAL AND REPLACEMENT OF SIGNS, MAILBOXES, ETC.

It is the responsibility of the Contractor to remove all poles, etc. which are located within the construction area and replace at the time of backfilling and clean-up in the locations determined by the Street Superintendent. In the case of landscaping or other private items located in the construction area, the Contractor shall hand-deliver a written notice to all residences in that area stating its intentions to perform construction activities and shall do so at least five (5) working days prior to Work commencing. If, at the time of construction these items are still in the construction area, the Contractor is to remove and dispose of them properly. All signs and mailboxes shall be permanently installed within forty-eight (48) hours of completion of construction activities.

G. NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)GENERAL PERMIT

At the time of the preconstruction conference, the contractor shall submit, for the Engineer's approval, a program which includes all the measures which the contractor proposes to take for the construction of permanent erosion control work specified in the Contract and all the temporary control measures to prevent erosion and pollution of streams, lakes and reservoirs.

Permanent erosion control work and pollution prevention measures shall be performed at the earliest practicable time consistent with good construction practices. Temporary work and measures are not meant to be performed in lieu of permanent work specified in the Contract.

Construction of drainage facilities as well as the performance of other contract work which will contribute to the control of erosion and sedimentation shall be carried out in conjunction with earthwork operations or as soon thereafter as possible.

Except for that approved in writing by the Engineer, the contractor shall perform no clearing and grubbing or earthwork until the contractor's program has been approved.

If in the opinion of the Engineer, clearing and grubbing, excavation, or other construction operations are likely to create an erosion problem because of the exposure of erodible earth material, the Engineer may limit the surface area to be disturbed until satisfactory control measures have been accomplished. Unless otherwise permitted by the Engineer, the contractor shall not expose an area of erodible earth material greater than 217,800 square feet at any one location.

The Engineer may order the contractor to provide immediate measures to control erosion and prevent pollution. Such measures may involve the construction of temporary berms, dikes, dams, sediment basins and slope drains; the use of temporary mulches, mats and seeds and the use of other devices, methods, items, etc., as necessary.

At any time the contractor proposes to change its schedule of operations, the contractor shall review and update its erosion and pollution control program and submit it to the Engineer for approval.

The contractor shall not be entitled to additional compensation or an extension of contract time for any delays to the Work because of the contractor's failure to submit an acceptable erosion and pollution control program.

Erosion control and pollution prevention work specified in the Contract which is to be accomplished under any of the various contract items will be paid for by the bid item. Any additional Work required by the Owner will be paid for by the Force Account set up for this Work.

The cost of any erosion control and pollution prevention work which may be proposed by the contractor in its program, in addition to that specified in the Contract, will be considered as included in the prices bid for contract items.

13.0 DUST CONTROL

It shall be the Contractor's responsibility to provide adequate water for dust control. It is imperative that the air quality standards are maintained. In addition, dust could be quite hazardous in the everyday operations. It shall be the Contractor's responsibility to ensure that all regulations for air quality and safety are met.

14.0 SUPERVISORY PERSONNEL

It is the intent of these Special Privisions to provide a completed Project which will in every way reflect the work of competent journeyman mechanics in the various trades represented. The Contractor shall ensure that each portion of the work is supervised by a qualified person, well versed in the operation of the various tools required for the trade, the method in which the work is to be done, and a knowledge of the general requirements of the construction work. All work is to be done in accordance with the latest methods devised for such work to ensure the highest quality product.

15.0 SAFETY REQUIREMENTS

The Contractor shall comply with all pertinent provisions of the Department of Labor "Safety and Health Regulations for Construction" (29 CFR Part 1518, 36 CFR 7340), with

additions or modifications thereto, in effect during construction of this Project.

THE FOLLOWING MEASURES OR PROVISIONS ARE TO BE ADHERED TO AT ALL TIMES DURING THE CONSTRUCTION OF THIS PROJECT:

A. All heavy construction machinery to include trenching machines, bulldozers, backhoes, etc., must be equipped with a roll bar meeting the requirements of the above regulation.

B. Safety helmets will be worn by all personnel working at the site. In addition, all spectators and inspectors will be required to wear safety helmets in construction zone.

C. Steel toe safety shoes or boots will be worn by all personnel working at the site.

16.0 PRESERVATION OF BENCH MARKS AND MONUMENTS

The Contractor shall exercise caution to ensure that permanent benchmarks, monuments, established property corners, survey lines, and points are not damaged or disturbed by this Work. If any survey monuments, property corners, survey lines or points are damaged or disturbed, the Contractor's representative shall immediately notify the inspector. All centerline survey monumentation located in pavement removal areas shall be replaced by an Arizona Registered Land Surveyor (R.L.S.) after completion of the pavement removal and replacement operations. All costs incurred to re-establish such points shall be borne by the Contractor.

17.0 DISPOSAL OF EXCESS MATERIAL

Excess soil and unsuitable materials shall be removed from the site by the Contractor at its own expense and disposed of in accordance with the Contract Documents unless otherwise permitted herein. In the event the Contractor chooses to utilize local private lots to dispose of excess material, the Contractor must provide the Engineer with written permission from the lot owner prior to utilizing the lot. Placing material suitable for fill on vacant lots will require a Grading Permit in advance of placing the material.

18.0 REFERENCE STANDARD SPECIFICATIONS

Where standard specifications or testing methods have been referred to, such as ASTM or AASHTO, the intent is to refer to the latest applicable issue or revision of such specifications or testing methods. The following abbreviations are used in these Special Provisions.

AWWA American Waterworks Association

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AI	Asphalt Institute
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute (formerly the USA Standards Institute)
ASTM	American Society for Testing and Materials
NSF	National Sanitation Foundation
S.P.W.C.	Standard Specifications for Public Works Construction. (Wherever written herein shall mean "Maricopa Association of Governments, Arizona Specification for Public Works Construction".) The "Sample Forms" and "Part 100 – General Conditions" of these Standard Specifications for Public Works Construction are excluded from the documents for this Project.

19.0 CODES, ORDINANCES AND LOCAL SPECIFICATIONS

All Work under this Project shall be performed in strict accordance with these Special Privisions and the Standard Specifications for Public Works Construction (SPWC). Where any conflict occurs between these plans and specifications and the local codes and ordinances in effect at the time, such codes and ordinances shall take precedence over these plans and specifications only if these plans and specifications are inferior as to materials and workmanship called for by such codes and ordinances.

20.0 INTERFERING STRUCTURES AND UTILITIES

The Contractor shall notify Arizona 811 (formerly Blue Stake) (1-800-782-5348) at least three (3) working days prior to any excavations.

The Contractor shall exercise all possible caution to prevent damage to existing structures and utilities, whether above ground or underground. The Contractor shall notify all utility offices concerned at least seventy-two (72) hours in advance of construction operations in which a utility's facilities may be involved.

Any structure or utility damage caused by the work shall be repaired or replaced in a condition equal to or better than the condition prior to the damage. Such repair or

replacement shall be accomplished at the Contractor's expense without additional compensation from the Owner.

If interfering structures or installations such as vaults, manholes, valves, utility poles, guy wires, or anchors are encountered, the Contractor shall notify the Engineer and contact the appropriate utility or structure owner at least seven (7) days in advance of construction to arrange for protection or relocation of the structure.

The Contractor shall remove, protect and/or replace all existing structures, utilities or other improvements and similar items within the proposed improvements at its own expense without additional compensation from the Owner unless specifically provided for as a pay item of Work by the Specifications or as otherwise provided for on the Plans. Replacement shall be in a manner and in a condition at least equivalent to, or better than, the original condition.

If the Contractor encounters existing facilities which will prevent the construction of any facility and which are not properly shown on the Plans, Contractor shall notify the Owner before continuing with the construction in order that the Owner may make such field revisions as necessary to avoid conflict with the existing structure. The cost of waiting or "down" time during such field revision shall be borne by the Contractor without additional cost to the Owner. If the Contractor fails to notify the Owner when an existing structure is encountered, but proceeds with the construction despite this interference, Contractor does so at its own risk. In particular, when the location of the new construction will prohibit the restoration of existing structures to their original condition; the Contractor shall notify the Engineer and contact the utility or structure owner so a field relocation may be made if possible to avoid the conflict.

In the event of interruption to any utility service as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall promptly notify the proper authority. Contractor shall cooperate with the said authority in restoration of service as promptly as possible and shall bear all costs of repair. In no case shall interruption of any utility service be allowed to exist outside working hours unless prior approval of the Owner is received.

Neither the Owner nor its officers or agents shall be responsible for damages to the Contractor as a result of the locations of the water and sewer lines or utilities being other than those shown on the Plans or for the existence of water, sewer lines or utilities not shown on the Plans.

21.0 AIR QUALITY - OPERATING PERMITS

The Contractor may be required to obtain registration certificates and/or operating permits for sources of air pollution.

Information concerning these certificates and permits may be obtained from:

The Office of Air Quality
Arizona Department of Environmental Quality
P.O. Box 600
Phoenix, AZ 85001-0600
(602) 207-2300

22.0 ADJUST UTILITIES TO FINISHED GRADE

The Contractor shall be responsible for locating all manhole rims, valve boxes, meter boxes, utility vaults, etc., and setting them to finished grade. The Contractor shall adjust sewer and water facilities to finished grade in accordance with the specifications within seven (7) days after street surfacing has been completed on each street. All valves and/or manholes will be made visible and accessible for emergency use within 24 hours. It shall be the responsibility of the Contractor to coordinate with the various private utility companies so that they can adjust their facilities to finished grade at an appropriate time. Adjust all facilities in accordance with these specifications and the MAG Standard Details, as modified by Lake Havasu City.

23.0 SAFETY, HEALTH AND SANITATION PROVISIONS

The Contractor shall provide and maintain in a neat, sanitary condition such accommodations for the use of its employees as may be necessary to comply with the requirements and regulations of the Arizona State Department of Health.

The Contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions, on its own responsibility or as the Owner may determine, reasonably necessary to protect the life and health of employees on the job, the safety of the public and to protect property in connection with the performance of the Work covered by the Contract.

Precaution shall be exercised by the Contractor at all times for the protection of persons (including employees) and property. The Contractor shall comply with the provisions of all applicable laws, pertaining to such protection including all Federal and State occupational safety and health acts, and standards and regulations promulgated thereunder.

24.0 PUBLIC SAFETY AND TRAFFIC CONTROL

Every attempt shall be made to provide public safety during the construction of the Project. Traffic control shall be performed in accordance with Section 2650, Traffic Control, of the Technical Specifications.

During all construction operations, the Contractor shall construct and maintain such facilities as may be required to provide access for all property owners to their property. No person shall be cut off from access to their residence or place of business for a period exceeding two (2) hours, unless the Contractor has made a special arrangement with the affected persons. It shall be the Contractor's responsibility to notify all adjacent property owners of the construction activity and the schedule of such activities.

The Contractor shall submit for approval a traffic control and barricade plan within ten (10) days of receipt of Notification of Award of Contract. There shall be no deviations from the approved barricade plan unless a revised barricade plan is submitted and approved. The Contractor shall issue a news release once a week for duration of the Project. The release will be published in Sunday's newspaper and shall indicate the area in which the Contractor will be performing work for that week.

Businesses must be notified forty-eight (48) hours prior to any restrictions on normal parking areas used by their employees or patrons.

The Contractor shall contact, cooperate with, and give notice to each resident, homeowner, business or school that will be affected by any part of the construction process, particularly concerning temporary interruptions to vehicular access.

Written notice of the approximate schedule and explanation of work shall be given to each resident, homeowner, business or school at least five (5) days prior to commencement of work in the area. Verbal door-to-door communication shall be made at least twenty-four (24) hours prior to construction to remind all affected parties of the construction to take place.

The Owner shall receive a copy of all notifications to residents. In the event of complaints by residents, the Owner may require the Contractor to provide documentation (i.e., check list) showing the date and time of the verbal door-to-door communication.

In addition, the Contractor is responsible to answer and resolve any conflicts that may arise between a homeowner or business owner and himself during the construction process.

The Contractor shall provide and station competent flaggers whose sole purpose shall be to direct the movement of public traffic through or around the work. Proper advanced warning signs shall be in place when flaggers are working and removed when work requiring flaggers is completed. Flaggers must be used to assist trucks for safe ingress and egress whenever truck movements may interfere with safe passage through the work zone.

All traffic control devices that are not in use or will not be used for a period greater than 72 hours or that are determined by the Engineer to be unnecessary, confusing, or causing

an unsafe condition, shall be removed by the Contractor from the public right-of-way immediately upon notification by the Engineer.

Every attempt shall be made to provide public safety during the construction of the Project. Traffic control shall be performed in accordance with Section 2650, Traffic Control, of the Technical Specifications. No person shall be cut off from access to their residence or place of business for a period exceeding six (6) hours, unless the Contractor has made a special arrangement with the affected persons. In addition, no work will be scheduled which will interrupt regular trash pickup to either residential or commercial properties. It will be the Contractor's responsibility to coordinate its activities with the local trash haulers.

No streets, avenues, boulevards or cul-de-sacs will be closed to traffic unless prior arrangements have been made and approval has been obtained from the Engineer.

25.0 TEMPORARY FACILITIES ON SITE

A. General

Except as otherwise provided, the Owner shall bear no costs of temporary facilities and their removal.

B. Temporary Utility Services

The Contractor shall provide temporary electric power as necessary for the execution of the Work, including that required by all Subcontractors. Contractor shall make the necessary arrangements with Owner, shall bear all costs for these temporary services and shall furnish and install all necessary transformers, metering facilities and distribution centers from branch circuits as Contractor may require.

The Contractor shall provide lighting and outlets in temporary structures throughout the Project as may be required for safety, proper performance and inspection of the Work. If operations are performed during hours of darkness, or if natural lighting is deemed insufficient by Owner, the Contractor shall provide adequate floodlights, clusters and spot illumination. The use of permanently installed lighting fixtures, lamps and tubes for work will not be permitted except by special permission of Owner. The Contractor shall make arrangements with Subcontractors for electrical services and lighting as may be necessary in the performance of their work.

Temporary water service lines, if required, shall be installed and removed by the Contractor, who shall pay all charges for making the connections, running the temporary lines, removing the temporary lines at the completion of the Work and

disconnecting the services. All relocations required to clear the work of others shall be performed by the Contractor when requested by the Owner.

C. Temporary Structures

Prior to starting Work, the Contractor shall, as directed by Owner, provide and maintain suitable temporary office facilities for the duration of the Project as required for the Contractor's project administration; and all necessary sheds and facilities for the proper storage of tools, materials and equipment employed in the performance of the Work.

D. Toilet Facilities

The Contractor shall provide and maintain temporary toilet facilities for the duration of operations, which shall be maintained in a clean and sanitary condition acceptable to Owner and in full compliance with applicable regulations of any public authority.

E. Telephones

The Contractor shall provide, maintain and pay for telephone services for the duration of the Work as required for the Contractor's operation.

F. Fence and Barricades

The Contractor shall provide such protective fences and barricades as Contractor may deem necessary for public safety and to protect Contractor’s storage areas and the Work in place. The location and appearance of all fences shall be subject to the approval of the Owner.

G. Contractor Parking

The Contractor shall not park its equipment, nor allow its personnel to park, in any area except those specifically designated by the Owner.

H. Temporary Living Quarters

Temporary living quarters shall not be allowed on the job site or on publicly owned properties. In addition, all Lake Havasu City Zoning Codes for the area in question shall be strictly adhered to.

I. Removal of Temporary Construction

The Contractor shall remove temporary office facilities, toilets, storage sheds and

other temporary construction from the site as soon as, in Owner's opinion, the progress of Work permits. Contractor shall recondition and restore those portions of the site occupied by the same to a condition equal to or better than it was prior to construction.

26.0 ACCESS TO WASHES

A. Unless otherwise mentioned herein, the Contractor must obtain written permission from the Owner prior to gaining access or utilizing washes or City parcels for any purpose. Request for access to washes and City parcels will be reviewed on a case by case basis. The Contractor shall have access to washes and City parcels via public streets and/or private easements only. For the purposes of this paragraph, "private easement" means a contract by and between the Contractor and a property owner, in writing, authorizing the Contractor to travel across the property owner's real property in order to have ingress or egress to washes, parcels or any portion thereof. Such contracts, if any, shall be filed with the City before the Contractor may exercise the rights thereunder granted. Access to any wash, parcels, or portion thereof by any means not in compliance with the terms of this paragraph shall be deemed a trespass and a breach of the terms of the Contract.

B. Violations of the provisions of subparagraph (A.) hereof, shall entitle the City to deduct the sum of One Thousand Dollars ($1,000.00) from the monies due to Contractor as and for liquidated damages for each such violation. For the purposes of this paragraph, each entry by a vehicle upon land for which Contractor has not received permission to enter shall be deemed a separate violation of subparagraph (A.) hereof.

27.0 COORDINATION AND COOPERATION WITH UTILITY COMPANIES AND OTHER TRADES

A. Coordination/Interruption

The Contractor is responsible to coordinate work with all utility companies and other trades, on or affecting the Project, for an efficient and effective execution of the complete Project. The Contractor shall carefully examine all work that may conflict, and plan removal and/or installation details in advance of the construction to avoid any such conflict. Failure on the Contractor's part to coordinate with any and all utilities, public or private, shall preclude the City's consideration for additional time or cost.

B. Permission Required

Utility mains and utility service to buildings shall not be cut off or otherwise interrupted without the Contractor obtaining permission from the Owner in each

and every instance.

C. Scheduling of Interruptions

Where utilities serve facilities or buildings in use, interruptions in service shall be scheduled during the hours when the facility is not in operation. Any overtime costs occasioned thereby shall be regarded as incidental to, and included within, the Contract Price.

D. General Requirements

Prior to interrupting any utility service, the Contractor shall ascertain that it has the proper materials, together with adequate workmen and equipment, to complete the Work with a minimum of delay.

E. Project Electrical Service

The Contractor is responsible to coordinate with Unisource, Electric Division, to determine the extent of work to be performed by Unisource and by the Contractor to provide electric service for the finished product. The Contractor is also responsible to contact Unisource to determine the hardware required by Unisource to provide service to the final product. Unisource does not provide service to delta connections.

****END OF SECTION 00800****

SECTION 01210

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 Description

The outline of measurement and payment in this section is intended to provide a general guideline to the Contractor in preparing bids and submitting pay requests. Listing of work included in each bid item is not intended to include all work, but is to provide general guidance to the Contractor for allocating costs. All work will be paid for on a unit price basis with payment made for the quantity of each item completed.

All materials required for construction shall be furnished by the Contractor unless specifically stated. Items not specifically measured and paid for shall be considered as subsidiary items required to complete the installation in accordance with the intent of the contract documents. The Contractor shall include in the unit price bid items, all costs associated with subsidiary items not being measured for payment.

1.2 Authority

Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

Take all measurements and compute quantities. The Engineer will verify measurements and quantities.

1.3 Unit Quantities

Quantities indicated in the Bid Form are for bidding and contract purpose only. Quantities and measurements supplied or placed in the Work and verified by the Engineer shall determine payment.

If the actual Work requires more or fewer quantities than indicated, provide the required quantities at the unit prices contracted.

PART 2 – UNITS AND METHODS OF MEASUREMENT

2.1 General

All items that are included in the bid for measurement and payment are included herein. All other items of work shall be considered subsidiary to construction and will not be measured for payment.

2.2 Units and Methods of Measurement

2.2.1 Mobilization, Bonds, and Insurance

The Contract Lump Sum Price for this item shall constitute full compensation for furnishing all materials, labor, equipment and tools for all required bonds, insurance, mobilization of staff and equipment, and any other costs associated with complying with the contract administrative requirements and commencing work at the project site. This item also includes all work and materials necessary to complete the work as described in the plans and specifications. **Payment for this item shall be lump sum and shall not be requested until at least thirty days from the notice to proceed has elapsed.**

Payment for this item shall be made in accordance with Table A.

TABLE A

Payment for Mobilization on First Partial Payment	Not to exceed 2.5% of the Lump Sum Base Bid
Subsequent payments for Mobilization	Not to exceed 2.5% of the Lump Sum Base Bid
Payment For Mobilization on Final Partial Payment	Any remaining Mobilization in excess of 5% of the Lump Sum Base Bid

2.2.2 Port Drive - Bypass

The Contract Lump Sum Price for this item shall constitute full compensation for furnishing all materials, labor, equipment and tools for the construction of the bypass and all other related items. This item also includes all work and materials necessary to complete the

work as described in the Plans and Specifications. Payment of this item shall be lump sum.

2.2.3 Port Drive – Temporary Electrical Connection

The Contract Lump Sum Price for this item shall constitute full compensation for furnishing all materials, labor, equipment and tools for the cost of installing temporary power connection for the electric bypass pump. This item also includes all work and materials necessary to complete the work as described in the Plans and Specifications. Payment of this item shall be lump sum.

2.2.4 Port Drive – Wet Well Rehabilitation

The Contract Lump Sum Price for this item shall constitute full compensation for furnishing all materials, labor, equipment and tools for the rehabilitation of the existing wet well and all other related items. This item also includes all work and materials necessary to complete the work as described in the Plans and Specifications. Payment of this item shall be lump sum.

2.2.5 Queens Bay - Bypass

The Contract Lump Sum Price for this item shall constitute full compensation for furnishing all materials, labor, equipment and tools for the construction of the bypass and all other related items. This item also includes all work and materials necessary to complete the work as described in the Plans and Specifications. Payment of this item shall be lump sum.

2.2.6 Queens Bay – Temporary Electrical Connection

The Contract Lump Sum Price for this item shall constitute full compensation for furnishing all materials, labor, equipment and tools for the cost of installing temporary power connection for the electric bypass pump. This item also includes all work and materials necessary to complete the work as described in the Plans and Specifications. Payment of this item shall be lump sum.

2.2.7 Queens Bay – Wet Well Rehabilitation

The Contract Lump Sum Price for this item shall constitute full compensation for furnishing all materials, labor, equipment and tools for the rehabilitation of the existing wet well and all other related

items. This item also includes all work and materials necessary to complete the work as described in the Plans and Specifications. Payment of this item shall be lump sum.

2.2.8 Force Account

The Contract Lump Sum Price for this item shall be included in the Bid Schedule. Only the OWNER shall determine the use of monies in the "Force Account".

The OWNER will authorize the use of monies in the Force Account by Change Order. Unused Force Account monies will be removed from the Cost of the Work by Change Order.

****END OF SECTION 01210****

LAKE HAVASU CITY

Project Specifications
100%

EXPIRATION DATE: 06/30/2028

EXPIRATION DATE: 12/31/27

Island WWTP Filter Upgrades Project

TABLE OF CONTENTS

SPECIFICATIONS

DIVISION 1
GENERAL REQUIREMENTS

SECTION 01030

SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Identification and summary description of the Project, the Work, location, OWNER furnished equipment, Work by OWNER, activities by others, and coordination.

B. The Project consists of
   1. The rehabilitation of the Island Wastewater Treatment Plant (WWTP) Tertiary Filter System performing concrete wall repairs, removal and installation of new traveling bridge system with related mechanical and electrical equipment, handrails, grating and effluent weir plate replacements. Owner/Engineer should be notified 48 hours in advance to inspect the porous plates and cell dividers after the media is removed. Depending on the condition of porous plates and cell dividers, Owner may request for the replacement of porous plates and cell dividers under this project.
   2. Installation of new electrical power disconnect panel with related conduit and wiring.

1.02 LOCATION OF PROJECT

A. The Project is located at the following addresses:
Island Wastewater Treatment Plant (WWTP): 1150 McCulloch Blvd N, Lake Havasu City, AZ 86403.

1.03 WORK BY THE OWNER

A. Concurrent to this Project, the OWNER will:
   1. Provide site access.
   2. Coordinate startup and shutdown of facilities.

1.04 ACTIVITIES BY OTHERS

A. OWNER, utilities, and others may perform activities within Project area while the Work is in progress:
   1. Schedule the Work with OWNER, utilities, and others to minimize mutual interference.

B. Cooperate with others to minimize interference and delays:
   1. When cooperation fails, submit recommendations and perform Work in coordination with work of others as directed.

2. When the Work depends for proper execution or results upon work performed by others, inspect and promptly report apparent discrepancies or defects in work performed by others.
3. Assume responsibility for work performed by others, except for defects reported as specified in this paragraph and defects which may become apparent in work performed by others after execution of the Work.

1.05 OPERATION OF EXISTING FACILITIES

A. All work must be scheduled with the OWNER to avoid interference with existing facilities that are operational in WWTP. Refer to Section 01040 for additional requirements.

B. During the entire construction period, both the tanks of the tertiary filter system shall remain shut down. Filters 1 and 2 are currently not in operation and can remain out-of-service during the duration of construction. See Section 01040 for Order of Construction.

1.06 COORDINATION OF WORK

A. Maintain overall coordination of the Work:
1. As more fully set forth in the General Conditions, CONTRACTOR shall be solely responsible for coordination of all of the work. Supervise, direct and cooperate fully with all subcontractors, manufacturers, fabricators, suppliers, distributors, installers, testing agencies and all others whose services, materials or equipment are required to ensure completion of the work within the Contract time.
2. As more fully set forth in the General conditions, CONTRACTOR shall cooperate with and coordinate work with the work of any other contractors, utility service companies or OWNER's employees performing additional work related to the Project site.
3. CONTRACTOR shall coordinate work with the work of others to assure compliance with schedules.
4. CONTRACTOR shall attend and participate in all project coordination or progress meetings and report on the progress of all work and compliance with construction schedule.

1.07 POTABLE WATER SUPPLY PROTECTION

A. All materials of construction which may come into contact with drinking water shall conform to NSF International Standards 60 and 61.

1.08 PERMITS

1. None required.

1.09 CONTRACTOR'S USE OF PREMISES

A. CONTRACTOR may use the premises of the Island WWTP for the duration of construction.

Coordinate with Owner for staging area locations, parking, temporary trailers, and storage units.

B. CONTRACTOR assumes full responsibility for the protection and safekeeping of products and materials CONTRACTOR has stored on the site.

C. CONTRACTOR shall move any stored products, or materials, under CONTRACTOR's responsibility, which interfere with operations of OWNER and separate contractors/subcontractors.

D. CONTRACTOR shall obtain and pay for the use of any additional storage or work areas if needed for CONTRACTOR's operations.

E. CONTRACTOR shall restore any areas used for materials storage, equipment storage, or employee and subcontractor parking to their original condition or better, unless specified otherwise.

1.10 MAINTENANCE OF TRAFFIC

A. None Required.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01040

ORDER OF CONSTRUCTION

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Order of construction activities to allow the OWNER normal operation of the existing facilities located on the Project site.
   2. The Tertiary filter system will be out-of-service for the entire during construction.

B. Related Sections include, but are not necessarily limited to:
   1. Division 1.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

A. Milestone Dates - The construction duration to reach substantial completion shall not exceed 300 calendar days.
   1. CONTRACTOR shall include sufficient and complete overhead costs in base Bid for a 300 calendar day construction duration to reach substantial completion. No change orders or claims for extended overhead will be considered unless the actual duration to reach substantial completion exceeds 300 calendar days and OWNER was responsible for extending the timeline:
      a. No credit or refund will be given to CONTRACTOR if the work is substantially completed sooner than 300 calendar days.

B. Order of Construction - The Contractor shall follow a phased approach for completing the tertiary filter upgrades.
   1. OWNER to isolate and drain the tertiary filter, as required.
   2. CONTARCTOR to remove the tertiary filter traveling bridge with guide rails, all other associated mechanical and electrical equipment, remove filter media to accommodate the concrete repair work, inspection of underdrains and cell dividers by Owner/Engineer and installation of new moving bridge, filter beds, handrails and gratings.
   3. Rehabilitation sequence of the Tertiary Filter System:
      a. Coordinate with the OWNER to isolate the tertiary filter system.
      b. Remove the equipment on the tertiary filter to accommodate the repair and upgrade works.
      c. Remove filter media and notify Owner/Engineer to inspect the filter underdrains, cell dividers and replace them if it is required as per the Owner/Engineer.

d. Perform power tool cleaning to remove all loose concrete, dirt, debris and other contaminants from the walls to be repaired.
e. Perform high pressure wash minimum 2000 PSI, to obtain aggregate surface profile as specified in the drawings or by manufacturer.
f. Clean filter tanks interior and haul waste off-site for disposal.
g. Perform concrete repair work as per the Owner/Engineer approved procedures.
h. Install grout pad for new guide rails of traveling bridge, anchor bolting, install porous plates(if required), cell dividers(if required), filter media, handrails, gratings, weir plate and traveling bridge.
i. Complete testing and transfer existing electrical service to new panel (to coordinate with Owner)

4. Perform filter performance testing.
5. After successful testing, place filter into service.
6. Any damage to existing property/equipment must be replaced with the original working conditions.
7. Coordinate with the OWNER to keep the Tertiary filter system in service.

END OF SECTION

SECTION 01200

MOBILIZATION/DEMOBILIZATION

PART 1 - GENERAL

1.1 Description

A. Description of Work

1. The work to be performed in accordance with this section includes the movement of personnel, equipment, supplies, and incidentals to the project site; for the establishment of offices, buildings and other facilities necessary for work on the project; for premiums on bonds and insurance for the project and for all other work and operations which must be performed or costs incurred before beginning work on the various contract items.

2. Demobilization at the end of the job includes removal of tools, materials, equipment and facilities used by the CONTRACTOR during construction of the project. Also included is final cleanup to leave the site with a neat, clean appearance.

PART 2 - MATERIALS

2.1 General

A. Materials shall consist of equipment, buildings, and tools necessary to move to the project site to perform work. Material for bid items shall not be included in Mobilization.

PART 3 - EXECUTION

3.1 General

A. Setting up of offices, and the use of private property for storage or work area shall be executed in a legal manner in accordance with local and state codes and ordinances.

B. Use of private property will require a signed agreement with the property owner and shall be submitted to Engineer for approval prior to use. Sign off from property owner regarding restored property conditions will be required prior to project closeout.

PART 4 – MEASUREMENT AND PAYMENT

See Section 01210

END OF SECTION

SECTION 01210

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 Description

The outline of measurement and payment in this section is intended to provide a general guideline to the Contractor in preparing bids and submitting pay requests. The listing of work included in each bid item is not intended to include all work but is to provide general guidance to the Contractor for allocating costs. All work will be paid for on a unit price basis with payment made for the quantity of each item completed.

All materials required for construction shall be furnished by the Contractor unless specifically stated. Items not specifically measured and paid for shall be considered as subsidiary items required to complete the installation in accordance with the intent of the contract documents. The Contractor shall include in the unit price bid items all costs associated with subsidiary items not being measured for payment.

1.2 Authority

Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

Take all measurements and compute quantities. The Engineer will verify measurements and quantities.

1.3 Unit Quantities

Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements supplied or placed in the Work and verified by the Engineer shall determine payment.

If the actual Work requires more or fewer quantities than indicated, provide the required quantities at the unit prices contracted.

PART 2 – UNITS AND METHODS OF MEASUREMENT

2.1 General

All items that are included in the bid for measurement and payment are included herein. All other items of work shall be considered subsidiary to construction and will not be measured for payment.

2.2 Units and Methods of Measurement

2.2.1 Mobilization, Bonds, and Insurance

The Contract Lump Sum Price for this item shall constitute full compensation for bonds, insurance and furnishing all materials, labor, equipment and tools for the mobilization of staff and equipment, and any other costs associated with complying with the contract administrative requirements and commencing work at the project site. This item also includes all work and materials necessary to complete the work as described in the plans and specifications. **Payment for this item shall be a lump sum and shall not be requested until at least thirty days from the notice to proceed has elapsed.**

Payment for this item shall be made in accordance with Table A.

TABLE A

Payment for Mobilization on First Partial Payment	Not to exceed 2.5% of the Lump Sum Base Bid
Subsequent payments for Mobilization	Not to exceed 2.5% of the Lump Sum Base Bid
Payment For Mobilization on Final Partial Payment	Any remaining Mobilization in excess of 5% of the Lump Sum Base Bid

2.2.2 Tertiary Filter Upgrades

A. The Contract Lump Sum Price for this item shall constitute full compensation for furnishing all materials, labor, equipment and tools for the repair and upgrades of the tertiary filter system.
B. This item also includes all work and materials necessary to complete the work as described in the Plans and Specifications. Payment of this item shall be lump sum
C. Contractor to provide a SQ. FT unit price for the concrete damage repair works with the bid to cover any additional repair other than mentioned in the drawings.

D. Contractor to provide an LF unit price for the concrete crack repair works with the bid to cover any additional repair other than mentioned in the drawings.
E. Contractor to provide lump sum price for filter media replacement.
F. Contractor to provide lump sum for grating and handrail replacement.
G. Contractor to provide a lump sum price to remove and replace the existing porous plates. The removal and installation of new porous plates might be a bid adder after the inspection by Owner/Engineer.
H. Contractor to provide a lump sum price to remove and replace the existing washwater launders. The removal and installation of new washwater launders might be a bid adder after the inspection by Owner/Engineer.
I. Contractor to provide an LF unit price for the removal and replacement of existing cell dividers. The removal and installation of cell dividers might be a bid adder after the inspection by the Owner/Engineer.

END OF SECTION

SECTION 01300

FORCE ACCOUNT

PART 1 - GENERAL

1.1 Description of Work

A. The work to be performed in accordance with this section includes additional work that is outside the general scope of the proposed project. The work to be performed shall be specifically requested in writing by the OWNER or the ENGINEER. As the project is completed, it is anticipated that the OWNER may request additional work to be performed that currently is not a part of this Contract and it is the intent that the requested work shall be performed in accordance with this section.

PART 2 - MATERIALS

2.1 General

A. Any materials utilized under this Section shall conform specifically with the appropriate Materials Section of these Specifications unless the OWNER specifically requests in writing a deviation from the Specifications. If the materials are not covered by an appropriate Specification of this document, then the OWNER will provide a written specification for the materials requested.

PART 3 - EXECUTION

3.1 Workmanship

A. Furnish all materials, equipment and labor required to complete the work. All workmanship shall meet or exceed the appropriate Specifications included in this document or any supplemental Specifications that may be provided. Perform work in accordance with the contract Plans or in accordance with any supplemental plans that may be provided by the OWNER.

3.2 Measurement and Payment

A. Measurement

1. The method of measurement shall be in accordance with the appropriate specification or as included in specific written instructions from the OWNER or the ENGINEER.

B. Payment

1. Payment for work performed under this section shall be made for those items specifically requested in writing by the OWNER. The value of any work performed in this Section shall be determined by one or more of the following methods in the order of precedence listed below.

C. Unit prices previously approved.

D. An agreed upon price.

1. The amount specified for Force Account in the Bid Documents is an estimate that is provided so each potential bidder has an equal opportunity in the bidding. The amount does not in any way represent what work may be requested or the quantity or value of the work. The CONTRACTOR shall only be compensated for the actual work requested and performed.
2. See Section 00310 Bid Schedule for Bid Items.

END OF SECTION

SECTION 01320

PROJECT MEETINGS, SCHEDULES, AND REPORTS

PART 1 - GENERAL

1.1 Summary

This Section includes the following administrative and procedural requirements:

A. Project Meetings

1. Preconstruction conference.
2. Progress/Coordination meetings.

B. Schedules and Reports

1. Initial Project schedules.
2. Weekly Construction progress schedule.
3. Procurement schedule.
4. Construction progress reports.
5. Schedule of values.
6. Special reports.
7. Quality Control Testing Plan and Reports.
8. Health and Safety Plan.

C. Related Work Specified Elsewhere

Submittal .....Section 01330

1.2 Project Meetings

A. Preconstruction Conference

1. Engineer will conduct a meeting as described in Section 800, Special Provisions, Paragraph 4.0, to review items stated in the following agenda and to establish a working understanding between the parties as to their relationships during performance of the Work.

2. Preconstruction conference shall be attended by the following.

a. Contractor and his superintendent
b. Engineer/Owner

c. Utilities
d. City Departments
e. Representatives of principal Subcontractors and Suppliers.

3. Meeting Agenda

a. Construction schedules.
b. Critical Work sequencing plan/Baseline schedule with milestones
c. Designation of responsible personnel
d. Project coordination.
e. Procedures and Processing of:
(1) Field decisions.
(2) Substitutions.
(3) Submittals.
(4) Change Orders.
(5) Applications for Payment.
f. Procedures for testing.
g. Procedures for maintaining record documents.
h. Use of Premises:
(1) Office, work, and storage areas.
(2) Owner's requirements.
i. Construction facilities, controls, and construction aids.
j. Temporary utilities.
k. Safety and first-aid.
l. Security.

4. Location of Meeting: To Be Determined.

5. Reporting:

a. Within 5 working days after the meeting, Engineer will prepare and distribute minutes of the meeting to Owner and Contractor.
b. Contractor shall provide copies to Subcontractors and major Suppliers.

B. Coordination Schedules

1. Engineer will conduct a meeting at least 10 days before submission of the first Application for Payment to finalize the initial coordination schedules requested under ARTICLE 1.3 this Section.
2. The meeting shall be attended by:
a. Contractor and his superintendent.
b. Representatives of principal Subcontractors and Suppliers.

c. Engineer

C. Progress Meetings

1. Engineer will schedule and conduct a weekly meeting, and as necessary, as determined by the Engineer. Representatives of the Owner, Engineer, and Contractor shall be present at each meeting. With Engineer's concurrence, Contractor may request attendance by representatives of Subcontractors, Suppliers, or other entities concerned with the Project or involved with planning, coordination, or performance of future activities. All participants in the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work.

2. Contractor and each Subcontractor represented shall be prepared to discuss the current construction progress report and any anticipated future changes to the schedule. Each Subcontractor shall comment on the schedules of Contractor and other Subcontractors and advise if their current progress or anticipated activities are compatible with the proposed Work.

3. Contractor shall be responsible for addressing any issues with subcontractors, and provide directions as are necessary to resolve the situation and promote construction progress.

4. Meeting Agenda:
   a. Review of construction progress since previous meeting.
   b. Field observations, interface requirements, conflicts.
   c. Problems which impede construction schedule.
   d. Off-site fabrication.
   e. Delivery schedules.
   f. Submittal schedules and status.
   g. Site use and responsibilities.
   h. Temporary facilities and services.
   i. Hours of Work.
   j. Hazards/Safety.
   k. Housekeeping.
   l. Quality and Work standards.
   m. Change Orders.
   n. Documentation of information for payment requests.
   o. Corrective measures and procedures to regain construction schedule if necessary.
   p. Revisions to construction schedule.
   q. Review of proposed activities for succeeding Work period.
   r. Review proposed Contract modifications for:
      (1) Effect on construction schedule and on completion

date.

(2) Effect on other contracts of the Project.

s. Other business.

5. Location of Meetings: Meeting shall be held at the office of the Owner, unless otherwise approved.

6. Reporting:

a. Within 5 working days after each meeting, Engineer will prepare and distribute minutes of the meeting to Contractor.

b. Contractor shall distribute copies to principal Subcontractors and Suppliers.

1.3 Schedules and Reports

A. Initial Coordination Schedules

1. Within 10 days after the Effective Date of the Agreement, Contractor shall submit to Engineer for review and acceptance:

a. A preliminary procurement schedule of Equipment and Materials.

b. A preliminary schedule of values for partial pay purposes.

c. A preliminary schedule of Submittals, as stated in Section 01330.

d. Preliminary cash requirement prediction.

B. Baseline Construction Schedule

1. Within 20 days after issuance of Notice of Award of the Contract, Contractor shall submit to Engineer for review and acceptance a detailed baseline construction schedule employing the critical path scheduling method.

a. The schedule shall show the Work in a horizontal bar chart, and indicate the start date, duration, and end date for each activity.

b. The Contractor shall submit to the Engineer, 1 electronic copy in approved format for review. Sheet size shall be a minimum 11 x 17-inches.

c. No single activity shall be more than 15 days in duration.

d. The Contractor shall include all work by Subcontractors in the baseline construction schedule.

e. The schedule shall be resourced base and include work breakdown structures.

f. Within each activity, indicate estimated completion percentage in 10% increments.

2. After the construction schedule is approved, the schedule shall serve as the Contractor's Baseline Schedule for all Work on the project. Activity ID's shall not be changed without the Engineer's written permission from this point forward. New activity ID's will be allowed, but only for new work outside the original project baseline schedule activities.
3. If required by Engineer, the Contractor shall provide sub schedules to define in more detail, critical portions of the baseline schedule, including inspections and tests.
4. The Contractor shall coordinate the baseline construction progress schedule with the schedule of values, Submittal schedule, procurement schedule, progress reports, and payment requests.
5. The Contractor shall revise the construction baseline schedule after each meeting, event, or activity where revisions have been recognized and accepted in accordance with the GENERAL CONDITIONS.
6. The Contractor shall update and submit one (1) electronic copy in approved format of the revised schedule to the Engineer at least once each month to show actual progress compared to the originally accepted baseline construction schedule and any proposed changes in the schedule of remaining Work. The revised schedule shall be updated and submitted to the Engineer prior to each payment request. Engineer's approval for payment will not be recommended to be paid by the Owner until the monthly revised schedule is accepted by the Engineer. Include the schedule with construction progress report (See Section 1320.1.3.D).

C. Procurement Schedule

1. After submittal of preliminary procurement schedule as stated above under "Initial Coordination Schedules", submit a detailed schedule for procurement of Equipment and Materials to be furnished by Contractor, Subcontractors, manufacturers, and Suppliers. Do not include minor items which are known to be regularly stocked by local suppliers or readily available upon short notice. Submit to Engineer for review with the construction progress schedule.
2. Engineer will review and comment on the schedule for procurement. Contractor shall make all required revisions as specified, prior to acceptance of schedule.
3. Procurement schedule shall coincide with the construction progress schedule and the Submittal schedule, and shall indicate the date each item will be needed at the Site and the time required for delivery after order is placed.
4. Update the accepted schedule for procurement at least once each

month to show the status of orders placed, Submittals, and delivery. Submit with the construction progress report.

5. If requested by Engineer, submit copies of purchase orders placed by Contractor or Subcontractors.

D. Construction Progress Reports

1. Submit a report on actual construction progress on a monthly basis. More frequent reports may be required should the Work fall behind the accepted schedule.
   a. Submit a weekly report to coordinate with, and supplement the monthly construction progress report, and which details Work scheduled for the following one-week interval, including:
      (1) Work activities which will occur.
      (2) Number and size of crews.
      (3) Construction equipment on Site.
      (4) Major items of Equipment and Material to be installed. CONTRACTOR quality control testing update.
      (5) Health and safety update.
   b. Format shall be on 11 x 17- inch paper, submitted to Engineer in seven (7) copies.
2. Construction progress reports shall consist of the revised construction progress schedule and a narrative report which shall include but not be limited to the following:
   a. Comparison of actual progress to planned progress shown on originally accepted schedule.
   b. Summary of activities completed since the previous construction progress report.
   c. Identification of problem areas and proposed corrective actions.
   d. A description of current and anticipated delaying factors, if any.
   e. Impact of possible delaying factors.
3. Submit a construction progress report to Engineer with each application for partial payment. Work reported complete but not readily apparent to Engineer must be substantiated with supporting data when requested by Engineer.
4. If a schedule update reveals that, through no fault of Owner, the Work is likely to be completed later than the Contract completion date, Contractor shall:
   a. Establish a plan for making up lost time.
      (1) Increase number of workers, or

(2) Increase amount or kinds of tools, or
(3) Work overtime or additional shifts, or
(4) A combination of the above actions.

b. Submit plan to Engineer before implementing the plan.
c. Take actions as accepted to get the Work back on schedule at no additional cost to Owner.

E. Schedule of Values
1. Submit as set forth in GENERAL CONDITIONS, based on the preliminary schedule of values.
2. Coordinate preparation of schedule of values with preparation and content of construction progress schedule.
3. Content
a. Schedule shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction.
b. Follow the construction progress schedule breakdown of Work activities as format for listing component items and assigning values.
c. For each major line item, list sub values of major products or operations under the item.
(1) Each item shall include a directly proportional amount of the Contractor's overhead and profit.
(2) For items on which progress payments will be requested for stored materials received, but not installed, break down the value into:
(a) The cost of the materials delivered and unloaded, including taxes paid, unless taxes are exempted. Contractor shall provide a paid in full invoice.
(b) The total installed value.
d. The sum of all values listed in the schedule shall equal the total Contract Price.

F. Special Reports
1. When an event of an unusual and significant nature occurs at the site, prepare and submit a special report. List the chain of events, persons participating, and response by Contractor's personnel, an evaluation of the results or effects, and similar pertinent information. Advise the Owner in advance when such events are known or predictable.
2. Submit original report to Engineer.

G. Quality Control Testing Plan and Reports

1. A Quality Control Testing Plan shall be developed by the CONTRACTOR and submitted to the ENGINEER no later than the Preconstruction Conference. The Plan will include the following items:

   a. Qualifications of the proposed laboratory including laboratory accreditations and certifications for technicians proposed for the work.

   b. Test Frequency Table (one table for each specification section requiring CONTRACTOR quality control) establishing the proposed number of tests. The Table shall include columns for:

      (1) Material Tested
      (2) Sampling and Testing Points
      (3) Test Method
      (4) Minimum Sampling Frequency
      (5) Estimated Quantity of Materials
      (6) Number of Tests Required
      (7) The Table shall also include columns for number of tests complete and % of tests complete. These last two columns are for use in periodic reporting of QC testing to the ENGINEER

2. The CONTRACTOR shall submit reports of Quality Control Testing to the ENGINEER at each Coordination Meeting. The report shall include all Quality Control test reports for testing completed during the prior week, and shall include updated Test Summary Tables. The Tables shall include updated values for cumulative number of tests completed and % of required number of tests completed. One Table shall be submitted for each specification item requiring CONTRACTOR quality control testing, and it shall be updated through the end of the prior week.

PART 2 - PRODUCTS - Not Applicable.

PART 3 - EXECUTION - Not Applicable.

END OF SECTION

SECTION 01325

CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.1 Summary

This Section specifies administrative and procedural requirements for construction photographs.

1.2 Submittals

A. Submit link to download files from the cloud, or flash drive as specified in Section 01330, Submittals and in PART 3 - this Section.

B. Photographer shall submit a digital sample set of the type and quality required during construction, for review and acceptance by Engineer.

1.3 Quality Assurance

Contractor shall provide adequate photography such that he can document conditions. Inadequate documentation not being able to prove responsibility for damages will hence cause the contractor to be responsible.

PART 2 - PRODUCTS

2.1 Photographic Requirements

Specified in PART 3, this Section.

PART 3 - EXECUTION

3.1 Project Site Photographs

A. The CONTRACTOR shall be responsible for photographing the entire project site to show the existing and general condition of the site prior to construction. Each photograph must be time stamped with the date of the photograph. In addition, the CONTRACTOR shall take photographs before, during, and after each of the following phases of construction:

1. Site clearing
2. Demolitions
3. Excavations

4. Installation
5. Final completion

B. Photographs shall be taken of the following areas and at the following times at a minimum.

1. Existing Site conditions before Site work is started. Number of views shall be adequate to cover the Site.

2. Finished Project after completion of Work. Number of views shall be adequate to show the finished Work. It is particularly important to provide a view of the restoration of each property upon completion of construction.

3. If Project is not completed during the Contract Time or authorized extensions, photographs shall continue to be taken at no increase in Contract Price.

C. The principal reason for obtaining photographs is to document the existing condition of items not scheduled for replacement or items to be removed and replaced in kind such as landscaping, privacy walls, wash locations, etc., as may be necessary for the completion of the WORK. The photographs may, in some degree, preclude the possibility of post construction litigation between CONTRACTOR, adjacent property owners, and the OWNER.

D. Digital Images

1. Submit one (1) complete set of digital image electronic files for each area of work prior to starting work.

a. Provide images in JPEG format, with minimum sensor size of 5.0 mega pixels.
b. Submit images that have same aspect ratio as the sensor, uncropped.
c. The photos of each residence and areas adjacent shall be labeled electronically on each photograph by address. Any media submitted shall be labeled with Project name, area and street. Station and/or address shall be included as applicable.
d. Identify electronic media with date digital photographs were taken.

E. Deliver to Engineer/Owner

3.2 Property Photographs for Work on Private Property

Photographs shall be taken at each residential property in sufficient detail to record the existing condition of the property and all existing improvements including trees, shrubs decorative rock and other ornamental or functional improvements. The

photographs must be approved by the Engineer and Owner prior to any construction activities on the property. When taking property photos, the street name needs to be properly defined.

3.3 Additional Photographs

A. From time to time Engineer/Owner may issue requests for additional photographs, in addition to periodic photographs specified

1. Engineer will give the contractor notice, where feasible.
2. In emergency situations, the contractor shall take additional photographs within 24 hours of Engineer's request.
3. Circumstances that could require additional photographs include, but are not limited to:
    a. Substantial Completion of a major phase or component of Work.
    b. Owner's request for special publicity photographs. Special events planned at Project Site.
    c. Immediate follow-up when on-site events result in construction damage or losses.
    d. Photographs to be taken at fabrication locations away from Project Site.
    e. Extra record photographs at time of final acceptance.

3.4 Measurement and Payment - Not Applicable.

END OF SECTION

SECTION 01330

SUBMITTALS

PART 1 - GENERAL

1.1 Summary

A. This Section includes definitions, descriptions, transmittal, and review of Submittals.

B. Related Work Specified Elsewhere:

Project Meetings, Schedules, and Reports	Section 01320
Construction Photographs	Section 01325
Equipment and Materials	Section 01600
Substitutions	Section 01631
Contract Closeout	Section 01780

1.2 General Information

A. Definitions

1. Shop Drawings, product data, and Samples are technical Submittals prepared by Contractor, Subcontractor, manufacturer, or Supplier and submitted by Contractor to Engineer as a basis for approval of the use of Equipment and Materials proposed for incorporation in the Work or needed to describe installation, operation, maintenance, or technical properties.

   a. Shop Drawings include custom-prepared data of all types including drawings, diagrams, performance curves, material schedules, templates, instructions, and similar information not in standard printed form applicable to other projects.
   b. Product data includes standard printed information on materials, products, and systems; not custom- prepared for this Project. Designation of selection for the specific item must highlight the proposed choice.
   c. Samples include both fabricated and not fabricated physical examples of materials, products, and Work; both as complete units and as smaller portions of units of Work; either for limited visual inspection or (where

indicated) for more detailed testing and analysis. Mock-ups are a special form of Samples, which are too large to be handled in the specified manner for transmittal of Sample Submittals.

2. Informational Submittals are those technical reports, administrative Submittals, certificates, and guarantees not defined as Shop Drawings, product data, or Samples.
    a. Technical reports include laboratory reports, tests, technical procedures, technical records, and Contractor's design analysis.
    b. Administrative Submittals are those non technical Submittals required by the Contract Documents or deemed necessary for administrative records. These Submittals include maintenance agreements, Bonds, Project photographs, physical work records, statements of applicability, copies of industry standards, Project record data, security/protection/safety data, and similar type Submittals.
    c. Certificates and guarantees are those Submittals on Equipment and Materials where a written certificate or guarantee from the manufacturer or Supplier is called for in the Specifications.

3. Refer to ARTICLES 1.3 and 1.4 of this Part for detailed lists of documents and specific requirements.

B. Quality Requirements

1. Submittals such as Shop Drawings and product data shall be of suitable quality for legibility and reproduction purposes. Every line, character, and letter shall be clearly legible.Drawings such as reproducible shall be useable for further reproduction to yield legible hard copy.
2. Documents submitted to Engineer that do not conform to specified requirements shall be subject to rejection by Engineer, and upon request by Engineer, Contractor shall resubmit conforming documents. If conforming Submittals cannot be obtained, such documents shall be retraced, redrawn, or photographically restored as may be necessary to meet such requirements. Contractor's (or his Subcontractor's) failure to initially satisfy the legibility quality requirements will not relieve Contractor (or his Subcontractors) from meeting the required schedule for Submittals.

C. Language and Dimensions
1. All words and dimensional units shall be in the English

language.

2. Metric dimensional unit equivalents may be stated in addition to the English units. However, English units of measurement shall prevail.

D. Submittal Completeness

1. Submittals shall be complete with respect to dimensions, design criteria, materials of construction, and other information specified to enable Engineer to review the information effectively.
2. Where standard drawings are furnished which cover a number of variations of the general class of Equipment, each drawing must be annotated to indicate exactly which parts of the drawing apply to the Equipment being furnished. Use hatch marks to indicate variations that do not apply to the Submittal. The use of "highlighting markers" will not be an acceptable means of annotating Submittals. Annotation shall also include proper identification of the Submittal permanently attached to the drawing.
3. Reproductions or copies of Contract Drawings or portions thereof will not be accepted as complete fabrication or erection drawings.

1.3 Submittals

Contract Drawings for erection drawings to indicate information on erection or to identify detail drawing references. Whenever the Drawings are revised to show this additional Contractor information, Engineer's title block shall be replaced with a Contractor's title block, and Engineer's professional seal shall be removed from the drawing. The Contractor shall revise these erection drawings for subsequent Engineer revisions to the Contract Drawings.

A. Items shall include, but not be limited to, the following:

1. Manufacturer's specifications.
2. Catalogs, or parts thereof, of manufactured Equipment.
3. Shop fabrication and erection drawings.
4. Instruction books and operating manuals.
5. Material lists or schedules.
6. Performance tests on Equipment by manufacturers.
7. Concrete mix design information.
8. All drawings, catalogs or parts thereof, manufacturer's specifications and data, samples, instructions, and other information specified or necessary:
    a. For Engineer to determine that the Equipment and Materials conform to the design concept and comply with the intent of the Contract Documents.
9. Equipment List.

10. Hourly rate for equipment and labor.

B. Schedule of Submittals

1. Schedule all submittals required prior to fabrication, manufacture, or installation, for submission within 14 calendar days of the Notice to Proceed.Prepare for Engineer's concurrence, a schedule for submission of all Submittals specified or necessary for Engineer's approval of the use of Equipment and Materials proposed for incorporation in the Work or needed for proper installation, operation, or maintenance. Submit the schedule with the procurement schedule and construction progress schedule. Schedule submission of all Submittals to permit review, fabrication, and delivery in time so as to not cause a delay in the Work of Contractor or his Subcontractors or any other contractors as described herein.
2. In establishing schedule for Submittals, allow 20 calendar days in Engineer's office for reviewing original Submittals and 5 calendar days in Engineer's office for reviewing resubmittals.
3. The schedule shall indicate the anticipated dates of original submission for each item and Engineer's approval thereof and shall be based upon at least one resubmission of each item.
4. Schedule Submittals pertaining to storage, installation, and operation at the Site for Engineer's approval prior to delivery of the Equipment and Materials.
5. Submittals shall be resubmitted until the Engineer determines the submittals are acceptable. Any delay in the submittal acceptance, due to the submission of unacceptable submittals, does not warrant any extension of contract times.
6. Contractor shall provide submittals for the following items no later than 30 days after Notice to Proceed:
   A. Tertiary Filter and Control Panel

C. Transmittal of Submittals

1. All Submittals for Equipment and Materials furnished by Contractor, Subcontractors, manufacturers, and Suppliers shall be submitted to Engineer by Contractor.
2. After checking and verifying all field measurements, transmit all Submittals to Engineer for approval as follows:

   a. Mark each Submittal by Project name and number, Contract title and number, and the applicable Specification Section and Article number. Include in the letter of transmittal the Drawing number and title, sheet number (if applicable), revision number, and electronic filename (if applicable). Unidentifiable Submittals will

be returned for proper identification.

b. Check and include Contractor's approval for Submittals of Subcontractors, Suppliers, and manufacturers prior to transmitting them to Engineer. Contractor's approval shall constitute a representation to Owner and Engineer that Contractor has either, determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data, or Contractor assumes full responsibility for doing so, and that Contractor has coordinated each Submittal with the requirements of the Work and the Contract Documents.

c. At the time of each submission, call to the attention of Engineer in the letter of transmittal any deviations from the requirements of the Contract Documents.

d. Make all modifications noted or indicated by Engineer and return revised Submittals until approved. Direct specific attention in writing, or on revised Submittals, to changes other than the modifications called for by Engineer on previous Submittals. After Submittals have been approved, submit copies thereof for final distribution. Previously approved Submittals transmitted for final distribution will not be further reviewed and are not to be revised. If errors are discovered during manufacture or fabrication, correct the Submittal and resubmit for review.

e. Following completion of the Work, and prior to final payment, furnish record documents and approved Samples and Shop Drawings necessary to indicate "as constructed" conditions, including field modifications, in the number of copies specified. Furnish additional copies for insertion in Equipment instruction books and operating manuals as required. All such copies shall be clearly marked "PROJECT RECORD."

f. Keep a copy or sample of each Submittal in good order at the project site.

3. Information to Manufacturer's District Office: Contractor shall arrange for manufacturers and Suppliers of Equipment and Materials to furnish copies of all agreements, drawings, specifications, operating instructions, correspondence, and other matters associated with this Contract to the manufacturer's district office servicing the Owner. Insofar as practicable, all business matters relative to Equipment and Materials included in this Contract shall be conducted through such local district offices.

D. Engineer's Review

1. Engineer will review and take appropriate action on Submittals in accordance with the accepted schedule of Submittals. Engineer's review and approval will be only to determine if the items of Equipment and Materials covered by the Submittals will, after installation or incorporation into the Work, conform to information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer's review and approval will not extend to design data reflected in Submittals, which is peculiarly within the special expertise of Contractor or Contractor's Subcontractors or Suppliers. Review and approval of a component item as such will not indicate approval of the assembly in which the item functions.
2. Engineer's review and approval of Shop Drawings, product data, or Samples will not relieve Contractor of responsibility for any deviation from requirements of the Contract Documents unless Contractor has in writing called Engineer's attention to such deviation at the time of submission, and Engineer has given written approval of the specific deviation. Approval by Engineer shall not relieve Contractor from responsibility for errors or omissions in Submittals.

E. Submittal Action Stamp

1. Engineer's review action stamp, appropriately completed, will appear on all Submittals of Contractor when returned by Engineer. Review status designations listed on Engineer's action stamp are defined as follows:
   a) APPROVED: Signifies Equipment or Material represented by the Submittal, conforms to the design concept and complies with the intent of the Contract Documents and is approved for incorporation in the Work. Contractor is to proceed with fabrication or procurement of the items and with related Work. Copies of the Submittal are to be transmitted by Engineer for final distribution.
   b) APPROVED AS NOTED (RESUBMIT): Signifies Equipment and Material represented by the Submittal conforms to the design concept and complies with the intent of the Contract Documents and is approved for incorporation in the Work in accordance with Engineer's notations. Contractor is to proceed with fabrication or procurement of the items and with related Work in accordance with Engineer's notations and is to submit a revised Submittal

responsive to notations marked on the returned Submittal or written in the letter of transmittal.

c) RETURNED FOR REVISION (RESUBMIT): Signifies Equipment and Material represented by the Submittal appears to conform to the design concept and comply with the intent of the Contract Documents, but information is either insufficient in detail or contains discrepancies which prevent Engineer from completing his review. Contractor is to resubmit revised information responsive to Engineer's annotations on the returned Submittal or written in the letter of transmittal. Fabrication or procurement of items represented by the Submittal and related Work is not to proceed until the Submittal is approved.

d) NOT A P P R O V E D (SUBMIT ANEW): Signifies Equipment and Material represented by the Submittal does not conform to the design concept or comply with the intent of the Contract Documents and is disapproved for use in the Work. Contractor is to provide Submittals responsive to the Contract Documents.

e) PRELIMINARY: Signifies Submittals of such preliminary nature that a determination of conformance with the design concept or compliance with the intent of the Contract Documents must be deferred until additional information is furnished. Contractor is to submit such additional information to permit layout and related activities to proceed.

f) REFERENCE ONLY, NO APPROVAL IS REQUIRED: Signifies Submittals which are for supplementary information only; pamphlets, general information sheets, catalog cuts, standard sheets, bulletins and similar data, all of which are useful to Engineer or Owner in design, operation, or maintenance, but which by their nature do not constitute a basis for determining that items represented thereby conform with the design concept or comply with the intent of the Contract Documents. Engineer reviews such Submittals for general content but not for basic details.

g) FOR DISTRIBUTION: (PREVIOUSLY APPROVED): Signifies Submittals which have been previously approved and are being distributed to Contractor, Owner, Resident Project Representative, and others for coordination and construction purposes.

F. Instruction Books and Operating Manuals

1. Equipment instruction books and operating manuals prepared by the

manufacturer shall include the following:

a. Index and tabs.

b. Instructions for installation, start-up, operation, inspection, maintenance, parts lists and recommended spare parts, and data sheets showing model numbers.

c. Applicable drawings.

d. Warranties and guarantees.

e. Address of nearest manufacturer-authorized service facility.

f. All additional data specified.

2. Information listed above shall be bound into hard-back binders of three-ring type. Sheet size shall be 8-1/2 x 11. Binder color shall be white. Capacity shall be a minimum of 1-1/2-inches, but sufficient to contain and use sheets with ease.

a. Provide with following accessories:

(1) Label holder.
(2) Business card holder.
(3) Sheet lifters.
(4) Horizontal pockets.

b. The following information shall be imprinted, inserted or affixed by label on the binder front cover:
(1) Equipment name.
(2) Manufacturer's name.
(3) Project name: Contract name and number.

c. The following information shall be imprinted, inserted, or affixed by label on the binder spine:

(1) Equipment name.
(2) Manufacturer's name.
(3) Volume number (if applicable).

G. Samples

1. Office Samples shall be of sufficient size and quantity to clearly illustrate the following:

a. Functional characteristics of the product, with integrally related parts and attachment devices.
b. Full range of color, texture, and pattern.

2. Field Samples and Mock-ups:

a. Contractor shall erect field Samples and mock-ups at the Project Site and at a location acceptable to Engineer.
b. Size or area shall be as specified in the respective Specification Section.
c. Fabricate each Sample and mock-up complete and finished.
d. Remove mock-ups at conclusion of Work or when acceptable to the Engineer if not a permanent part of construction.

1.4 Information Submittals

A. Informational Submittals are comprised of technical reports, administrative Submittals, and guarantees, which relate to the Work, but do not require Engineer approval prior to proceeding with the Work. Informational Submittals include:

1. Welder qualification tests.
2. Welding procedure qualification tests.
3. X-ray and radiographic reports.
4. Hydrostatic testing of pipes.
5. Field test reports.
6. Concrete cylinder test reports.
7. ASME pressure vessel test reports.
8. Certification on Materials:
   a. Steel mill tests.
   b. Brick and concrete masonry unit lab tests.
9. Soil test reports.
10. Piping stress analysis.
11. Warranties and guarantees.

B. Transmittal of Informational Submittals

1. All informational Submittals furnished by Subcontractors, manufacturers, and Suppliers shall be submitted to Engineer by Contractor unless otherwise specified.
   a. Identify each informational Submittal by Project name and number, Contract title and number, and the Specification Section and Article number marked

thereon or in the letter of transmittal. Unidentifiable Submittals will be returned for proper identification.

b. At the time of each submission, call to the attention of Engineer in the letter of transmittal any deviations from the requirements of the Contract Documents.

2. Format Requirements:

a. Technical reports and administrative Submittals except as otherwise specified shall be submitted in a .pdf format

b. Responsibilities of Contractor, Owner, and Engineer regarding tests and inspections of Equipment and Materials and completed Work are set forth elsewhere in these Contract Documents.

c. The party specified responsible for testing or inspection shall in each case, unless otherwise specified, arrange for the testing laboratory or reporting agency to distribute test reports in .pdf format.

d. Technical reports and administrative Submittals except as otherwise specified shall be submitted in a .pdf format.

e. Responsibilities of Contractor, Owner, and Engineer regarding tests and inspections of Equipment and Materials and completed Work are set forth elsewhere in these Contract Documents.

f. The party specified responsible for testing or inspection shall in each case, unless otherwise specified, arrange for the testing laboratory or reporting agency to distribute test reports in .pdf format.

C. Engineer's Review

1. Engineer will review informational Submittals for indications of Work or Material deficiencies.

2. Engineer will respond to Contractor on those informational Submittals, which indicate Work or Material deficiency.

PART 2 - PRODUCTS - Not Applicable.

PART 3 - EXECUTION – Not Applicable.

END OF SECTION

SECTION 01331

REFERENCE FORMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This Section contains the required forms for CONTRACTOR's use in documenting testing Work and other Work required under this Contract. This Section supplements but does not supersede specific testing requirements found elsewhere in the Contract Documents.

B. The forms listed below are included in this Section are referenced from other Sections in the Contract Documents. Forms will include, but will not necessarily be limited to the following:

	Title
1.	Request for Change Order Proposal
2.	Change order Proposal
3.	Request for Information
4.	Contractor's Daily Construction Report
5.	Field Order
6.	Work Change Directive
7.	Shop Drawing Transmittal Form

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

REQUEST FOR CHANGE ORDER PROPOSAL

Date: _____

Contractor:_____

Project Name:

Request for Change Order Proposal No. _____

NOTICE TO CONTRACTOR: Please submit a Change Order Proposal for the proposed modifications to the Contract Documents as described below. If acceptable, a Change Order will be issued to authorize the work. THIS IS NOT A CHANGE ORDER FOR AUTHORIZATION TO PROCEED WITH THE WORK AS DESCRIBED!

SCOPE OF WORK:

_____

OWNER

CHANGE ORDER PROPOSAL

Date:_____

Contractor: _____

Project Name:

Project No.

Change Order Proposal No.:

Dear Sir:
Certain items of extra work have been found necessary which are not covered by the Contract for the above referenced Project. Therefore, we submit the following amounts as the basis of compensation for such extra work:

JUSTIFICATION:

The Contract Time will be (increased)(decreased)_____calendar days.

The Contract Amount will be (increased)(decreased) $_____dollars.

By:_____

Title:_____

Contractor:_____

REQUEST FOR INFORMATION

Project Name:

Contractor_____ RFI#_____
Requested By_____ Directed to _____
Subject_____ Date Received _____
Spec. Section_____ Date Transmitted _____
Drawing References_____ Date Reply Received _____
Date Reply Needed_____ Date Reply Transmitted _____

INFORMATION NEEDED:

Date:_____ Signature: _____

REPLY:

Date:_____ Signature:_____

CONTRACTOR'S DAILY CONSTRUCTION REPORT

Project Name:

Contractor's Name_____Report No._____Date: _____

CONTRACTORS WORK FORCE:	SUBCONTRACTORS WORK FORCE:	EQUIPMENT ON SITE:
Administrative		In Use / Not in Use
Supervisors	Mechanical	Cranes
Carpenters	Electrical	Loaders
Iron Workers	Instrumentation	Dozers
Operators	Sitework	Scrapers
Finishers	Masonry	Compactors
Welders	Roofing	Compressors
Electricians	Rebar	Welders
Laborers	Foundation	Graders
_____	Painting	Trucks
_____	_____	Backhoe
_____	_____	___
	_____	

Work Performed:

Material and Equipment Delivered:

Remarks:

_____
(Authorized Signature)

FIELD ORDER

Date:_____

Contractor:_____

Project Name:

Field Order No.: _____

By:_____
Owner's Authorized Signature

Date:_____

By_____
Contractor's Receipt Acknowledged

Date:_____

WORK CHANGE DIRECTIVE

No. _____

PROJECT:

DATE OF ISSUANCE_____ EFFECTIVE DATE _____

OWNER:

CONTRACTOR:

You are directed to proceed promptly with the following change(s):

Description:

Purpose of Work Change Directive:

Attachments: (List documents supporting change)

If a claim is made that the above change(s) have affected Contract Price or Contract Times, any claim for a Change Order based thereon will involve one or more of the following methods of determining the effect of the change(s).

Method of determining change in Contract Price:

□ Unit Prices

□ Lump Sum

□ Other_____

Estimated increase (decrease) in Contract Price: $_____
If the change involves an increase, the estimated amount is not to be exceeded without further authorization.

Method of determining change in Contract Times:

□ Contractor's records

□ OWNER's records

□ Other _____

Estimated increase (decrease) in Contract Times: Substantial Completion:____days
Ready for final payment:____days
If the change involves an increase, the estimated time is not to be exceeded without further authorization.

AUTHORIZED:

_____
OWNER

By: _____

NCS

Shop Drawing Transmittal

Project Name:		Transmittal No.:
Project Location:		Date Received:
To:	From:	NCS Project No.:
		Reviewed By:
		Date Reviewed:
Attn:	Attn:	Spec. Section:
Date Transmitted:	Previous Transmittal Date:	1st. Sub.☐ ReSub.☐

No. Copies	Description	Manufacturer	Drawing or Data No.	Action Taken*

Submitter's Remarks:

* The action Designated Above is in Accordance with the Following Legend:

A - No Exceptions Taken
B - Furnish as Noted
C - Revise and Submit
1. Not enough information for review.
2. No reproducibles submitted.
3. Copies illegible
4. Not enough copies submitted.
5. Wrong sequence number.
6. Wrong resubmittal suffix.
7. Wrong specification section.
8. Wrong form used.
9. See comments.

D - Rejected
E - Engineer’s review not required.
1. Submittal not required.
2. Supplemental information. Submittal retained for informational purposes only.
3. Information reviewed and approved on prior submittal.
4. See comments.

Reviewer's Comments:

Returned by (NCS) : Date:

Distribution:	Supplier (if applicable)	____ Copies	OWNER:	____ Copies
	Sub Consultant 1:	____ Copies	MONTROSE:	____ Copies
		____	Sub Consultant 2:	____ Copies

SECTION 01340

TECHNICAL SUBMITTALSSHOP DRAWINGS, PROJECT DATA & SAMPLES, OPERATION AND MAINTENANCE MANUALS, EQUIPMENT RECORD SHEETS

PART 1 - GENERAL

1.01 DESCRIPTION

A. General:
   1. Section Addresses:
      a. Mechanics of shop drawing and operation and maintenance manual submittal and review process.

B. Related Sections include but are not necessarily limited to:
   1. Division 1 - General Requirements.
   2. Sections in Divisions 2 through 17 identifying submittal requirements.

1.02 SUBMITTALS: GENERAL

A. Transmit all technical submittals electronically to:

Contact Person: Brian Hamrick (or other designated representative)
Email address: bhamrick@ncseng.com

For those items that require hard copies, send to following address:
NCS Engineers LLC,
202 E. Earll Drive,
Suite 110,
Phoenix,
Arizona, 85012.

B. Utilize one copy of "Contractor's Shop Drawing Transmittal" (Exhibit A-01340) Form to transmit all shop drawings, Operation and Maintenance Manuals, and samples. Transmittals will not be received from or returned to subcontractors.

C. Provide submittal information defining specific equipment or materials utilized on the project. Generalized product information not clearly defining specific equipment or materials to be provided will be rejected.

D. Calculations required in individual specification sections will be received for information purposes only and will be returned stamped "E". Engineer's Review Not Required" to acknowledge receipt.

E. Assure submittals meet the following schedule:
   1. Shop drawings:
      a. Submittal and approval prior to that portion of work being installed and prior to 50 percent overall completion.
      b. ENGINEER will attempt to return all submittals to CONTRACTOR within 14 calendar days of receipt.
   2. Operation and Maintenance Manuals and Data Record Sheets:
      a. Initial submittal within 45 days after date shop drawings are approved.

F. Final payment on the project shall not be made until final approved copies of all Operation and Maintenance Manuals have been received.

G. Provide CONTRACTOR's stamp of approval as indication of his checking and verification of dimensions and coordination with interrelated work.

H. Provide schedule of submittals with anticipated submittal dates within two weeks after the preconstruction conference.

1.03 SUBMITTALS: SHOP DRAWINGS

A. Transmittal Mechanics:
   1. Utilize one copy of "Contractor's Transmittal" Form.
   2. Number transmittals consecutively beginning with 1.
   3. Assure resubmitted items retain the original number but with an added suffix letter starting with "A".
   4. Assure only one specification section is covered by one letter of transmittal.
   5. Provide breakout of each transmittal component on the "Contractor's Transmittal" Form. Each component thus defined shall receive specific action by the ENGINEER. Define manufacturer, item, tag number, and Drawing/Specification reference, as applicable.
   6. Do not change the scope of any re-submittal from the original transmittals' scope. If some components of the original transmittals are approved and others are not, the CONTRACTOR shall not resubmit the approved components in subsequent re-submittal packages, unless requested to do so by ENGINEER. Provide a summary sheet containing all components of the original transmittal at the front of each re-submittal. Indicate each component as either "approved", outstanding", or "submitted for action". Items previously approved shall be referenced to the transmittal in which approval was received. "Outstanding" items are defined as items unapproved and not yet resubmitted for action. "Submitted for action" shall indicate items which are included for review in the transmittal.
   7. Provide submittal in pdf format and transmit to ENGINEER via email for review.
   8. Provide clear space (3 inch square) for ENGINEER stamping of each component.

9. ENGINEER will return reviewed submittal in pdf format via email.

B. Transmittal Contents:
   1. Coordinate and identify shop drawing contents so that all items can be easily verified by the ENGINEER.
   2. Identify equipment or material use, tag number, drawing detail reference, weight, and other project specific information.
   3. Provide sufficient information together with technical cuts and technical data to allow an evaluation to be made to determine that the item submitted is in compliance with the Contract Documents.
   4. Submit items like equipment brochures, cuts of fixtures, product data sheets or catalog sheets on 8½ x 11 inch pages. Indicate exact item or model and all proposed options.
   5. Larger sheets (11"x17" or 24"x36") should be folded into smaller sections to and sent by hard copy, if needed.
   6. Include legible scale details, sizes, dimensions, performance characteristics, capacities, test data, anchoring details, installation instructions, storage and handling instructions, color charts, layout drawings, parts catalogs, rough-in diagrams, wiring diagrams, controls weights and other pertinent data. Arrange data and performance information in format similar to that provided in Contract Documents. Provide, at minimum, the detail provided in the Contract Documents.
   7. If proposed equipment or materials deviate from the Specifications or Drawings in any way, clearly note the deviation and justify the said deviation in detail in a separate letter immediately following transmittal sheet. If explanation is not given, shop drawings will be returned without action.
   8. Provide copy of applicable specification section annotated in red to indicate that all requirements have been met with the shop drawing.

1.04 SUBMITTALS: SAMPLES

A. Identify sample as to: manufacturer, item, use, type, project designation, tag number, specification section or drawing detail reference, color, range, texture, finish and other pertinent data.

B. Include application specific brochures, and installation instructions.

C. Provide CONTRACTOR’s stamp of approval on samples as indication of his checking and verification of dimensions and coordination with interrelated work.

D. Resubmit samples of rejected items.

E. Approved samples submitted or constructed, constitute criteria for judging completed work. Finished work or items not equal to samples will be rejected.

F. Samples may be retained for comparison purposes and the CONTRACTOR shall remove samples when directed. CONTRACTOR shall include in bid all costs of furnishing and removing samples.

1.05 SUBMITTALS: OPERATION AND MAINTENANCE MANUALS

A. Transmittal Mechanics:
   1. See Paragraph 1.02 and 1.03.
   2. Provide transmittal form for Operation and Maintenance Manual with original number of the shop drawing approved item plus a suffix "O-M".
   3. Submit one copy until approval is received.
   4. Provide complete electronic copies of the entire O&M manual in PDF format. The entire O&M manual information for each specification section shall be included in a single PDF. Each PDF shall be appropriately labeled. This is required for all O&M manuals associated with this Project. All pdf section s shall be combined into a single pdf with an indexed title of contents for the entire O&M Manual. Each Section pdf shall be book marked to the table of contents. Place on CD. Provide two CDs.
   5. Deficient submittals will be returned along with transmittal form which will be marked to indicate deficient areas.
   6. Identify resubmittals with the original number plus a suffix letter starting with "A."
   7. Submit hard copy Final Operation and Maintenance Manuals (3 copies) printed on 8-½" x 11" inch size high quality paper with standard three-hole punching and bound in stiff metal hinged binder constructed as a three-post style. Provide binders with titles. Tab each section of manuals for easy reference with plastic-coated dividers. Provide index for each manual.
   8. Reduce drawings or diagrams bound in manuals to an 8½" x 11" inch or 11" x 17" inch size. However, where reduction is not practical to ensure readability, fold large drawings separately and place in vinyl envelopes which are bound into the binder. Identify vinyl envelopes with drawing numbers.

B. Transmittal Content:
   1. Submission of Operation and Maintenance Manuals is applicable to but not necessarily limited to:
      a. Equipment such as meters, valves, pumps and feed system controls, electrical panels, and instrumentation.
      b. Equipment used with electrical motor loads (pumps).
      c. Specialized equipment including valves and instrumentation and control system components for process systems such as meters, recorders, and transmitters.
      d. Valves and actuators.
   2. Prepare operation and maintenance manuals which include, but are not necessarily limited to the following detailed information, as applicable:

a. Equipment function, normal operating characteristics, limited operations.
b. Assembly, disassembly, installation, alignment, tolerances, adjustment, and checking instructions.
c. Operating instructions for start-up, routine and normal operation, regulation and control, shutdown, and emergency conditions.
d. Lubrication and maintenance instructions (including schedules).
e. Guide to “troubleshooting”.
f. Parts list (including material of construction) and predicted life of parts subject to wear.
g. Outline, cross-section, and assembly (exploded view) drawings; engineering data; and electrical diagrams, including elementary diagrams, wiring diagrams, connection diagrams, word description of wiring diagrams and interconnection diagrams.
h. Test data and performance curves.
i. A list of recommended spare parts with a price list.
j. Copies of installation instructions, parts lists or other documents packed with equipment when delivered.
k. Tag numbers relating the equipment back to the Contract Documents.
l. Safety instructions.
m. ISO identification numbers for bearings.
n. List of specialty tools required and availability.
o. List weight of overall assemblies and individual weights of major individual components.
p. List of vendors and who to contact for warranty work.
q. List of fastener grades.
r. Copy of warranty, if applicable.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SUBMITTALS: APPROVAL OR REJECTION

A. Items within Transmittals will be reviewed for overall design intent and will receive one of the following Actions:

A - NO EXCEPTIONS TAKEN
B - FURNISH AS NOTED
C - REVISE AND RESUBMIT
D - REJECTED
E - ENGINEER’S REVIEW NOT REQUIRED

B. Transmittals received will be initially reviewed to ascertain inclusion of CONTRACTOR's approval stamp. Drawings not stamped by the CONTRACTOR or stamped with a stamp containing language other than that specified in Paragraph 1.02 G will not be reviewed for technical content and will be returned without any action.

C. Transmittals returned with disposition "A" or "B" are considered ready for fabrication and installation. If for any reason a transmittal that has an "A" or "B" disposition is resubmitted, it must be accompanied by a letter defining the changes that have been made and the reason for the resubmittal. The CONTRACTOR shall assure that previously approved documents are destroyed when they are superseded by a resubmittal as such.

D. Transmittals with disposition "A" or "B" combined with Action "C" (Revise and Resubmit) or "D" (Rejected), will be individually analyzed giving consideration as follows:

1. The portion of the transmittal given "C" or "D" will not be distributed (unless previously agreed to otherwise at the Preconstruction Conference). One copy or the one transparency of the "C" or "D" drawings will be marked up and returned to the CONTRACTOR. It shall be the CONTRACTOR's responsibility to ensure that these items are corrected and resubmitted.
2. Items marked "A" or "B" will be fully distributed.
3. If a portion of the items or system proposed are acceptable, however, the major part of the individual drawings or documents are incomplete or require revision, the entire submittal may be given "C" or "D" action. This is at the sole discretion of the ENGINEER. In this case, some drawings may contain relatively few or no comments or the statement, "Resubmit to maintain a complete package." Distribution to the OWNER, CONTRACTOR, and ENGINEER will not be made (unless previously agreed to otherwise).

E. Failure to include any specific information specified under the submittal paragraphs of the specifications shall result in the transmittal being returned to the CONTRACTOR unapproved.

F. In addition to calculations stamped and returned "E. Engineer's Review Not Required", other transmittals such as submittals which the Engineer considers as "Not Required" and submittal information in a transmittal which have been reviewed and approved in a prior transmittal, will be returned with action "E. Engineer's Review Not Required."

END OF SECTION

SECTION 01420

DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Definitions

1. Basic contract definitions used in the Contract Documents are defined in the GENERAL CONDITIONS. Definitions and explanations are not necessarily either complete or exclusive but are general for the Work.

2. General Requirements are the provisions or requirements of DIVISION 1 Sections, which apply to the entire Work of the Contract.

B. Related Information Specified Elsewhere: Specification standards and associations applicable to the Work are specified in each Section.

1.2 Specification Format and Content Explanations

A. Specification Format: The Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's (CSI) Section Format and Master Format numbering system. Some portions may not fully comply, and no particular significance will be attached to such compliance or noncompliance.

1. Divisions and Sections: For convenience, a basic unit of Specification text is a "Section," each unit of which is numbered and named. These are organized with related Sections, into "Divisions," which are recognized as the present industry consensus on uniform organization and sequencing of Specifications. The Section title is not intended to limit meaning or content of Section, nor to be fully descriptive of requirements specified therein, nor to be an integral part of text.

2. Section Numbering: Used for identification and to facilitate cross-references in Contract Documents. Sections are placed in numeric sequence; however, numbering sequence is not complete, and listing of Sections in Table of Contents at beginning of the Project Manual must be consulted to determine numbers and names of Specification Sections in these Contract Documents.

3. Page Numbering: Numbered independently for each Section. Section numbers are shown with page number at bottom of each page, to facilitate location of text.
4. Parts: Each Section of Specifications generally has been subdivided into three basic "parts" for uniformity and convenience (PART 1 - GENERAL, PART 2 - PRODUCTS, and PART 3 - EXECUTION). These "Parts" do not limit the meaning of text within. Some Sections may not contain all three "Parts" when not applicable or may contain more than three "Parts" to add clarity to organization of Section.
5. Underscoring of Titles: Used strictly to assist reader of Specification in scanning text for key words in content. No emphasis on or relative importance is intended except where underscoring may be used in the body of text to emphasize a duty, critical requirement, or similar situation.
6. Project Identification: Project file number and identification are recorded at bottom of each page of Specifications to minimize possible misuse of Specifications, or confusion with other Project Specifications.

B. Specification Content

1. These Specifications apply certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in situations or circumstances. These conventions are explained as follows:
   a. Imperative and Streamlined Language: These Specifications are written in imperative and abbreviated form. This imperative language of the technical Sections is directed at the Contractor, unless specifically noted otherwise. Incomplete sentences shall be completed by inserting "shall," "the Contractor shall," and "shall be," and similar mandatory phrases by inference in the same manner as they are applied to notes on the Drawings. The words "shall be" shall be supplied by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, fulfill (perform) all indicated requirements whether stated imperatively or otherwise.
   b. Specifying Methods: The techniques or methods of specifying requirements vary throughout text, and may include "prescriptive," "compliance with standards," "performance," "proprietary," or a combination of these. The method used for specifying one unit of Work has no bearing on requirements for another unit of Work.
   c. Overlapping and Conflicting Requirements: Where compliance with two or more industry standards or sets of requirements is specified, and overlapping of those different

standards or requirements establishes different or conflicting minimums or levels of quality, notify Engineer for a decision as specified in GENERAL CONDITIONS.

d. Abbreviations: Throughout the Contract Documents are abbreviations implying words and meanings which shall be appropriately interpreted. Specific abbreviations have been established, principally for lengthy technical terminology and in conjunction with coordination of Specification requirements with notations on Drawings and in schedules. These are normally defined at first instance of use. Organizational and association names and titles of general standards are also abbreviated.

C. Assignment of Specialists: In certain instances, Specification text requires that specific Work be assigned to specialists in the operations to be performed. These specialists shall be engaged for performance of those units of Work, and assignments are requirements over which Contractor has no choice or option. These assignments shall not be confused with, and are not intended to interfere with, enforcement of building codes and similar regulations governing the Work, local trade and union jurisdictions, and similar conventions. Nevertheless, final responsibility for fulfillment of Contract requirements remains with Contractor.

D. Trades: Except as otherwise specified or indicated, the use of titles such as "carpentry" in Specification text, implies neither that the Work must be performed by an accredited or unionized tradesperson of corresponding generic name (such as "carpenter"), nor that specified requirements apply exclusively to work by tradespersons of that corresponding generic name.

1.3 Drawing Symbols

A. Except as otherwise indicated, graphic symbols used on Drawings are those symbols recognized in the construction industry for purposes indicated. Refer instances of uncertainty to Engineer for clarification.

1.4 Industry Standards

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference and are stated in each Section.

1. Referenced standards, referenced directly in Contract Documents or

by governing regulations, have precedence over nonreferenced standards which are recognized in industry for applicability to the Work.

2. Where compliance with an industry standard is required, the standard in effect shall be as stated in GENERAL CONDITIONS.
3. Where an applicable code or standard has been revised and reissued after the date of the Contract Documents and before performance of Work affected, the Engineer will decide whether to issue a Change Order to proceed with the updated standard.
4. In every instance the quantity or quality level shown or specified shall be the minimum to be provided or performed. The actual installation may comply exactly, within specified tolerances, with the minimum quantity or quality specified, or it may exceed that minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for the context of the requirements. Refer instances of uncertainty to the Engineer for a decision before proceeding.
5. Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with the Contract Documents.
    a. Where copies of standards are needed for performance of a required construction activity, Contractor shall obtain copies directly from the publication source.

B. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision.

PART 2 - PRODUCTS - Not Applicable.

PART 3 - EXECUTION - Not Applicable.

END OF SECTION

SECTION 01423

REFERENCE STANDARDS

PART 1 - GENERAL

1.01 DESCRIPTION

A. When a reference standard is specified, comply with requirements and recommendations stated in that standard, except when they are modified by the Contract Documents, or when applicable laws, ordinances, rules, regulations or codes establish stricter standards. The latest provisions of applicable standards shall apply to the Work, unless otherwise specified. Reference standards include, but are not necessarily limited to, the following:

1. American Association of State Highway and Transportation Officials (AASHTO).
2. American Concrete Institute (ACI).
3. American Gear Manufacturers Association (AGMA).
4. American Institute of Steel Construction (AISC).
5. American Iron and Steel Institute (AISI).
6. American National Standards Institute (ANSI).
7. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
8. American Society of Mechanical Engineers (ASME).
9. American Society for Testing and Materials (ASTM).
10. American Water Works Association (AWWA).
11. American Welding Society (AWS).
12. Concrete Reinforcing Steel Institute (CRSI)
13. Factory Mutual (FM).
14. Institute of Electrical and Electronics Engineers (IEEE).
15. National Electrical Manufacturer's Association (NEMA).
16. Occupational Safety and Health Administration (OSHA).
17. National Fire Protection Association (NFPA).
18. Underwriters' Laboratories, Inc. (UL).
19. All other applicable standards listed in the Specifications and the standards of utility service companies, where applicable.
20. NSF International (NSF).
21. State Division of Industrial Safety (DIS)
22. Institute of Makers of Explosives (IOMOE)
23. Enclosures for Industrial Controls and Systems (ICS)
24. (ISA) See 13329-3
25. National Association of Corrosion Engineers (NACE)

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01520

FIELD OFFICES AND SHEDS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary field offices and other structures required for office and storage space required by Contractor.

B. Related Work Specified Elsewhere

Equipment and Materials..... Section 01600

PART 2 - PRODUCTS

2.1 Field Offices

A. General

1. Provide trailers, mobile buildings, or buildings constructed with floors raised aboveground, with steps, landings, and railings at entrance doors.
2. Buildings shall be structurally sound, secure, and weather tight.
3. Provide appropriate type fire extinguishers at each office and storage area.
4. Maintain offices during progress of the Work.
5. Install office spaces ready for occupancy 15 days after date stated in Notice to Proceed.

B. Contractor's Office

1. Provide a field office or conex for Contractor's superintendent on the Site. It shall be of size required for general use, with lights, heat, air, furnishings, telephone service, and other necessary facilities and utilities required by Contractor's operations.

2.2 Storage Sheds and Trailers

A. On Site

1. Provide temporary buildings or trailers needed for storage of Equipment and Materials installed under this Contract (and those furnished by Owner or others under separate contract).

2. Provide ventilation, heating and plackards as required by Equipment and Material stored.

B. Off Site

1. Advise Engineer of any arrangements made for storage of Equipment and Materials in a place other than Owner's Site. Furnish evidence of insurance coverage with Application for Payment in conformance with the GENERAL CONDITIONS.

PART 3 - EXECUTION

3.1 Location, Installation and Maintenance

A. General

1. Place temporary buildings, trailers, and stored materials in locations acceptable to Owner or Engineer.
2. Install field offices and sheds to resist winds and elements of the locality where installed.
3. Remove when no longer needed at the Site or when Work is completed.
4. Keep approach walks free of leaves, mud, water, ice, or snow.
5. At completion of Work, remove temporary buildings and trailers, foundations (if any), utility services, and debris. Prepare ground or paved areas as specified in applicable Sections.

PART 4 - MEASUREMENT AND PAYMENT - Not Applicable

END OF SECTION

SECTION 01580

PROJECT IDENTIFICATION AND SIGNS

PART 1 - GENERAL

1.1 Summary

A. This Section includes basic requirements for temporary Project identification and informational signs required during construction.

B. Related Work Specified Elsewhere

Submittals..... Section 01330

1.2 Quality Assurance

A. Design signs and structure to withstand wind and environmental conditions of locality. Provide with finish adequate to withstand weathering, fading, chipping, and peeling for duration of construction.

1.3 Submittals

A. Submit as specified in Section 01330.

B. Includes, but not limited to, the following.

1. Shop Drawings and product data as applicable.
2. Show content, layout, lettering, colors, structure, and foundation.

PART 2 - PRODUCTS

2.1 Identification Signs

A. Project Identification

1. Construct to design, size, and material indicated.
2. Construct structure and framing of wood, structurally adequate to resist design requirements of locality. Construct sign surface of minimum 3/4-inch thickness exterior grade plywood with medium density overlay. Panels shall be of size to minimize joints. Overall size shall be 4’ x 8’.
3. Rough hardware shall be galvanized or aluminum.

4. Coating: Paint as specified of colors selected by Engineer.
5. Information Content:
    a. Project title, logo, and name of Owner as shown on Contract Documents.
    b. Names and titles of authorities.
    c. Name and title of Engineer.
    d. Name of prime Contractor and major Subcontractors.
    e. Responsible Individual Phone Number

B. Contractor Identification: If not part of Project identification sign, provide and install Contractor's standard sign.

2.2 INFORMATIONAL SIGNS

A. Construction

1. This includes signs for traffic, construction workers, and general public in regard to directions, warnings, hazards, locations of areas, facilities, equipment, and others of a similar nature.
2. Provide signs of design, size, color, and lettering as required by regulatory agencies. Signs shall be painted metal, wood, plastic, or fiberglass and of materials suitable for the conditions in which they are placed, such as weathering and fading.
3. Construct structure and framing of wood or metal, structurally adequate to resist design requirements of area of Project. If within ROW signs should be designed with quick releases or break points.

PART 3 - EXECUTION

3.1 Installation

A. Project and Contractor Identification Sign

1. CONTRACTOR shall obtain OWNER’s approval for the location of the CONTRACTOR’s identification sign. The sign shall be installed in an appropriate location so as not to obstruct traffic, pedestrians, or construction operations.
2. Erect on framing or foundation, and rigidly brace.
3. Maintain sign in good repair, in a clean and neat condition.
4. Remove upon completion of Project.

B. Informational Signs

1. Install at appropriate locations and in sufficient quantities to assure

visibility. Relocate as required by progress of work, or Engineer's request.

2. Maintain signs in good repair, in a neat, clean, readable condition.
3. Remove all signs, framing, supports, and foundations upon completion of Project.

PART 4 - MEASUREMENT AND PAYMENT - Not Applicable.

END OF SECTION

SECTION 01600

EQUIPMENT AND MATERIALS

PART 1 - GENERAL

1.1 Summary

A. This Section includes administrative and procedural requirements governing Contractor's selection of products for use in the Project.

B. Related Work Specified Elsewhere

1. For the applicability of industry standards to products specified: DIVISIONS 2 through 16.
2. For submittal of Contractor's construction progress schedule and the Submittal schedule: Section 01320 and Section 01330.
3. For handling requests for substitutions made after award of the Contract: Section 01631.

1.2 Definitions

A. Definitions used in this Article are not intended to change the meaning of other terms used in these Contract Documents, such as "specialties," "systems," "structures," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well- recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "Material," "Equipment," "system," and terms of similar intent.

a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents. "Foreign Products," as distinguished from "domestic products," are items substantially manufactured (50% or more of value) outside the United States and its possessions. Products produced or supplied by entities substantially owned (more than 50%) by persons who are not citizens of, nor living within, the United States and its possessions are also considered to be foreign

products.

2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

3. "Equipment" is a product with operational or non-operational parts, whether motorized, or manually operated, that may require service connections, such as wiring or piping.

1.3 Submittals

A. Submittal of preliminary procurement schedule is specified in Section 01320 - PROJECT MEETINGS, SCHEDULES, AND REPORTS.

B. Submittals for products are specified in Section 01330 and in applicable Sections of DIVISIONS 2 through 16.

1.4 Quality Assurance

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.

B. Nameplates: Along with required labels and operating data, manufacturer or producer's nameplates, imprints, or trademarks may be placed on surfaces exposed to view.

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.

a. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated Equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data: Name of product and manufacturer including address (and telephone number).
b. Model and serial number.
c. Capacity.
d. Speed.
e. Ratings.

1.5 Transportation and Shipment

A. Shipment Preparation

1. Contractor shall require manufacturers and Suppliers to prepare products for shipment in a manner to facilitate unloading and handling, and to protect against damage, deterioration, or unnecessary exposure to the elements in transit and storage. Provisions for protection shall include the following:

a. Crates or other suitable packaging materials.
b. Covers and other means to prevent corrosion, moisture damage, mechanical injury, and accumulation of dirt in motors, electrical equipment, and machinery.
c. Suitable rust-preventive compound on exposed machined surfaces and unpainted iron and steel.
d. Grease packing or oil lubrication in all bearings and similar items.

B. Marking: Each product item shall be tagged or marked as identified in the delivery schedule or on Submittals. Complete packing lists and bills of material shall be included with each shipment. Each piece of every item need not be marked separately, provided that all pieces of each item are packed or bundled together and the packages or bundles are properly tagged or marked.

1.6 Product Delivery, Storage and Handling

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at the Site and to prevent overcrowding of construction spaces. Allow ample time to avoid delay of the Work.
2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected. Inspect shipment to assure:

a. Product complies with requirements of Contract Documents and reviewed Submittals.
b. Quantities are correct.
c. Containers and packages are intact and labels are legible.
d. Products are properly protected and undamaged.

5. Store products at the Site in a manner that will facilitate inspection and measurement of quantity or counting of units. Mark deliveries of component parts of Equipment to identify the Equipment, to permit easy accumulation of parts, and to facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weather tight enclosure, and with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.
8. Protect motors, electrical Equipment, plumbing fixtures, and machinery of all kinds against corrosion, moisture deteriorations, mechanical injury, and accumulation of dirt or other foreign matter.
9. Protect exposed machined surfaces and unpainted iron and steel as necessary with suitable rust-preventive compounds.
10. Protect bearings and similar items with grease packing or oil lubrication.
11. Handle and store steel plate, sheet metal, and similar items in a manner to prevent deformation.
12. For storage of pipe and other products on easements and rights-of-way in residential and commercial areas, do not exceed the minimum required by scheduled laying operations, and conform to all requirements of public authorities. Store or place pipe along roads, set back from shoulder or curb, and at an angle tending to deflect vehicles if struck. Place or block pipe to preclude its accidental movement.

B. Handling

1. Provide equipment and personnel necessary to unload and handle products, by methods to prevent damage or soiling to products, or packaging.
2. Handle by methods to prevent bending or overstressing. Where lifting points are designated, lift components only at those points.

3. Provide additional protection to surrounding surfaces as necessary to prevent damage.

C. Maintenance of Storage

1. Inspect stored products on a scheduled basis as approved by engineer.
2. Verify that storage facilities comply with manufacturer's product storage requirements, including environmental conditions continually maintained.
3. Verify that surfaces of products exposed to elements are not adversely affected; that any weathering of finishes is acceptable under requirements of Contract Documents.
4. For mechanical and electrical Equipment in long-term storage, provide manufacturer's service instructions to accompany each item, with notice of enclosed instructions on exterior of package. Service Equipment on a regularly scheduled basis.

D. Protection After Installation: Provide substantial coverings as necessary to protect installed products from damage from subsequent construction operations.

PART 2 - PRODUCTS

2.1 Product Selection

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise specified or indicated, new at the time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
2. Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Continued Availability: Where, because of the nature of its application, Owner is likely to need replacement parts or additional amounts of a product at a later date, either for maintenance and repair, or replacement, provide standard products for which the manufacturer has published assurances that the products and its parts are likely to be available to Owner at a later date. Conform to applicable Specifications, codes, standards, and regulatory agencies.

4. Comply with size, make, type, and quality specified, or as specifically approved in writing by Engineer.
5. Manufactured and Fabricated Products:

    a. Design, fabricate, and assemble in accordance with the best engineering and shop practices.
    b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
    c. Equipment and Materials shall be suitable for service conditions intended.
    d. Equipment capacities, sizes, and dimensions indicated or specified shall be adhered to unless variations are specifically approved in writing by Engineer.
    e. Provide labels and nameplates where required by regulatory agencies or to state identification and essential operating data.
6. Do not use products for any purpose other than that for which designed.
7. To the fullest extent possible, provide products of the same kind from a single source.

PART 3 - EXECUTION

3.1 Installation of Products

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place except as required for proper movement and performance, and accurately located and aligned with other Work.
    1. Obtain and distribute copies of manufacturer's printed instructions and recommendations if not a part of Submittals, containers, or packaging to parties involved in the installation, including a copy to Engineer (and Resident Project Representative).
    2. Maintain one complete set of instructions at the Site during installation and until completion.
    3. Handle, install, connect, clean, condition, and adjust products in accordance with such instructions and in conformance with specified requirements. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Engineer for further instructions.
B. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of completion.

PART 4 - MEASUREMENT AND PAYMENT - Not Applicable

END OF SECTION

SECTION 01610

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Description of applicable codes, ordinances, and regulations.

1.02 CODES AND ORDINANCES

A. Applicable Codes: Compliance with all laws, ordinances, and regulations of authorities having jurisdiction is an integral requirement of the Contract Documents, whether each code is mentioned or not in the Contract documents.

B. Compliance: Comply with all applicable codes, ordinances and regulations in effect at the time of bid opening, including but not necessarily limited to the following:
1. 2018 International Building Code with Local amendments.
2. 2017 National Electrical Code with Local amendments.
3. 2018 International Plumbing Code with Local amendments.
4. 2018 International Fire Code with Local amendments and supplemental rules and regulations.
5. National Fire Protection Association Standards.
6. Utility Company requirements.
7. State and Federal Safety and Health Laws.
8. National Electrical Safety Code (NESC).
9. Amendments to Codes.
10. Clean Water Act compliance for storm water and potable water discharges.
11. NSF International Standards 60 and 61.

C. Detailed Requirements: Be familiar with and verify detailed requirements of applicable codes to verify that items and their installation provided under Work of this Contract meet or exceed legal requirements.
1. Discrepancies: If discrepancies occur between the Contract Documents, local codes, local utility requirements, etc., most stringent requirements shall apply.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01631

SUBSTITUTIONS

PART 1 - GENERAL

1.1 Summary

A. This Section includes administrative and procedural requirements for handling requests for substitutions made after award of the Contract.

B. Related Work Specified Elsewhere:

1. Requirements for submitting Contractor's Construction Schedule and the Submittal Schedule: SECTIONS 01320 and 01330.

2. Requirements governing Contractor's selection of products: SECTION 01600.

1.2 Definitions

A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.

B. Substitutions: Changes in products, Materials, Equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions. The following are not considered to be requests for substitutions:

1. Revisions to the Contract Documents requested by Owner or Engineer.

2. Specified options of products and construction methods included in the Contract Documents.

1.3 Submittals

A. Substitution Request Submittal: Engineer will consider written requests for substitution if received within 14 calendar days of Notice to Proceed. Requests received more than 14 calendar days

after Notice to Proceed may be considered or rejected solely at the discretion of the Owner.

1. Submit 3 copies of each request for substitution for consideration. Submit requests in the form and according to procedures required for Change Order proposals. Requests for substitution shall not be submitted in the form of a Request for Information (RFI).

2. Identify the Equipment or Material, the fabrication, or installation method to be replaced in each request. Include related Specification Section/Article and Drawing numbers.

3. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:

    a. Statement indicating why specified product or method of construction cannot be provided.

    b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate the proposed substitution.

    c. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

    d. Product data, including drawings and descriptions of products and fabrication and installation procedures.

    e. Samples, where applicable or requested.

    f. Identification of available sales, maintenance, repair, and replacement services.

    g. A statement indicating the effect of the substitution on Contractor's construction progress schedule compared to the schedule without approval of the

substitution. Indicate the effect of the proposed substitution on the overall Contract Times. If specified product cannot be provided within the Contract Times, provide letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delay in delivery.

h. An itemized estimate of costs that will result directly or indirectly from approval of the substitution, including:

(1) A proposal of the net change, if any, in the Contract Price.

(2) Costs of redesign required by the proposed change.

(3) Costs of resulting claims as determined in coordination with other contractors having work on the Project affected by the substitution.

i. Statement indicating whether or not incorporation or use of the substitute is subject to payment of any license fee or royalty.

j. Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents, will perform adequately the functions and achieve the results called for by the general design, is similar in substance to that specified, and is suitable for same use as that indicated and specified.

k. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.

4. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a request for substitution. Engineer will notify Contractor of acceptance or rejection of the substitution within 14 calendar days of receipt of the request, or one week of receipt of additional information or documentation, whichever is later. Acceptance, if granted, will be in the form of a Change Order.

PART 2 - PRODUCTS

2.1 Substitutions

A. Conditions: Engineer will receive and consider Contractor's request for substitution when one or more of the following conditions are satisfied, as determined by Engineer. If the following conditions are not satisfied, Engineer will return the requests without action except to record noncompliance with these requirements.

1. Extensive revisions to the Contract Documents are not required.

2. Proposed substitution is in keeping with the general intent of the Contract Documents and will produce indicated results.

3. Substitution request is timely, fully documented, and properly submitted.

4. The specified product or method of construction cannot be provided within the Contract Times. Engineer will not consider the request if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.

5. The requested substitution offers Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Engineer for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.

7. The specified product or method of construction cannot be provided in a manner that is compatible with other materials and where Contractor certifies that the substitution will overcome the incompatibility.

8. The specified product or method of construction cannot be coordinated with other materials and where Contractor certifies that the proposed substitution can be coordinated.

9. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where Contractor certifies that the proposed substitution provides the required warranty.

B. Engineer’s review and acceptance of Submittals shall not relieve Contractor from responsibility for any variation from the requirements of the Contract

Documents. Engineer's acceptance of Submittals not complying with the Contract Documents does not constitute an acceptable or valid request for substitution, nor does it constitute approval of a substitution. Acceptance by Engineer shall not relieve Contractor from responsibility for errors or omissions in the Submittals.

PART 3 - EXECUTION - Not Applicable.

PART 4 - MEASUREMENT AND PAYMENT - Not Applicable.

END OF SECTION

SECTION 01650

DEMONSTRATION OF SYSTEMS / COMMISSIONING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Pre-operational, Startup, and Commissioning.

B. Related Sections include but are not necessarily limited to:
   1. Division 1 - General Requirements.

1.02 DEFINITIONS

A. Pre-operational Period: The period of time after the initial installation/construction.

B. Startup Period: A period of time (anticipated one week) immediately following the completion of the pre-operational period during which the CONTRACTOR initiates flow through the facility, starts up process equipment, calibrates and adjusts systems, completes OWNER training, and confirms the equipment is working as a system. During this period, the CONTRACTOR, manufacturer's agents, and OWNER's equipment pre-purchase suppliers verify installation requirements.

C. Commissioning Period: A specified consecutive period of time (up to four weeks) immediately following the completion of the startup period during which the ENGINEER operates the water treatment facility with support from the CONTRACTOR and OWNER.

D. Post Demonstration Period: The period of time after successful completion of the commissioning period but before final acceptance of Project during which the CONTRACTOR completes all punch list items and Project closeout procedures, and the OWNER has accepted ownership of the facility.

1.03 SUBMITTALS

A. General:
   1. Approved Operation and Maintenance manuals prior to start of startup.
   2. Written request for OWNER and ENGINEER to witness each system start-up. Request to be received by OWNER minimum two weeks before scheduled training of OWNER's personnel on that system.
   3. Equipment installation and start-up certifications.

4. Letter verifying completion of all pre-operational testing and start-up activities including receipt of all specified items from manufacturers/suppliers as final item prior to initiation of commissioning.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXECUTION

A. General:
1. Demonstration of systems and commissioning of the facilities constructed under this Contract shall be performed in three phases, as indicated in Article 1.02.

B. Pre-operational Period:
1. CONTRACTOR requirements:
a. Properly connect, align, calibrate, and adjust all system components. Check out procedures include but are not limited to:
1) Ring out all power, control and monitoring circuits prior to connection.
2) Voltage check of all circuits.
3) Phase sequence check.
4) Connecting piping system cleanliness check.
5) Alignment check of all connected machinery.
6) Pressure and vacuum testing of all closed systems.
7) Check of lubrication.
8) Calibration of all safety equipment.
9) Manual rotation/movement of moving parts to assure freedom of movement.
10) "Bump starting" of electrical motors to verify proper rotation.
11) Check of valving orientation and position status.
12) Verify proper instrumentation and control signal generation, transmission, reception and response.
13) Check that all tagging/identification systems are in place.
14) Confirm media installation.
b. OWNER shall witness CONTRACTOR operation of traveling bridge system prior to training to verify functional integrity.
c. Provide all labor, supervision, utilities, equipment, vehicles, and required items necessary to perform work during this period.

d. Provide certificate signed by equipment manufacturer's representative and CONTRACTOR that equipment was correctly installed and is ready for operation (as shown in Exhibit A-1650).

C. Startup Period:

1. CONTRACTOR Requirements:

a. Final alignment and testing of traveling bridge mechanisms.
b. Mechanical and electrical commissioning..
c. Startup pumping equipment and support systems.
d. Calibrate and adjust system.
e. Performance monitoring and optimization of filter media.
f. Filter media conditioning.
g. Provide training of OWNER personnel on all equipment during the startup period:
   1) OWNER personnel training on individual systems will not be considered as meeting the Contract requirements unless:
      a) All pretraining deliverables are received and approved.
      b) During training, all system malfunctions are addressed.
      c) All provisions of field/classroom training specifications are met.
   2) Training not in compliance with the above will be performed again in its entirety by the manufacturer at no additional cost to OWNER.
   3) Training shall not be conducted until water is running through the treatment plant, and the equipment is operational.
h. Maintain the facilities.

END OF SECTION

CERTIFICATE OF EQUIPMENT INSTALLATION AND STARTUP SERVICES

Project: _____

Equipment (Individual Component): _____

Specification Section: _____

Contract: _____

I hereby certify that the named equipment has been inspected by the Manufacturer's Representative and further certify:

1. That the equipment is properly installed and is in accordance with the Contract Documents.
2. That equipment is tested and is functioning as intended.
3. That nothing in the installation shall void the warranty.
4. That equipment, as installed, is ready to be operated by others.

MANUFACTURER'S REPRESENTATIVE

Signature: _____ Date: _____

Name (print): _____

Title: _____

Representing: _____

CONTRACTOR

Signature: _____ Date: _____

Name (print): _____

Title: _____

SECTION 01651

TRANSPORTATION AND HANDLING OF MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. CONTRACTOR shall make all arrangements for transportation, delivery and handling of equipment and materials required for prosecution and completion of the Work.

B. Shipments of materials to CONTRACTOR or subcontractors shall be delivered to the site only during regular working hours. Shipments shall be addressed and consigned to the proper party giving name of Project, street number and city. Shipments shall not be delivered to OWNER, except where otherwise directed.

C. If necessary to move stored materials and equipment during construction, CONTRACTOR shall move materials and equipment without any additional compensation.

1.02 PREPARATION FOR SHIPMENT

A. When practical, factory assemble products. Matchmark or tag separate parts and assemblies to facilitate field assembly. Cover machined and unpainted parts that may be damaged by the elements with a strippable protective coating.

B. Package products to facilitate handling and protect from damage during shipping, handling, and storage. Mark or tag outside of each package or crate to indicate its purchase order number, bill of lading number, contents by name, OWNER'S contract name and number, CONTRACTOR, equipment number, and approximate weight. Include complete packing lists and bills of materials with each shipment.

C. Protect products from exposure to the elements and keep thoroughly dry and dust free at all times. Protect painted surfaces against impact, abrasion, discoloration, or other damage. Grease or oil all bearings and similar items.

D. Do not have products shipped until:
   1. Related Shop Drawings have been approved by ENGINEER.
   2. Related factory test results, required in the individual Specification Sections, have been reviewed and accepted by ENGINEER.
   3. Required storage facilities have been provided.

1.03 DELIVERY

A. CONTRACTOR shall arrange, with the United States Postal Service, a special address for the Project, if needed. All deliveries shall be made to that address.

B. Arrange deliveries of products in accordance with construction schedules and in ample time to facilitate inspection prior to installation.

C. Coordinate deliveries to avoid conflict with Work and conditions on site and to accommodate the following:
   1. Work of other contractors, or OWNER.
   2. Limitations of storage space.
   3. Availability of equipment and personnel for handling products.
   4. OWNER'S use of premises.

D. Have products delivered to site in manufacturer's original, unopened, labeled containers. Keep ENGINEER informed of delivery of all equipment to be incorporated in the Work.

E. Partial deliveries of component parts of equipment shall be clearly marked to identify the equipment, to permit easy accumulation of parts and to facilitate assembly.

F. Immediately on delivery, inspect shipment to assure:
   1. Product complies with requirements of Contract Documents and reviewed submittal.
   2. Quantities are correct.
   3. Containers and packages are intact, and labels are legible.
   4. Products are properly protected and undamaged.
   5. Verify that the accelerometer recordings were made during shipment.

G. Promptly remove damaged products from the Project site and expedite delivery of new undamaged products, and remedy incomplete or lost products to provide that specified, so as not to delay progress of the Work.

1.04 PRODUCT HANDLING

A. Provide equipment and personnel necessary to handle products, including those provided by OWNER, by methods to prevent soiling or damage to products or packaging.

B. Provide additional protection during handling as necessary to prevent scraping, marring or otherwise damaging products or surrounding surfaces.

C. Handle products by methods to prevent bending or overstressing.

D. Lift heavy components only at designated lifting points.

E. Materials and equipment shall at all times be handled in a safe manner and as recommended by manufacturer or supplier so that no damage will occur to them. Do not drop, roll or skid products off delivery vehicles. Hand carry or use suitable materials handling equipment.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01780

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 Summary

A. This Section includes administrative and procedural requirements for Contract closeout including, but not limited to, the following:

1. Inspection procedures.
2. Project record document submittal.
3. Instruction book and operating manual submittal.
4. Submittal of warranties.
5. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections of the Specifications.

C. Related Work Specified Elsewhere

1. Prerequisites to Contract Completion and Final Acceptance: GENERAL CONDITIONS.
2. Submittals: SECTION 01330.

1.2 Contract Completion

A. Preliminary Procedures: Before requesting inspection for Notice of Completion, complete the following. List exceptions in the request.

1. In the Application for Payment that coincides with, or first follows, the date Final Acceptance is claimed, show 100% completion for the portion of the Work.

   a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Price.
   b. If 100% completion cannot be shown, include a list of incomplete items, the value of incomplete Work, and reasons the Work is not complete.

2. Advise Owner of pending insurance changeover requirements.

3. Submit specific warranties, workmanship Bonds, maintenance agreements, final certifications, and similar documents.

4. Obtain and submit releases enabling Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
5. Submit record drawings, instruction books and operating manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra stock, and similar items.
7. Make final changeover of permanent locks and transmit keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete start-up testing of systems and instruction of Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the Site, along with mockups, construction tools, and similar elements.
9. Submit consent of Certificate of Completion from Contractor.
10. Inspection Procedures: On receipt of a request for inspection, Engineer will either proceed with inspection or advise Contractor of unfilled requirements. Owner will prepare the Notice of Completion following inspection or advise Contractor of construction that must be completed or corrected before the notice will be issued. Engineer will repeat inspection when requested and assured by Contractor that the work is complete.
11. Results of the completed inspection will form the basis of requirements for Final Acceptance.

1.3 Final Acceptance

A. Preliminary Procedures: Before requesting final inspection for Notice of Completion of Final Acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.
2. Submit an updated final statement, accounting for final additional changes to the Contract Price.
3. Submit a certified copy of Engineer's final inspection list of items to be completed or corrected, endorsed and dated by Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by Engineer.
4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the Date of Contract Completion or when

Owner took possession of and assumed responsibility for corresponding elements of the Work.

5. Submit consent of surety to final payment.
6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
7. Submit a final liquidated damages settlement statement.
8. Reinspection Procedure: Engineer will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to Engineer. Upon completion of re-inspection, Owner will prepare a Notice of Completion of Final Acceptance. If the Work is incomplete, Engineer will advise Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for Final Acceptance.
9. If necessary, re-inspection will be repeated.

1.4 Record Document Submittals

A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for Engineer's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation. This will require an “as constructed” elevation of the manhole top and invert elevations of all pipes entering and leaving the manhole.

1. Record information concurrently with construction progress.
2. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Mark each document "PROJECT RECORD" in neat, large, printed letters.
3. Mark new information that is important to Owner but was not shown on Contract Drawings or Shop Drawings.
4. Note related Change Order numbers where applicable.
5. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
6. Upon completion of the Work, submit record drawings to Engineer for Owner's records.
7. Include the following:

    a. Depths of various elements of foundation in relation to

finish first floor datum. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

b. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of construction.

c. Where Submittals are used for mark-up, record a cross-reference at corresponding location on Drawings.

d. Field changes of dimension and detail.

e. Changes made by Change Order or other Modifications.

f. Details not on original Contract Drawings.

g. As constructed information shall include a GPS coordinate of the sanitary manhole including the invert elevation of the pipes entering and leaving the manhole. The GPS level of accuracy shall be to centimeters. A registered land surveyor of the state of Arizona shall conduct the survey. This information shall be recorded on the record information set submitted to the Engineer. The information shall also be provided in an electronic format compatible with AUTOCAD release 2004.

h. Provide a record location of all service laterals where they connect to the main sewer. The separation distance between the service lateral at the crossing of a water line shall be recorded by the Contractor on his record documents.

C. Record Specifications: Maintain one complete copy of the Project Manual including Addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and Modifications issued in printed form during construction.

1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
3. Note related record drawing information and product data.
4. Upon completion of the Work, submit record Specifications to Engineer for Owner's records.
5. Include the following:

a. Manufacturer, trade name, catalog number, and Supplier of each product and item of Equipment actually installed, particularly optional and substitute items.

b. Changes made by Addendum, Change Order, or other

Modifications.

c. Related Submittals.

D. Record Product Data: Maintain one copy of each product data Submittal. Note related Change Orders and markup of record drawings and specifications.

1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Site and from the manufacturer's installation instructions and recommendations.
2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.

E. Upon completion of markup, submit complete set of record product data to Engineer for Owner's records. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and Submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to Engineer for Owner's records.

F. Warranties and Bonds: Specified in GENERAL CONDITIONS, Section 01330.

PART 2 - PRODUCTS - Not Applicable.

PART 3 - EXECUTION

3.1 Closeout Procedures

A. Operation and Maintenance Instructions: Arrange for each installer of Equipment that requires regular maintenance to meet with Owner's personnel at Project Site to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:

1. Instruction books and operating manuals.
2. Record documents.
3. Tools.
4. Lubricants.
5. Fuels.

6. Identification systems.
7. Control sequences.
8. Hazards, hazardous chemicals data sheets.
9. Cleaning.
10. Warranties and bonds.
11. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating Equipment, demonstrate the following procedures:

1. Start-up.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

3.2 Final Restoration

A. General: The GENERAL CONDITIONS requires general cleaning during construction.
1. Remove temporary structures, tools, equipment, supplies, and surplus materials.
2. Remove temporary protection devices and facilities, which were installed, to protect previously completed Work.
3. Restore the entire construction area to pre-construction condition.

B. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

C. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the Site and dispose of lawfully.

PART 4 - MEASUREMENT AND PAYMENT - Not Applicable.

END OF SECTION

Division 2
SITE WORKS

SECTION 02072

DEMOLITION, CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. All demolition, cutting and patching.

B. Related Sections include but are not necessarily limited to:
   1. Division 1 - General Requirements.

1.02 QUALITY ASSURANCE

A. Use only firms or individual trades qualified to perform work required under this Section.

1.03 SUBMITTALS

A. Not Used.

1.04 DELIVERY, STORAGE, AND HANDLING

A. General:
   1. Salvage items, designated for OWNER's salvage, as a unit. Clean, list, and tag for storage. Protect from damage and store on site where designated by OWNER. Salvage each item with auxiliary or associated equipment required for operation.

1.05 PROJECT/SITE CONDITIONS

A. Perform preliminary investigations as required to ascertain extent of work. Conditions which would be apparent by such investigation will not be allowed as cause for claims for extra costs.

1.06 SEQUENCING AND SCHEDULING

A. Coordinate and reschedule work as required to preclude interference with other operations.

1.07 PERMITS

A. Obtain and pay for all permits required by all authorities having jurisdiction and notify all involved utility companies.

B. Obtain approval of authorities having jurisdiction for any work which affects access

to or exit from such areas. Obtain approval of authorities for any temporary construction which affects such areas.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Non shrink grout:
      a. Master flow 713 by Master Builders.
      b. Approved equal.
   2. Epoxy bonding adhesive:
      a. Euco No. 452 MV by Euclid Chemical Co.
      b. Sikadur 32 Hi-Mod by Sika Corporation.
      c. Or approved equal.

2.02 MATERIALS

A. Non shrink Grout:
   1. Nonmetallic, noncorrosive and non-staining.
   2. Premixed with only water to be added in accordance with manufacturer's instructions at jobsite.
   3. Grout to produce a positive but controlled expansion. Mass expansion not to be created by gas liberation or by other means.
   4. Minimum compressive strength at 28 days to be 6500 psi.
   5. Coat exposed edges of grout with a cure/seal compound recommended by grout manufacturer.

B. Epoxy Bonding Adhesive:
   1. Two component, moisture insensitive adhesive manufactured for the purpose of bonding fresh concrete to hardened concrete.

PART 3 - EXECUTION

3.01 PREPARATION

A. Provide substantial barricades and safety lights as required.

B. Provide temporary weather protection as necessary.

3.02 INSTALLATION

A. Cutting and Removal:
   1. Remove existing work indicated to be removed and CONTRACTOR to check for any concrete degradation on the walls of tertiary filter tanks as necessary for installation for the traveling bridge and to perform the repair work.
   2. Neatly cut and remove materials and prepare all openings to receive new work as specified in drawings or by manufacturer.
   3. Remove concrete in small sections for repair work as required.

B. Modification of Existing Concrete:
   1. Where indicated, remove existing concrete and finish remaining surfaces as specified in Section 03930(if applicable) and in drawings:
      a. Protect remaining concrete from damage.
      b. Make openings by sawing through the existing concrete.
      c. Concrete may be broken out after initial saw cuts in the event concrete thickness prevents cutting through.
      d. Where sawing is not possible, make openings by drilling holes around perimeter of opening and then chipping out the concrete:
         1) Holes shall be sufficient in number to prevent damage to remaining concrete.
   2. Oversize required openings in existing concrete 1 IN on all sides and build back to required opening size by means of non-shrink grout epoxy bonded to the existing concrete.
   3. Where oversized openings cannot be made, remove the concrete to the required opening size and cut back exposed reinforcing 1 IN from face of concrete and fill resulting holes with non-shrink grout.

C. Matching and Patching:
   1. Methods and materials:
      a. Similar in appearance, and equal in quality or as approved by Owner/Engineer to adjacent areas for areas or surfaces being repaired.
      b. Subject to review of ENGINEER.
   2. Thoroughly dry and clean all metal surfaces.
   3. Prime all bare metal in accordance with Section 09800 (if applicable).
   4. Dispose of items or materials not designated for OWNER's salvage or reuse. Promptly remove from site.
   5. Do not store or sell CONTRACTOR salvaged items or materials on site.

D. Clean up:
   1. Transport debris and legally dispose of off-site.

END OF SECTION

SECTION 02100

CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 Description

A. Description of Work

The work to be performed in accordance with this section includes clearing, grubbing, and disposal of materials, for all ground surfaces within the limits designated on the plans. The work shall include the furnishing of all labor, tools, equipment, materials and the performing of all operations required to provide a complete item in accordance with the project plans and these specifications.

Clearing and grubbing includes the removal of all brush, undergrowth, heavy growth of grass or weeds, debris, rubbish of any nature, obstructions or material which is unsuitable for the foundation of fills, pavements, or other required structures and the disposal of all spoil materials resulting from clearing and grubbing in an approved landfill.

B. Related Work Specified Elsewhere

Removal of Existing Improvements .....Section 02110

1.2 Protection of Property

Protect existing improvements, adjacent property, utilities, trees, plants, or any other existing items which are not specifically intended to be removed.

1.3 Submittals

A. Disposal Area

Describe the location of the disposal area and provide written approval for the use of the area for disposing of waste from the operation. Work performed at the disposal area shall meet all local codes and ordinances.

PART 2 - MATERIALS (NOT APPLICABLE) PART 3

- EXECUTION

3.1 Limits of Work

Clearing and grubbing operations are to remain within the limits of construction and/or the right-of-way as shown on the plans. Clear and grub only in areas that are affected by excavation or other earthwork operations.

3.2 Construction Methods

Remove all stumps, roots, buried logs, brush, grass, and other unsuitable materials. Grub roots and other projections over 1-1/2 inches in diameter to a depth of at least 18 inches below the finished subgrade or slope elevation.

Backfill all holes remaining after the grubbing operation in accordance with Section 2200, Earthwork.

3.3 Disposal

Dispose of all debris at an approved landfill.

3.4 Burning

No burning shall be permitted.

3.5 Existing Vegetation to Remain

Save all trees and shrubs which will not interfere with excavation or embankment or cause disintegration of the improvements. Coordinate removal of vegetation with the OWNER. Protect trees, shrubbery, vines, plants, grasses and other vegetation growing outside of the limits of construction.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Measurement

No measurement will be made for this item.

4.2 Payment

No payment will be made for Clearing and Grubbing. Clearing and grubbing shall be considered incidental to other items.

**END OF SECTION*

SECTION 02110

REMOVAL OF EXISTING IMPROVEMENTS

PART 1 - GENERAL

1.1 Summary

A. Description of Work

The work to be performed in accordance with this section includes the removal and disposal of various existing improvements, such as structures, pipes, travelling bridge, filter media, gratings and other items necessary for the accomplishment of the improvement. The work shall include the furnishing of all labor, tools, equipment, materials and the performing of all operations required to provide a complete item in accordance with the project plans and these specifications.

1.2 Protection of Property

Protect existing improvements, adjacent property, utilities, trees, plants, or any other existing items which are not specifically intended to be removed.

1.3 Disposal

All materials shall be disposed of at an approved landfill, unless otherwise approved by the Owner.

1.4 Submittals

A. Landfill

Provide a copy of the permit to use the landfill.

B. Disposal Area

For sites other than the landfill, describe the location of the disposal area and provide written approval for the use of the area for disposing of waste from the operation. Work performed at the disposal area shall meet all local codes and ordinances.

PART 2 -MATERIALS

2.1 General

Materials required for relocation work shall be as specified herein or as otherwise indicated.

PART 3 - EXECUTION

3.1 Limits of the Work

Confine removal of existing improvements within the area of construction. Pavement removal shall be limited to an area that is no more than the one week ahead of the projected work. At no time shall the Contractor have asphalt removed from any street longer than 60 days.

3.2 Construction Methods

A. Removal of Existing parts of Structure walls that needs to be repaired.

1. Saw cut concrete to neat, vertical, true lines in such a manner that the adjoining surface will not be damaged. The existing concrete shall be saw cut till the hard surface of the concrete is exposed.

B. Removal of Existing Traveling Bridge, Filter Media, Gratings.

1. The existing traveling bridge shall be removed after disconnecting electrical and machinal components associated to the traveling bridge.
2. Existing traveling bridge should be removed as per approved procedures and proper care to be taken to ensure that no damage was done to the existing structures and utilities.
3. The existing filter media shall be removed without damaging the porous plates, cell dividers and media should be dumped in an approved landfill by the Owner.
4. Gratings shall be removed as specified in the drawings in approved procedure and should be placed at appropriate locations designated by the Owner.

C. Miscellaneous Removals

Perform all miscellaneous removals as required by the Owner or where indicated on the plans. The miscellaneous removals shall include but not be

limited to the following tasks:

1. Relocate existing fences and gates.
2. Remove planter boxes, block walls, concrete walls and footings.
3. Remove existing irrigation systems and replace or plug.
4. Removal and relocation of signs and mailboxes. All City owned signs shall be removed from the areas of construction and delivered to the City as directed. All privately owned signs located within the areas of construction shall be removed and delivered to the property Owner or placed on the adjacent property as directed.
5. All mailboxes located within the areas of construction shall be removed and temporarily reset on the adjacent property for use. When grading and construction is adequately completed, the mailboxes shall be permanently reset at the back of the curb and restored to a better than or equal condition than existing.

3.3 Backfill and Densification

Backfill all holes remaining after removal of existing improvements.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Measurement

No Measurement shall be made for this item.

4.2 Payment

A. Removal of Existing Improvements

If no item is listed in the bid tab or the measurement and payment section, this item is to be considered incidental.

B. Removal of Existing Improvements

Payment will be made at the contract lump sum price. This price shall be full compensation for furnishing all materials, labor, equipment, tools and appurtenances necessary to complete the work.

C. Miscellaneous Removals

All other removals shall be considered incidental to other items. No payment will be made for miscellaneous removals.

See Section 00310 Bid Schedule for Bid Items.

END OF SECTION

Division 3
CONCRETE WORKS

SECTION 03301

EPOXIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Epoxy.
   2. Epoxy gel.
   3. Epoxy bonding agent.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. D 638 - Standard Test Method for Tensile Properties of Plastics.
   2. D 695 - Standard Test Method for Compressive Properties of Rigid Plastics.
   3. D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

1.03 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Provide epoxy materials that are new and use them within shelf life limitations set forth by manufacturer.
   2. Perform and conduct work of this Section in neat orderly manner.

1.04 SUBMITTALS

A. Not Used.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Epoxy: Water-insensitive two-part type low viscosity epoxy adhesive material containing 100 percent solids and meeting or exceeding following characteristics when tested in accordance with standards specified: Manufacturers: One of the following or equal:
   1. Master Builders, Inc., Concressive Standard LVI.
   2. Sika Chemical Corp.'s, Sikadur 35 Hi-Mod LV.

Physical Characteristic	Test Method	Required Results
Tensile Strength	ASTM D 638	8,000 pounds per square inch at 14 days and 77 deg. F cure.
Flexure Strength	ASTM D 790	11,000 pounds per square inch at 14 days and 77 deg. F cure.
Compressive Strength	ASTM D 695	16,000 pounds per square inch at 24 hours and 77 deg. F cure.
Bond Strength	N/A	Concrete shall fail before failure of epoxy.
Gel Time in 5-Mil Film	N/A	Four hours maximum at 77 deg. F
Elongation	ASTM D 638	1 percent minimum at 14 days and 77 deg. F

B. Epoxy Gel: Manufactures: One of the following or pre-approved equal:
   1. Sika Chemical Corp.'s, Sikadur 31 Hi-Mod Gel.

C. Epoxy Bonding Agent: Manufacturers: One of the following or pre-approved equal:
   1. Master Builders, Inc., Concressive 1001 Liquid LPL.
   2. Sika Chemical Corp.'s, Sikadur 32 Hi-Mod.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install and cure epoxy materials in accordance with manufacturer's installation instructions.

B. Epoxy:
   1. Apply in accordance with manufacturer's installation instructions.

C. Epoxy Gel:
   1. Apply in accordance with manufacturer's installation instructions.
   2. Use for vertical or overhead work, or where high viscosity epoxy is required.
   3. Epoxy gel used for vertical or overhead work may be used for horizontal work.

D. Epoxy Bonding Agent:
   1. Apply in accordance with manufacturer's installation instructions.
   2. Bonding agent will not be required for filling form tie hole or for normal finishing and patching of similar sizes small defects.

END OF SECTION

SECTION 03302

EPOXY RESIN/PORTLAND
CEMENT BONDING AGENT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Epoxy resin/portland cement bonding agent.

1.02 REFERENCES

A. American Society for Testing of Materials (ASTM):
   1. C 109 - Standard Test Method for Compressive Strength of Hydraulic-Cement Mortars (Using 2-in. Cube Specimens)
   2. C 348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
   3. C 496 - Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
   4. C 882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Sika Corporation, Lyndhurst, New Jersey, Sika Armatec 110.

B. Substitutions: The use of other than the specified product will be considered providing the CONTRACTOR request its use in writing to the ENGINEER. This request shall be accompanied by:
   1. A certificate of compliance from an approved independent testing laboratory that the proposed substitute product meets or exceeds specified test standards.

2.02 PERFORMANCE CRITERIA

A. Properties of the Mixed Epoxy Resin/Portland Cement Adhesive:
   1. Pot life: 75-105 minutes.
   2. Contact time: 24 hours.
   3. Color: Dark gray.

B. Properties of the Cured Epoxy Resin/Portland Cement Adhesive:
   1. Compressive strength in accordance with ASTM C 109:
      a. 1 day: 810 pounds per square inch minimum.

b. 7 day: 6,000 pounds per square inch minimum.
c. 28 day: 8,000 pounds per square inch minimum.

2. Splitting tensile strength in accordance with ASTM C 496:
   a. 28 days: 540 pounds per square inch minimum.
3. Flexural Strength:
   a. 1,100 pounds per square inch minimum in accordance with ASTM C 348.
4. Bond strength in accordance with ASTM C 882 modified at 14 days:
   a. 0 hours open time: 1,900 pounds per square inch minimum.
   b. 24 hours open time: 1,500 pounds per square inch minimum.
5. The epoxy resin/portland cement adhesive shall not produce a vapor barrier.
6. Material must be proven to prevent corrosion of reinforcing steel when tested under the procedures as set forth by the Federal Highway Administration Program Report Number FHWA/RD86/193. Proof shall be in the form of an independent testing laboratory corrosion report showing prevention for corrosion of the reinforced area.

2.03 MATERIALS

A. Epoxy Resin/Portland Cement Adhesive:
   1. Component "A" shall be an epoxy resin/water emulsion containing suitable viscosity control agents. It shall not contain butyl glycidyl ether.
   2. Component "B" shall be primarily a water solution of a polyamine.
   3. Component "C" shall be a blend of selected portland cements and sands.
   4. The material shall not contain asbestos.

PART 3 - EXECUTION

3.01 MIXING AND APPLICATION

A. Mixing the Epoxy Resin: Shake contents of Components "A" and Component "B". Empty all of both components into a clean, dry mixing pail. Mix thoroughly for 30 seconds with a jiffy paddle on a low-speed with 400 to 600 revolutions per minute drill. Slowly add the entire contents of Component "C" while continuing to mix for 3 minutes until uniform with no lumps. Mix only that quantity that can be applied within its pot life.

B. Placement Procedure:
   1. Apply to prepared surface with stiff-bristle brush, broom, or "hopper type" spray equipment:
      a. For hand applications: Place fresh, plastic concrete/mortar while the bonding bridge adhesive is wet or dry, up to 24 hours.
      b. For machine applications: Allow the bonding bridge adhesive to dry for 12 hours minimum.

C. Adhere to all limitations and cautions for the epoxy resin/portland cement adhesive in the manufacturer's current printed literature.

3.02 CLEANING

A. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent area.

END OF SECTION

SECTION 03600

GROUT

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Concrete mortar, grout, drypack mortar, nonshrink grout, and epoxy grout.

B. Related Sections:
   1. Section 03301 - Epoxies.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. C 109 - Standard Test Method for Comprehensive Strength of Hydraulic Cement Mortars.
   2. C 157 - Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
   3. C 191 - Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
   4. C 827 - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.

B. U. S. Corps of Engineers (USCE):
   1. CRD C-621 - Corps of Engineers Specification for Non-Shrink Grout.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Concrete Mortar:
   1. General: Consist of concrete mixture with coarse aggregate removed and water quantity adjusted as required.
   2. At Exposed Concrete Surfaces not to be Painted or Submerged in Water: White cement.

B. Grout:
   1. Consist of mixture of Portland Cement and sand.

C. Dry-Pack Mortar:
   1. Consist of mixture of Portland cement and sand.

D. Non-Shrink Grout:
   1. Consist of hydraulic cement, which when mixed with water hardens rapidly to produce permanent high strength material suitable for exterior use.
   2. Nonmetallic and not contain calcium chloride or other chemicals which accelerate corrosion of embedded steel.
   3. Physical Characteristics:
      a. When Tested in Accordance with ASTM C 827: Show no shrinkage prior to initial setting.
      b. When Tested in Accordance with ASTM C 157 and Corps of Engineers CRD C-621: Show no shrinkage in hardened state.
   4. Manufacturers: One of the following or pre-approved equal:
      a. Master Builders, Inc., Masterflow 928 Grout.

E. Epoxy Grout:
   1. Consist of mixture of epoxy and sand.
   2. Sand: Clean, bagged, graded, and kiln dried silica sand.

2.02 MIXES

A. Concrete Mortar Mix:
   1. Use water-cement ratio that is no more than that specified for concrete being repaired.
   2. At Exposed Concrete Surfaces not to be Painted or Submerged in Water: Use sufficient white cement to make color of finished patch match that of surrounding concrete.

B. Grout Mix:
   1. For Concrete Repair: Mix in same proportions used for concrete being repaired, with only sufficient water to give required consistency for spreading.
   2. For Spreading over the Surfaces of Construction or Cold Joints: Mix with no more water used than allowed by water-cement ratio specified for concrete.
   3. For grout not specified in subparagraph 2.02B1 or 2.02B2, mix in proportions by weight of one part cement to four part of concrete sand.

C. Dry-Pack Mortar Mix: Use only enough water so that resulting mortar will crumble to touch after being formed into ball by hand.

D. Non-Shrink Grout: Mix accordance with manufacturer's installation instructions such that resulting mix has semi-fluid, flowable consistency and is suitable for placing by pouring.

E. Epoxy Grout:
   1. Mix in accordance with manufacturer's installation instructions for mixing.
   2. Proportioning:
      a. For horizontal work, consist of mixture of one part epoxy as specified in Section 03301 with not more than 2 parts sand.
      b. For vertical or overhead work, consist of 1 part epoxy gel as specified in Section 03301 with not more than 2 parts sand.

PART 3 - EXECUTION

3.01 PREPARATION

A. Surface Preparation:
   1. Concrete Surfaces: Clean and roughen by heavy sandblasting. For portland cement based mortars and grouts, concrete shall be saturated and surface damp before mortar or grout is placed.
   2. Epoxy Grout:
      a. Wet contact surface with prepared grout as required to provide proper adhesion.
      b. Where required to wet the concrete surfaces, apply coat of epoxy for horizontal work or epoxy gel for vertical or overhead work prior to placing epoxy grout.

3.02 APPLICATION

A. Cement Mortar and Grout:
   1. For Imperfect Concrete Repair:
      a. Filling: Filling of voids around items through the concrete.
      b. Grout Spreading: Spread over construction joints, cold joints, and similar type items.
   2. Concrete Surfaces:
      a. Apply epoxy bonding agent to clean, roughened, and dry surface before placing mortar or grout.
   3. Placing:
      a. Exercise particular care in placing portland cement mortar or grout since they are required to furnish structural strength or impermeable water seal or both.
      b. Do not use cement mortar or grout that as not been placed within 30 minutes after mixing.

B. Epoxy Grout:
   1. Apply in accordance with manufacturer's installation instructions.
   2. Use where specified herein or where indicated on the Drawings.

3.03 FIELD QUALITY CONTROL

A. Tests:
   1. Non-Shrink Grout:
      a. A set of three specimens shall be made for testing. One at seven days, one at 25 days, and the third of a later date if needed.
      b. Compression test specimens shall be taken during construction from the first day of placement of grout.
      c. The costs of all laboratory tests shall be borne by the CONTRACTOR.
      d. Compressive Strength When Tested In Accordance With ASTM C 109:
         1) At One Day: Not less than 3,000 pounds per square inch. At 28 days: Not less than 6,000 pounds per square inch.

e. Setting Time when Tested In Accordance with ASTM C 191: Not less than 30 minutes.

END OF SECTION

SECTION 03930

CONCRETE REPAIR AND REHABILITATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:
   1. Provide all labor, materials, equipment and incidentals as shown, specified and required to repair or rehabilitate all existing concrete members and surfaces identified in the Contract Documents.
   2. Repair all damage to new concrete construction as specified herein, except that where such repairs are specified in drawings.

B. Coordination:
   1. Review installation procedures in the following Section and coordinate the installation of items that must be included with the repair and rehabilitation of concrete.

1.2 QUALITY ASSURANCE

A. Reference Standards: Comply with the applicable provisions and recommendations of the following, except as otherwise shown or specified:
   1. ASTM C 109, Test Method for Compressive Strength of Hydraulic Cement Mortars.
   2. ASTM C 157, Test Method for Length Change of Hardened Cement Mortar and Concrete.
   3. ASTM C 882, Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete.
   4. ASTM D 412, Test Methods for Vulcanized and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension.
   5. ASTM D 624, Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
   6. ASTM D 903, Test Method for Peel or Stripping Strength of Adhesive Bonds.
   7. ASTM G 109, Test Method for Determining the Effects of Chemical Admixtures on the Corrosion of Embedded Steel Reinforcement in Concrete Exposed to Chloride Environments.

1.3 SUBMITTALS

A. Shop Drawings: Submit for approval the following:
   1. Submit manufacturer's product information and recommended placement procedures for all repair materials.

2. Submit Shop Drawings, when requested by ENGINEER, to show all methods for supporting existing structures, pipes, etc., during demolition and repair activities. Comply with the requirements of Section 01330, Shop Drawing Procedures.
3. Copies of certificates that show that the repair materials are approved by the National Sanitation Foundation (NSF) for use on surfaces, which are in contact with potable water.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials:
   1. Conform to the requirements of Section 01651, Transportation and Handling of Materials and Equipment, and supplementary requirements below.
   2. Deliver all materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label, and the following information.
      a. Name or title of material.
      b. Manufacturer's stock number and date of manufacture.
      c. Manufacturer's name.

B. Storage of Materials:
   1. Conform to the requirements of Section 01661, Storage of Materials and Equipment, and supplementary requirements below.
   2. Storage only acceptable project materials on project site.
   3. Store in a suitable location approved by ENGINEER. Keep area clean and accessible.
   4. Restrict storage to repair materials and related equipment.
   5. Comply with health and fire regulations including the Occupational Safety and Health Act of 1970.

C. Handling of Materials:
   1. Conform to the requirements of Section 01651, Transportation and Handling of Materials and Equipment, and supplementary requirements below.
   2. Handle materials carefully to prevent inclusion of foreign materials.
   3. Do not open containers or mix components until necessary preparatory Work has been completed and application Work will start immediately.

PART 2 - PRODUCTS

2.1 REPAIR MORTAR

A. Repair mortar shall be a prepackaged cement based product specifically formulated for the repair of concrete surface defects. The repair mortar shall be a

two-component polymer-modified, portland cement, fast setting, trowel-grade mortar. The repair mortar shall be enhanced with a penetrating corrosion inhibitor and shall have the following properties:

Physical Property	Value	ASTM Standard
Compressive Strength (minimum)		C 109
at 1 day	2000 psi	
at 28 days	6000 psi	
Bond Strength (minimum)		C 882*
at 28 days	1800 psi	

* Modified for use with repair mortars.

B. Where the least dimension of the placement in width or thickness, exceeds 4-inches, the repair mortar shall be extended by addition of aggregate as recommended by the manufacturer.

C. Product and Manufacturer: Provide one of the following:
   1. SikRepair SHB, as manufactured by Sika Corporation.
   2. Or equal.

2.2 JOINT REPAIR SYSTEM

A. Joint Repair System: The joint repair system shall consist of two components, an epoxy resin adhesive and hypalon sheeting.
   1. Epoxy Resin Adhesive: Provide a two-component epoxy resin as follows:
      a. Component A shall be a modified epoxy resin of the epichlorohydrin bisphenol A type containing suitable viscosity control agents and pigments. It shall not contain butyl glycidyl ether.
      b. Component B shall be primarily a reaction product of a selected amine blend with an epoxy resin of the epichlorohydrin bisphenol A type containing suitable viscosity control agents, pigments and accelerators.
   2. Hypalon Sheeting: Provide Hypalon sheeting as follows:
      a. Hypalon sheeting shall consist of Hypalon rubber. It shall be perforated along the bonding edge to provide a mechanical key. It shall have the ability to be vulcanized with hydrocarbon solvent to permit its adhesion to an epoxy resin adhesive.
      b. The sheeting shall be provided in 12-inch width with a thickness of 40 mils.
      c. The sheeting shall be able to be lapped or seamed by heat or by anaromatic hydrosolvent strip.
      d. The sheeting shall be supplied with a removable center expansion strip.
   3. Product and Manufacturer: Provide one of the following:
      a. Sikadur Combiflex, as manufactured by Sika Corporation.

b. Or equal.

2.3 EXPOSED REBAR REPAIR

A. The exposed reinforcing repair system shall consist of two components, a first application of a corrosion inhibitor and then a final application of a protective slurry mortar.

B. Corrosion Inhibitor:
   1. The corrosion inhibitor shall penetrate the hardened concrete surface and form a protective layer on the reinforcement. It shall have the following properties:
      a. The product shall not change the substrate's color, appearance, or texture.
      b. Penetration (SNMS Analysis): 1/10 to 4/5 inches/day.
      c. Coating thickness (XPS and SIMS Analysis): 100 to 1000 angstroms.
      d. Corrosion Current Reduction (ASTM G 109): 65 percent at one year.
      e. Chloride Displacement (XPS and SIMS Analysis): Passes.
      f. Effectiveness in Carbonated Conditions (Electrochemical): passes.
      g. The product must not form a vapor barrier.
      h. The product must be environmentally sound.
      i. Post-application verification (Chromatography Plate Test): Passes.
      j. Longevity (Ten Year Accelerated Weather Testing): Passes.
   2. Product and Manufacturer: Provide one of the following:
      a. Sikrepair SHB, as manufactured by Sika Corporation.
      b. Or equal.

C. Protective Slurry Mortar:
   1. Protective slurry mortar shall be a two-component, polymer-modified, cementitious waterproofing and protective slurry mortar. Provide two coats at a rate of 50 sq. ft./gal./coat.
   2. Product and Manufacturer: Provide one of the following:
      a. Sikatop Seal 107, manufactured by Sika Corporation.
      b. Or equal.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which repair Work is to be installed, and notify ENGINEER, in writing, of conditions detrimental to proper and timely completion of Work. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 GENERAL

A. Surface Preparation:

1. The entire area to be repaired shall have all laitance, foreign material, and unsound concrete removed by chipping, abrasive blasting or hydroblasting. The surface shall be further roughened as specified herein. Where non-shrink grout or repair mortar is used, any additional surface preparation steps recommended by the manufacturer shall be performed.

2. Where repair concrete, shotcrete, or cement grout is used, and a bonding agent is not required, or where the repair mortar or non-shrink grout manufacturer recommends a wet or saturated surface, water shall be delivered to the surface continuously for a minimum of four hours. Where large surface areas are to be repaired, fog spray nozzles mounted on stands shall be provided in sufficient numbers such that the entire surface to be repaired is in contact with the fog spray cloud. The concrete shall be prevented from drying until after the repair operation is completed. Unrepaired surfaces shall be rewetted by water spray on at least a daily basis. Should more than four days elapse without rewetting the unrepaired surfaces, the original saturating procedure shall be repeated. All standing water in areas to be repaired shall be removed prior to placement of repair material. Means to remove excess water from the structure shall be provided.

3. Where the repair material manufacturer recommends the use of an epoxy-bonding agent, the recommendations of both the repair material and bonding agent manufacturers shall be followed.

B. Care shall be taken to fully consolidate the repair material, completely filling all portions of the area to be filled.

C. The repair surface shall be brought into alignment with the adjacent existing surfaces to provide a uniform, even surface. The repair surface shall match adjacent existing surfaces in texture and shall receive any coatings or surface treatments which had been provided for the existing surface.

D. Curing:

1. Curing of repair mortar and non-shrink grout shall be according to the manufacturer's recommendations except that the minimum cure period shall be three days.
2. Curing of other materials shall be according to Section 03300, Cast-in-Place Concrete.

3.3 TREATMENT OF SURFACE DEFECTS

A. Surface defects are depressions in a concrete surface which do not extend all the way through the member. The depressions can result from the removal of an embedded item, the removal of an intersecting concrete member, physical damage, unrepaired rock pockets created during original placement, or spalls from corroded reinforcing steel or other embeds.

B. Preparation:
   1. All loose, damaged concrete shall be removed by chipping to sound material.
   2. Where existing reinforcing bars are exposed, concrete shall be removed to a minimum of 1-inch all around the bars. If the existing bars are cut through, cracked, or the cross sectional area is reduced by more than 25 percent, the ENGINEER shall be notified immediately.
   3. The perimeter of the damaged area shall be score cut to a minimum depth of 0.5-inch and a maximum depth to not cut any existing reinforcing steel. Existing concrete shall be chipped up to the score line so that the minimum thickness of repair mortar is 0.5-inch.

C. Repair Material:
   1. Repair of surface defects in members, which are normally in contact with water or soil, or in the interior surfaces of enclosed chambers that contain water shall be made only with repair mortar.
   2. Repair of other surface defects may be by the application of repair mortar, repair concrete, shotcrete, or cement grout, as appropriate.

3.4 PATCHING OF HOLES IN CONCRETE

A. For holes larger than 48-inches, refer to the Drawings for reinforcement details.

3.5 PATCHING OF LINED HOLES

A. This Section applies to those openings which have embedded material over all or a portion of the inside edge. Unless indicated to remain in place on the Drawings or by the ENGINEER, such embedded materials shall be removed and the remaining hole repaired as specified above. The requirements for repairing holes in concrete specified above shall apply as modified herein.

B. Where embedded material is allowed to remain, it shall be trimmed back a minimum of 2-inches from the concrete surface. The embedded material shall be roughened or abraded to promote good bonding to the repair material. Any substance that interferes with good bonding shall be completely removed.

C. Any embedded item that is not securely and permanently anchored into the concrete shall be completely removed.

D. Embedded items which are larger than 12-inches in their least dimension shall be completely removed, unless they are composed of a metal to which reinforcing steel can be welded. Where reinforcement is required, it shall be welded to the embedded metal.

E. The following additional requirements apply to concrete members which are in contact with water or soil.

1. Lined openings, which are less than 4-inches in their least dimension, shall be filled with epoxy grout.
2. Lined openings which are greater than 4-inches, but less than 12-inches in their least dimension, shall be coated with an epoxy bonding agent prior to being filled with Class I non-shrink grout.
3. Lined openings which are greater than 12-inches in their least dimension shall be coated with an epoxy bonding agent and shall have a hydrophilic rubber waterstop or bead of hydrophilic sealant installed to the interior of the opening at the wall centerline, as required by Section 03251, Concrete Joints, prior to being filled with any approved repair material.

3.6 REPAIR OF DETERIORATED CONCRETE

A. This Section pertains to concrete which has been damaged due to corrosion of reinforcing steel, physical damage due to abrasion, and damage due to chemical attack. The only material acceptable for surface repair is repair mortar as specified herein. Where the repaired surface is to be subsequently covered with a PVC liner material, the finishing details shall be coordinated with the requirements of installing the liner material.

B. Surface Preparation:
   1. All loose, broken, softened, and acid contaminated concrete shall be removed by abrasive blasting and chipping down to sound, uncontaminated concrete.
   2. When the removal of deteriorated concrete is completed, CONTRACTOR to notify the ENGINEER, in writing. Two weeks shall be scheduled for the ENGINEER to inspect the surface, perform testing for acid contamination, determine if additional concrete must be removed, and to develop any special repair details that may be required. Should it be determined that additional concrete must be removed to reach sound, uncontaminated material, another two week period shall be scheduled for further evaluation after the end of the additional removal.
   3. Additional surface preparation shall follow the recommendations of the repair mortar manufacturer.
   4. Isolated areas of exposed reinforcing bars shall be treated as required for repair of surface defects. If extensive areas of reinforcement are uncovered after removal of deteriorated concrete, repair methods shall be as determined by the ENGINEER.

C. Repair Mortar Placement:
   1. The procedures recommended by the manufacturer for the mixing and placement of the repair mortar shall be followed.
   2. After the initial mixing of the repair mortar, additional water shall not be added to change the consistency should the mix begin to stiffen.
   3. Repair mortar shall be placed to a minimum thickness as recommended by the manufacturer, but not less than 0.50-inch. Where removal of deteriorated concrete results in a repair thickness of less than 0.5-inch to return to original

concrete surface location in isolated areas totaling less than ten percent of the total repair area, additional concrete shall be removed to obtain the 0.5-inch thickness. Where the area with repair thickness of less than 0.5-inch exceeds ten percent of the total repair area, notify the ENGINEER. In any case, repair mortar shall be added so that the minimum cover over existing reinforcing steel is 2-inches. Do not place repair mortar so as to create locally raised areas. Where there is a transition with wall surfaces which are not in need of repair, the repair mortar shall not be feathered at the transition. A score line shall be sawcut to not less than the minimum repair mortar depth and concrete chipped out to it to form the transition. Care shall be taken to not cut or otherwise damage any reinforcing steel.

4. The repair mortar shall be placed to an even, uniform plane to restore the member to its original surface. Tolerance for being out of plane shall be such that the gap between a 12-inch straight edge and the repair mortar surface does not exceed 0.125-inch and the gap between a 48-inch straight edge and the repair mortar surface does not exceed 0.25-inch. This shall apply to straight edges placed in any orientation at any location.

D. Finishing:

1. The repair mortar shall receive a smooth, steel trowel finish.

2. When completed, there shall be no sharp edges. All exterior corners, such as at penetrations, shall be made with a 1-inch radius. All interior corners shall be square except corners to receive PVC lining shall be made with a 2-inch repair mortar fillet.

E. Curing:

1. Curing shall be performed as recommended by the repair mortar manufacturer, except that the cure period shall be at least 24 hours and shall be by means of a continuous fog spray. If the manufacturer recommends the use of a curing compound, no material shall be used that would interfere with the bond of the protective coating system or adhesive used for placing PVC lining, where required.

3.7 EXPOSED REBAR REPAIR

A. The entire area to be repaired shall have all corrosion, foreign materials, and unsound concrete by means of abrasive blasting or hydroblasting.

B. Surface shall be visually dry before application of the corrosion inhibitor. The corrosion inhibitor shall be placed liberally to achieve 100 sq ft/gal coverage in two or more coats by allowing it to soak into the substrate. The re-coat time between coats shall be a minimum of one hour. Apply by use of rollers, brushes, or hand-pressure spray equipment.

C. After the last coat of the corrosion inhibitor is applied, a minimum curing time of 24 hours is required.

D. High Pressure Wash all surfaces to remove filmy residue that is left on the surface by the corrosion inhibitor. Residue acts like bond breaker and must be removed before mortar coating.

E. For mortar coating, refer to Paragraph 3.6.C, Repair Mortar Placement, Paragraph 3.6.D, Finishing, and Paragraph 3.6.E, Curing.

F. For Rebar lap length refers to drawings.

3.8 FIELD QUALITY CONTROL

A. OWNER will employ a testing laboratory to perform field quality control testing. ENGINEER will direct the CONTRACTOR on the number of standard compression tests and specimens required as specified below, under the direct inspection by ENGINEER. Furnish all necessary assistance required by ENGINEER. Provide all labor, material and equipment required including rods, molds, thermometer, curing in a heated storage box, and all other incidentals required. Above will be subject to approval by ENGINEER. Furnish all necessary storage, curing, and transportation required by the testing.

B. Field tests of cement based grouts and repair mortar:
   1. Compression test specimens will be taken during construction from the first placement of each type of mortar or grout, and at intervals thereafter as selected by the ENGINEER to ensure continued compliance with these specifications. The specimens will be made by the ENGINEER or its representative.
   2. Compression tests and fabrication of specimens for repair mortar and non-shrink grout will be performed as specified in ASTM C 109. A set of three specimens will be made for each test. Tests shall be made at 7 days, 28 days, and additional time periods as appropriate.
   3. All material, already placed, which fails to meet the requirements of these specifications, is subject to removal and replacement at the cost of CONTRACTOR.
   4. The cost of all laboratory tests on mortar and grout will be borne by the OWNER, however CONTRACTOR provide assistance to the ENGINEER in obtaining specimens for testing. he cost of any additional tests and investigation on Work performed which does not conform to the requirements of the specifications will be the CONTRACTOR's responsibility. Supply all materials necessary for fabricating the test specimens.

C. Repair Concrete: Repair concrete shall be tested for slump in accordance with ASTM C143 and test for compressive strength of the repair material in accordance with ASTM C39.

+ + END OF SECTION + +

Division 5
MISCELLANEOUS METALS

SECTION 05052

ANCHOR BOLTS, TOGGLE BOLTS AND CONCRETE INSERTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope:
   1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown on the Drawings, specified, and required to furnish and install anchor bolts, toggle bolts and concrete inserts.

B. This Section includes all anchor bolts, toggles and inserts required for the Work, but not specified under other Sections.

C. The types of Work using the anchor bolts, toggles and inserts include, but are not limited to the following:
   1. Hangers and brackets.
   2. Equipment.
   3. Piping.
   4. Electrical and Plumbing Work.
   5. Metal and plastic fabrications.
   6. Structural members and accessories.

D. Related Sections: CONTRACTOR shall coordinate the requirements of the Work in this Section along with the requirements of the Sections listed below which includes, but is not necessary limited to, Work that is directly related to this Section.

1.02 QUALITY ASSURANCE

A. Reference Standards: Comply with the applicable provisions and recommendations of the following, except as otherwise shown and specified.
   1. ASTM A36M-14 - Standard Specification for Carbon Structural Steel.
   2. ASTM A123M-17 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   3. ASTM A153M-16a - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   4. ASTM A167-99 – Standard Specification for Stainless Steel Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
   5. ASTM A176-99 – Standard Specification for Stainless Steel Heat-Resisting Chromium Steel Plate, Sheet, and Strip.
   6. ASTM A276-13a – Standard Specification for Stainless Steel Bars and Shapes.
   7. ASTM A307-14e1 - Standard Specification for Carbon Steel Bolts, Studs and Threaded Rod 60,000 psi Tensile Strength.

8. ASTM A484M-18a - Standard Specification for General Requirements for Stainless Bars, Billets and Forgings.
9. ASTM A536-84(2019)e1 - Standard Specification for Ductile Iron Castings.
10. ASTM B633-19 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
11. ASTM F593-17 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
12. Federal Specification FF-S-325 - Shield Expansion; Nail Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry).
13. Federal Specifications WW-H-171E - Hangars and Support, Pipe.
14. ICBO, International Conference of Building Officials.
15. International Building Code.

B. Inserts shall be ICBO, UL or FM approved.

C. Toggle Bolts: Federal Specification FF-B-588C - Type I, Class A, Style 1.

1.03 SUBMITTALS

A. Shop Drawings: Submit for approval the following:
1. Copies of manufacturer's specifications, load tables, dimension diagrams and installation instructions for the devices.
2. Copies of ICBO, UL or FM Reports certifying load carrying capacities and installation requirements for the anchorage devices.

PART 2 - PRODUCTS

2.01 DESIGN CRITERIA

A. When the size, length or load carrying capacity of an anchor bolt, toggle bolt, or concrete insert is not shown on the Drawings, provide the following:
1. For anchor bolts (cast-in-place), provide the size, length and capacity required to carry the design load based on the values and requirements given in the International Building Code.
2. For concrete anchors (epoxy adhesive types), stud type expansion anchors, and concrete inserts, provide the size, length, type, and capacity required to carry the design load based on the values and requirements given in the ICBO Evaluation Report, or similar certifications by UL or FM, for the anchor to be used. Alternately the capacity may be based on independent testing lab capacities for tension and shear strength using a minimum safety factor of four. Consideration of reduced capacity due to spacing and edge distance shall be made.

B. Determine design loads as follows:
1. For equipment anchors, use the design load recommended by the equipment manufacturer.

2. For pipe hangers and supports, use the total weight of: pipe, fittings, and water contained in pipe, plus the full weight of valves and accessories located between the hanger or support in question.
3. Allowances for vibration shall be included.
4. Concrete anchors shall develop ultimate shear and pull-out loads of not less than the following values in 4,000 psi concrete:

Bolt Diameter (Inches)	Min. Shear (Pounds)	Min. Pull-Out Load (Pounds)
½	5,000	7,600
5/8	8,000	12,000
3/4	11,500	17,000
7/8	15,700	20,400
1	20,500	28,400

2.02 APPLICATION

A. In masonry, only anchor bolts shall be used.

B. Anchor Bolts (cast-in-place):
1. Shall be used where indicated and may be used where concrete anchors are indicated.
2. Where an anchor bolt is indicated, only a cast-in-place anchor bolt shall be used, unless another anchor type is accepted by the ENGINEER.
3. Provide anchor bolts as shown on the Drawings or as required to secure structural steel to concrete or masonry.

C. Epoxy Adhesive Anchors:
1. Use where subject to vibration or where buried or submerged.
2. Use for pipe supports.
3. Use in concrete.
4. Shall not be used for pipe hangers.

D. Concrete Inserts:
1. Use only where indicated on the Drawings.
2. Use for pipe hangers and supports for the pipe size and loading recommended by the insert manufacturer.

E. Toggle Bolts:
1. Use for fastening brackets and other elements onto masonry units.

F. Stud Type Expansion Anchors:
1. Use only when indicted on the Drawings.

2.03 MATERIALS

A. Anchor Bolts:
   1. Provide carbon steel bolts complying with ASTM A 307 - headed or non-headed type where indicated.
   2. In buried or submerged locations, provide stainless steel bolts complete with washers complying with ASTM F 593 - AISI Type 316 and with nitronic 60 stainless steel nuts and locknuts.
   3. For equipment, provide anchor bolts, which meet the equipment manufacturer's recommendations for size, material, and strength.
   4. Provide anchor bolts as shown on the Drawings or as required to secure structural steel to concrete or masonry.
   5. Locate and accurately set the anchor bolts using templates or other devices as required.
   6. Protect threads and shank from damage during installation of equipment and structural steel.
   7. Comply with manufacturer’s required embedment length and necessary anchor bolt projection.

B. Epoxy Adhesive Anchors:
   1. Provide stainless steel adhesive anchors complying with ASTM F 593 - AISI Type 316 with nitronic 60 stainless steel nuts and locknuts.
   2. In buried or submerged locations, provide stainless steel adhesive anchors complying with ASTM F 593 - AISI Type 316 with nitronic 60 stainless steel nuts and locknuts.
   3. Anchors shall be of the size required for the concrete strength specified.
   4. Adhesive anchors shall consist of threaded rods or bolts anchored with an adhesive system into hardened concrete or grout-filled masonry. The adhesive system shall use a two-component adhesive mix and shall be injected with a static mixing nozzle following manufacturer’s instructions. The embedment depth of the rod/bolt shall provide a minimum allowable bond strength that is equal to the allowable tensile capacity of the rod/bolt, unless noted otherwise on the Drawings.
   5. Product and Manufacturer: Provide one of the following:
      a. RE 500 Epoxy Injection Adhesive Anchor System, as manufactured by Hilti.
      b. Or equal.

C. Concrete Inserts:
   1. For piping, grating and floor plate, provide malleable iron inserts. Comply with Federal Specification WW-H-171E (Type 18). Provide those recommended by the manufacturer for the required loading.
   2. Finish shall be black.
   3. Product and Manufacturer: Provide inserts by one of the following:
      a. Figure 282, as manufactured by ITT Grinnell.
      b. No. 380, as manufactured by Hohmann and Barnard, Incorporated.
      c. Or equal.

D. Toggle Bolts:
   1. Provide spring-wing toggle bolts, with two-piece wings.
   2. Provide carbon steel bolts with zinc coating in accordance with Federal Specification FF-S-325.
   3. Product and Manufacturer: Provide toggle bolts by one of the following:
      a. The Rawlplug Company, Incorporated.
      b. Haydon Bolts, Incorporated.
      c. Or equal.

E. Stud Type Expansion Anchors:
   1. Product and manufacturer
      a. Kwik-Bolt 3.
      b. Or equal.

F. Powder activated fasteners and other types of bolts and fasteners not specified herein shall not be used.

PART 3 - EXECUTION

3.01 INSPECTION

A. CONTRACTOR shall examine areas and conditions under which anchor bolts, toggle bolts and concrete insert Work is to be installed.

3.02 INSTALLATION

A. Assure that embedded items are protected from damage and are not filled in with concrete.

B. Use concrete inserts for pipe hangers and supports for the pipe size and loading recommended by the insert manufacturer.

C. Use toggle bolts for fastening brackets and other elements onto masonry units.

D. For the epoxy adhesive anchors and adhesive material, CONTRACTOR shall comply with the manufacturer's installation instructions on the hole diameter and depth required to fully develop the tensile strength of the adhesive anchor or reinforcing bar. Contractor shall properly clean out the hole utilizing a wire brush and compressed air to remove all loose material from the hole, prior to installing adhesive capsules or material.

3.03 CLEANING

A. After embedding concrete is placed, remove protection and clean bolts and inserts.

END OF SECTION

SECTION 05500

ALUMINUM HANDRAIL

PART 1 - GENERAL

1.1 Description

A. Description of Work

The work to be performed in accordance with this section includes furnishing and installing aluminum handrail including railing, posts, fittings and anchorage.

The work shall include the furnishing of all labor, tools, equipment, materials and performing all operations to provide a complete item in accordance with the project plans and these specifications.

1.2 Quality Assurance

A. Reference Test Standards and Specifications

ASTM B221, Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.

ASTM B241, Specification for Aluminum and Aluminum-Allow Seamless Pipe and Seamless Extruded Tube.

ASTM B209, Specification for Aluminum and Aluminum-Alloy Sheet Pipe and Plate.

1.3 Submittals

A. Certificates of Compliance

1. Handrail Materials and Fasteners

B. Shop Drawings

1. Handrail

PART 2 - MATERIALS

2.1 Aluminum Alloy for Pipe

ASTM B241, Alloy 6061-T6 or 6063-T6.

2.2 Aluminum Alloy Tubing

ASTM B221, Alloy 6061-T6 or 6063-T6, Schedule 40, Handrail grade.

2.3 Cast Aluminum Alloy

AASHTO M193.

2.4 Aluminum Alloy Shims

ASTM B209, Alloy 1100-1.

2.5 Aluminum Anodizing

After fabrication and finishing all aluminum railings shall be brushed and given a medium chemical etch and a clear architectural class satin finish in accordance with the "Standards for Anodized Architectural Aluminum".

2.6 Fasteners

A. Expansion shield anchor bolts and drive pins for attaching items to concrete or masonry. Stainless steal AISI type 304:

1. Expansion anchor bolts shall be stainless steel machine bolts inserted in separate double metal wedge lead expansion shields. Minimum bolt size 3/4-inch.

PART 3 - EXECUTION

3.1 Fabrication

Fabricate aluminum railings in the most practical sections, with closely fitted, continuously welded connections, grind welds until blended into adjacent surfaces. All railing surfaces shall receive clear satin anodized coating.

A. Joints

Weld all joints in conformance with Specifications for Welding Aluminum of the AWS. All welds shall be ground smooth and brushed to match tubing finish.

3.2 Installation, General

A. Insofar as possible, fabricate and fit metal work in the shop, in transportable components ready for field erection.

B. Finished work shall conform to a straight line or flat plane to within 1/8-inch in 8 feet and to within 1/4-inch total deviation.

C. Curved surfaces shall conform to a true arc of a circle to within 1/16- inch.

D. Make proper allowance for expansion and contraction of the metals and of the materials to which they are fastened.

E. Where metal is fastened to concrete, make the connection by means of embedding expansion shield anchor bolts. Wood plugs, plastic plugs or powder driven studs are not acceptable.

F. Construct work to withstand the forces required by UBC and OSHA.

G. All work subjected to contact by personnel shall have all corners rounded or chamfered, all edges ground smooth.

H. Perform all welding in accordance with AWS manual "Welding Aluminum". Employ methods and techniques to achieve the full strength of the members joined and architectural appearance.

I. Field Assembly: Set members to lines and elevations indicated. Align and adjust members before making permanent conditions.

3.3 Protection

Protect the aluminum from corrosion by separating aluminum and concrete and dissimilar metal surface with a plastic separator sheet or shims as required.

PART 4 - MEASUREMENT AND PAYMENT – Not Applicable

END OF SECTION

Division 6
FABRICATIONS

SECTION 06611

FIBERGLASS REINFORCED PLASTIC FABRICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Fiberglass reinforced plastic fabrications including:
   1. Ladders.
   2. Grating.
   3. Structural Shapes.

B. Related Sections:
   1. Section 01340 - Technical Submittals.
   2. Section 013201 - High Density CrosslinkPolyethelyne (HDCP) Tank.

1.02 REFERENCES

A. American National Standard Institute/NSF International (ANSI/NSF):
   1. ANSI/NSF Standard 61 - Drinking Water Treatment Chemicals - Health Effects.

1.03 SUBMITTALS

A. Shop Drawings for Owner/Engineer approval.

B. Product Data.

C. Manufacturer’s installation instructions.

D. Structural calculations as specified below will be signed and sealed by a licensed structural engineer in the State of Arizona.

E. Chemical and ultraviolet resistance data for all materials as specified below.

PART 2 - PRODUCTS

2.01 GRATING

A. Manufacturers: One of the following or equal:
   1. Fiberglass Grating - Chem Grate, Fibergrate.

B. Materials:
   1. Core: Unidirectionally aligned glass fibers.
   2. Mat: Submit standard corrosion liner.
   3. Veil: Submit standard corrosion liner.
   4. Ultraviolet Stabilizer: Added to the exterior surfaces in the type and amount recommended by the resin manufacturer.
   5. Resin: Fire retardant premium vinyl ester, antimony trioxide or pentoxide added to meet Class I flame spread rating of ASTM E 84 and self-extinguishing requirements of ASTM D 625, as manufactured by one of the following or equal as recommended by the resin manufacturer for the specific operating environment:
      a. Dow Derakane 530.
      b. Ashland Hetron 992.
      c. Interplastic VE 8400.
      d. Reichold Dion VER 9300FR.
   6. Color: Grey or as indicated on the Drawings.
   7. Anti-slip Coating: Permanently bonded grit of selected color.

C. Design Criteria and Chemical Exposure:
   1. Deflection and Concentrated Load: Maximum 0.06 inches at span of 48 inches under concentrated load of 250 pounds.
   2. Deflection and Uniform Distributed Load: Capable of carrying uniform distributed load of 100 pounds per square foot on simple span of 66 inches without deflecting more than 0.10 inches.
   3. Weight: Approximately 10.9 pounds per square foot for 2 inch high grating with open area of minimum 47 percent.
   4. Suitability: Use stairs and grating suitable for use in environments containing chlorine and sulfuric acid solutions at the temperatures and concentrations specified for the application.
   5. Each section shall not exceed 35 lbs. to facilitate easy lifting.

D. Components:
   1. Bearing Bars: I-bars, 1 1/2 inches minimum deep, I-bars spaced at 1-3/16 inches on center.
   2. Cross Bars: Spaced at 6 inches on center.
   3. Hold Downs, Connectors, and Accessories: As recommended by grating manufacturer.
   4. For plate settler area and other locations, provide covered grating (enclosed) with lifting handles for each section. The design shall prevent raw water intrusion and include a 1/8" thick fiberglass gritted plate over the grating.

E. Fabrication:
   1. Produce grating bearing and cross bars by pultrusion process. Do not use hand lay-up construction methods.
   2. Coat ends of grating with resin.
   3. Fabricate single sections for each span. Do not clamp 2 or more grating sections together within spans.

4. Maximum 1/8 inch clearance allowed between ends of grating and inside face of vertical leg of support angles.

F. Cutouts:
1. Provide where required for equipment access or penetrations, including valve operators, stems, and gate frames.
2. Seal cut edges with resin.

PART 3 - EXECUTION

3.01 ERECTION AND INSTALLATION, GENERAL

A. Install products as indicated on the Drawings, and in accordance with shop drawings and manufacturer's printed instructions, as applicable except where specified otherwise.

B. Secure to supporting surface as specified in shop drawings.

C. Where exit from ladder is forward over top rung, extend side rails 3 feet 6 inches minimum above landing, and return the rails with a radius bend to the landing.

D. Where exit from ladder is to side, extend ladder 5 feet 6 inches minimum above landing and rigidly secure at top.

E. Erect rail straight, level, plumb, and true to position indicated on the Drawings. Correct deviations from true line or grade which is visible to the eye.

F. Ladders to be fabricated of stainless steel unless noted otherwise on the Drawings.

END OF SECTION

Division 9
PROTECTIVE COATINGS

SECTION 09900

PROTECTIVE COATINGS

PART 1 - GENERAL

1.1 Summary

A. This Section includes coating of exterior and interior surfaces throughout the Project.

B. Coating systems include surface preparation, prime coat (first coat), finish coats (second and third coats), inspection, cleaning, and touch-up of surfaces and equipment. Shop preparation, prime coat, and finish coats to be shop-applied, may be specified elsewhere or referenced to this Section so that a complete system is specified and coordinated.

1. Where surface preparation and first (prime) coat are specified in other Sections to be shop-applied, such as for structural steel, or equipment, only the touch-up and finish coats are a part of field painting. Surface preparation is the required degree of preparation prior to application of first (prime) coat regardless if done in shop or field.
2. Concealed surfaces are generally not required to have finish-coats unless otherwise specified, but prime coat should be applied and touched up prior to concealment.

3. Where Equipment and Materials are provided with shop-applied finished coating system, only touch-up is a part of field painting.

5. Refer to applicable Sections to determine whether surface preparation and first coat, or complete coating system, is to be shop-applied.

C. Related Work Specified Elsewhere

1. Shop Painting and Coatings: All applicable Divisions.

2. Factory Prefinished Items: All applicable Divisions.

D. Colors

1. Color of finish coatings shall match accepted color Samples.

2. When second and finish coats of a system are of same type, tint or use an alternate color on second coat to enable visual coverage

inspection of the third coat. When first and second coats only are specified and are of same or different types, tint or use an alternate color on first coat to enable visual coverage inspection of the second coat.

3. Contract Price shall include the following approximate number of finish coat colors to form a basis for bidding:

   a. Epoxy: Eight colors, with 50% deep tone colors.

   b. Ceramic: Two colors, with 50% deep tone colors.

1.2 Quality Assurance

A. Reference Standards and Specifications

1. American National Standards Institute (ANSI)

   ANSI A 13.1 - Scheme for the Identification of Piping Systems.

   ANSI Z 53.1 - Safety Color Code for Marking Physical Hazards.

2. American Society for Testing and Materials (ASTM)

   ASTM D4258 - Surface Cleaning Concrete for Coating.

   ASTM D4261 - Surface Cleaning Concrete Unit Masonry for Coating.

3. Society for Protective Coatings (SSPC) Surface Preparation Specifications

   SP1 - Solvent Cleaning: Removes oil, grease, soil, drawing and cutting compounds, and other soluble contaminants.

   SP2 - Hand Tool Cleaning: Remove loose material. Not intended to remove adherent mill scale, rust, and paint.

   SP3 - Power Tool Cleaning: Removes loose material. Not intended to remove all scale or rust.

   SP5 - White Metal Blast Cleaning: Removes all scale, rust, foreign matter. Leaves surface gray-white uniform metallic color.

   SP6 - Commercial Blast Cleaning: Two-thirds of each square inch free of all visible residues; remainder only light discoloration.

SP10 - Near-White Metal Blast Cleaning.

SP11 - Power Tool Cleaning to Bare Metal.

4. American Waterworks Association (AWWA)

   Standard for Painting and Repainting Steel Tanks, Stand-Pipes, Reservoirs, and Elevated Tanks for Water Storage, D-102.

5. American Concrete Institute (ACI)

   ACI 515.1R Guide to the Use of Waterproofing, Damp-proofing, Protective and Decorative Barrier Systems for Concrete

B. Include on label of container:

1. Manufacturer's name, product name, and number.

2. Type of paint and generic name.

3. Color name and number.

4. Storage and temperature limits.

5. Mixing and application instructions, including requirements for precautions which must be taken.

6. Drying, recoat, or curing time.

C. Pre-painting Conference

1. Before Project field painting starts, representatives for the Owner, Contractor, coating applicator, and coating manufacturer’s technical representative shall meet with Engineer.

2. Agenda for the meeting will include details of surface preparations and coating systems to ensure understanding and agreement by all parties for compliance.

D. Warranty

1. The coating manufacturers and applicators shall warrant their products and applications respectively against defects for a period of five (5) years under normal use. The warranty shall be in printed form.

E. In the event a problem occurs with coating system, surface preparation, or application, coating applicator and coating manufacturer's technical representative shall promptly investigate the problem and submit results to Engineer.

F. Stated VOC shall be unthinned maximum VOC certified by manufacturer.

G. A coating report shall be completed daily by Contractor at each phase of the coating system starting with surface preparation. These shall be submitted on the form attached at the end of this Section.

1.3 Submittals

A. Submit as specified in Section 1330.

B. Includes, but not limited to, the following:

1. Schedule of products and paint systems to be used. Schedule shall include the following information:

a. Surfaces for system to be applied.

b. Surface preparation method and degree of cleanliness.

c. Product manufacturer, name, and number.

d. Method of application.

e. Dry-film mil thickness per coat of coating to be applied.

2. Color charts for selection and acceptance.

3. Technical and material safety data sheets.

4. Certification by coating manufacturer(s) that all coatings are suitable for service intended as stated on each coating system sheet. If manufacturer has an equivalent product as that specified, but it is not suitable for the intended purpose, he shall submit the recommended product for approval at no increase in cost, and state reasons for substitution.

5. Contractor shall certify in writing to the Engineer that applicators have previously applied all the systems in this Specification and have the ability and equipment to prepare the surfaces and apply the coatings correctly.

1.4 Delivery, Storage, and Handling

A. Delivery of Materials

1. Deliver in original unbroken sealed containers with labels and information legible and intact. Containers shall also have correct labels with required information.

2. Allow sufficient time for testing if required.

3. Open and mix on the premises and in the presence of the Engineer. Any rejected material shall be at once removed from the premises. Colors shall be as selected by Engineer.

B. Storage of Materials

1. Store only acceptable materials on Project site in enclosed structures to protect them from weather and excessive heat and cold. Store in accordance with County and State Safety Codes.

2. Provide separate area and suitable containers for storage of coatings and related coating equipment.

3. Dispose of used or leftover containers, thinners, rags, brushes, and rollers in accordance with applicable regulations.

1.5 Regulatory Requirements

A. In addition to requirements specified elsewhere for environmental protection, provide coating materials that conform to the restrictions of the local and regional jurisdiction. Notify Engineer of any coating specified herein that fails to conform to the requirements for the location of the project or location of application.

B. Lead Content: Use only coatings that are totally lead free except for zinc-rich primers which shall not have a lead content over 0.06% by weight of nonvolatile content.

C. Chromate Content: Do not use coatings containing zinc-chromate or strontium chromate.

D. Asbestos Content: Materials shall not contain asbestos.

E. Mercury Content: Materials shall not contain mercury or mercury compounds.

1.6 Project Conditions

A. This Project is in a location in which drifting coatings, if spray-applied, could contaminate adjacent surfaces or vehicles nearby. All containment precautions and application methods shall be taken into consideration and implemented to prevent the above from occurring.

1.7 Inspection Service

A. Owner will engage in the services of an independent NACE certified coating inspection service, Level III certification.

B. Inspection service will provide full-time inspection of all field surface preparation and coating applications to ensure full compliance with the requirements of this Specification. The presence of the inspection service shall not relieve Contractor for compliance with Specifications or authorized changes.

C. Inspection service will document all work, including nonconformance, using forms acceptable to Owner and Engineer. All documentation and reports will be prepared and signed by the Inspection service representative, and submitted to Engineer on a daily basis. At the completion of all coating applications, Inspection service representative will also submit a conformance report certifying that all Work relative to coatings complies with the Specifications or authorized change.

D. Inspection service will be responsible for field verification and recommendations of the following field coating operations:

1. Surface preparation methods, equipment.

2. Substrate conditions, moisture content of concrete, substrate profiles, and surface temperatures.

3. Temperature, humidity, and wind conditions at times of coating applications.

4. Specified or approved coating verification.

5. Application equipment.

6. Coating wet and dry film thickness.

7. Proper coating curing.

8. Coating system failure, causes, and remedy.

E. Inspection service representative will discuss with Engineer, Owner, and Contractor all recommended Specification deviations, changes in products, or application methods.

PART 2 - MATERIALS

2.1 Acceptable Manufacturers

A. Acceptable manufacturers are as follows:

1. Sauereisen
2. Carboline
3. Raven Lining Systems
4. Ameron Protective Coatings Systems Group, Ameron Corp.
5. Devoe Coating Company, Division of ICI.
6. Futura Coatings, Inc.
7. The Glidden Company.
8. International Protective Coatings.
9. Keeler & Long, Inc.
10. Kop-Coat, Inc., Division of Carboline.
11. Pittsburgh Paints, PPG Industries Inc.
12. Santile, Division of Carboline Company, Inc.
13. Tnemec Company, Inc.
14. Polyken

2.2 General

A. Materials furnished for each coating system must be compatible to the substrate.

B. When unprimed surfaces are to be coated, entire coating system shall be by the same coating manufacturer to assure compatibility of coatings.

C. When shop-painted surfaces are to be coated, ascertain whether finish materials will be compatible with shop coating. Inform Engineer/ Architect of any unsuitable substrate or coating conditions.

D. Coating system shall be as specified below or to the manufacturer's standard, whichever is more stringent.

2.3 Areas of Application

A. Submerged Concrete Surfaces, exposed to H_2S vapor:
   1. Surface Preparation and coating system: In accordance with manufacturer's recommendations.
   2. Applied to all concrete surfaces including floors, walls, baffles and ceilings.
   3. Product and Manufacturer:
      a. Sauereisen 210
      b. Raven 405
      c. Plasite 5371
      d. Or approved equal.

B. Ferrous Metals including all Structural Steel, Miscellaneous Ferrous Metals, and all Ferrous Piping; Interior Non-submerged:
   1. Surface Preparation: SSPC-SP6 Commercial Blast Cleaning as specified in Paragraph 3.1.
   2. Interior non-submerged applies to areas that are housed within a building and/or within a non-process, enclosed structure.
   3. Product and Manufacturer: Provide one of the following:
      a. Tnemec:
         1) Shop Primer: 66 H.B. Epoxoline – two coats, 2-3 dry mils per coat
         2) Field Primer or Filed Touchup: 66 H.B. Epoxoline – one coat, 2-3 dry mils per coat.
         3) Finish: 69 H.B. Epoxoline II – tow coats, 4-5 dry mils per coat.
      b. Or approved equal

C. Ferrous Metals, Including all Ferrous Piping; Exterior Non-submerged:
   1. Surface Preparation: SSPC-SP6 Commercial Blast Cleaning as specified in Paragraph 3.1.

2. Exterior non-submerged applies to areas that are not housed within a building or structure, and that are not located within process and / or water carrying structures or tanks.
3. Product and Manufacturer: Provided one of the following:
    a. Tnemec:
        1) Primer: 66 H.B. Epoxoline – tow coats, 2-3 dry mils per coat.
        2) Intermediate: 69 H.B. Epoxoline II – one coat, 4-5 dry mils.
        3) Finish: 75 Endura-Shield – tow coats, 1.5-2 dry mils per coat
    b. Or approved equal.

D. Galvanized Metal and Non-Ferrous Metal; Interior Non-Submerged:
1. Surface Preparation: SSPC-SP1 Solvent Cleaning, as specified in Paragraph 3.1.
2. Interior non-submerged applies to areas that are housed within a building and/or within a non-process, enclosed structure.
3. Product and Manufacturer: Provide one of the following:
    a. Tnemec:
        1) Primer: 66 H.B. Epoxoline – one coat, 3-4 dry mils
        2) Finish: 69 H.B. Epoxoline II – one coat, 4-5 dry mils.
    b. Or approved equal.

E. All Aluminum in Contact with Dissimilar Materials:
1. Surface Preparation: Remove all foreign matter.
2. Product and Manufacturer: Provide one of the following:
    a. Tnemec:
        1) 66 H.B. Epoxoline – two coats, 2.0 – 3.0 dry mils per coat
    b. Or approved equal.

F. PVC Piping, CPVC Piping, Fiberglass, Fiberglass Insulation Covering; Exterior:
1. Surface Preparation: Sand as specified by the coating manufacturer.
2. Exterior applies to areas that are not housed within a building and/or within an enclosed structure.
3. Product and Manufacturer: provide one of the following
    a. Tnemec:
        1) Primer/Intermediate: 66 H.B. Epoxoline – one coat each, 2.0 – 3.0
        2) Finish: 75 Endura-Shield – one coat, 3.0 dry mils
    b. Or approved equal.

G. PVC Piping, CPVC Piping, Fiberglass, Fiberglass Insulation Covering; Interior Non-Submerged:

1. Surface Preparation: Sand as specified by the coating manufacturer.
2. Product and Manufacturer: Provide one of the following:
    a. Tnemec:
        1) Primer/Intermediate/Finish: 66 H.B. Epoxoline – one coat each, 2.0 – 3.0 dry mils per coat.
    b. Or approved equal.

H. Steel and Galvanized Steel Pipe; Buried Exterior:
1. Surface Preparation: SSPC-SP10, Near-White Blast, as specified in Paragraph 3.1.
2. Product and Manufacturer: Provide one of the following:
    a. Tnemec:
        1) Primer: 66-1211 Epoxoline – two coats, 3-4 dry mils per coat.
        2) Field Primer or Field Touchup: Surface preparation as specified.
        3) Finish: 46-413 Tneme-Tar – two coats, 10.0 dry mils per coat.
    b. Or approved equal.

I. Submerged or Intermittently Submerged Ferrous Metals; Interior and Exterior:
1. Definition: Submerged shall apply to all metals below the maximum water surface elevation in open top structure unless otherwise noted or otherwise shown; and to all metals within liquid or residual solids carrying structures that are covered, including all metals on the underside of the covers unless otherwise noted or otherwise shown; and to all metals within an enclosed process structure. This shall apply to all metals whether intermittently or continuously submerged.

2. Surface Preparation: SSPC-SP 10 Near-White Blast Cleaning as specified in Paragraph 3.1.
    a. Tnemec:
        1) Primer: 69-1211 Epoxoline II – tow coats, 3-4 dry milsper coat.
        2) Intermediate: 69 H.B. Epoxoline II – tow coats, 5 dry mils per coat.
        3) Finish: 69 H.B. Epoxoline II – two coats, 5 dry mils per coat.
    b. Or approved equal.

J. Special Requirements for Aluminum:
1. Aluminum surfaces bearing in or embedded in concrete and fayin surfaces of bolted aluminum joints, except anchor bolts, shall be

given two coats of 66 H.B. Epoxoline Primer, or approved equal. The primer shall be allowed to dry between coats and before concrete is poured against it.

2. Where aluminum metals are placed in contact with or fastened to ferrous or stainless steel metals, the contact surfaces of each shall receive the protective coating specified for that metal and a gasket shall be placed between the two contact surfaces. The gasket material shall be non-conductive commercial grade neoprene, 60 durometer, 0.03-inch in thickness unless otherwise specified. Bolts shall be isolated using one piece non-conductive sleeves and washers as manufactured by PSI Products, Inc., Burbank, California: Parker Seal Col, Culvert City, California, or approved equal.

K. Galvanizing: All galvanizing, where called for in the Contract Documents, shall be hot-dip process conforming to ASTM A-123:

1. Surface Preparation: All surfaces to be clean and free of contaminants prior to application of the coating system.
2. Prime Coat: Series 104 H.S. Epoxy; one coat 4-5 mils DFT.
3. Finish Coat: Series 104 H.S. Epoxy; one coat 4-54 mils DFT.

L. Concrete Semi-Gloss Latex:

1. Surface Preparation: All surfaces to be clean and free of contaminants prior to application of the coating system.
2. Prime Coat: Series 7 Tneme-Cryl; one coat 2-3 mils DFT.
3. Finish Coat: Series 7 Tneme-Cryl; one coat 2-3 mils DFT.

M. Ductile and Cast Iron (Exterior Exposure):

1. Surface Preparation: Solvent scrub with stiff bristle brush followed by brush-off abrasive blast cleaning to a minimum surfaces profile depth of 1.5 mils.
2. Prime Coat: Series 69-1255 (beige) H.B. Epoxoline II: one coat 3-5 mils DFT.
3. Finish Coat: Series 73 Endura-Shield; one coat 3-4 mils DFT.

N. Ductile and Cast Iron (Interior Exposure):

1. Surface Preparation: Clean, dry, and free of contaminants
2. Prime Coat: Series 135 Chembuild; one coat 4-6 mils DFT.
3. Finish Coat: Series 69 H.B. Epoxoline II; one coat 4-6 mils DFT.

O. Ductile and Cast Iron (Buried):

1. Surface Preparation: Solvent scrub with stiff bristle brush followed by brush-off abrasive blast cleaning to a minimum surface profile depth of 1.5 mils.
2. Prime Coat: Series 69-1255 (beige) H.B. Epoxoline II; one coat 3-5 mils DFT.
3. Finish Coat: Series 69 H.B. Epoxoline II; one coat 4-6 mils DFT.

P. Ductile and Cast Iron (Immersions):

1. Surface Preparation: Solvent scrub with stiff bristle brush followed by brush-off abrasive blast cleaning to a minimum surface profile depth of 1.5 mils.
2. Prime Coat: Series 66 H.B. Epoxoline; one coat 4-6 mils DFT.
3. Finish Coat: Series 69 H.B/ Epoxoline II; one coat 4-6 mils thick.

Q. Stainless Steel Duct (Buried):

1. Surface Preparation: SSPC-SP6 Commercial Blast Cleaning or manufacturer's recommendations, whichever is more stringent.
2. Prime Coat: Polyken 1019 or 1027, or approved equal.
3. Finish Coat: Polyken 905 tape, or approved equal.

2.4 Surfaces Not to be Coated

A. Do not field paint any of the following items unless specifically noted otherwise.

1. Factory finished equipment, except for touch-up.

2. Metal surfaces of aluminum, stainless steel, copper, bronze and similar finished materials.

3. Equipment nameplates, valve stems, moving shafts and linkages.

2.5 Color Coding of Piping

A. Color Coding of Piping: Exterior and interior by color coding entire pipe.

1. General

a. Coat piping with solid colors as specified below for entire length of pipe in exposed finished and unfinished areas. Exclude areas in pipe chases and furred areas.

b. Coat all other piping in colors matching adjacent surfaces. If adjacent area is unfinished, paint in color determined by Engineer/Architect.

c. Identify piping with letters, arrows and bands as specified below. Apply after completion of finish coating.

2. Color Scheme

Description	Pipe and Band Color	Letter and Arrow Color
Potable Water (hot or cold)	Light blue	Black
Nonpotable or Raw Water	Light blue with red bands	Black
Seal Water	Dark blue with red bands	White
Low Pressure (Air) Aeration supply	Light green	Black
Sewage	Light gray	Black
Sludge	Light brown	White
Scum	Dark brown	White
Drain	Dark gray	White
Sample	Light gray with green bands	Black
Sprinkler Piping	Red	White

In addition, special painting of the following items will be required.

Item	Color
Valve handwheels and levers	Red

Number at least 2 inches high shall be painted on or adjacent to all accessible valves, pumps, flowmeters, and other items of equipment which are identified on the drawings or in the specifications by number.

3. Location of Letters, Arrows and Bands

a. Place letters, arrows and bands on piping near connections to equipment, adjacent to valves or fittings, on both sides of walls penetrated, and at intervals not to exceed 25 feet.

b. Place arrows adjacent to or below letters depending upon visibility. Place arrows in direction of flow. For dual-flow piping, indicate both directions.

c. Locate letters to be visible from normal line of vision above floor level. Letter locations subject to approval of Engineer/Architect.

d. Band to be full circumference of pipe.

4. Letter, Arrow and Band Size

a. Block-style letters, all capitals, conforming to ANSI A13.1 and as follows:

Outside Diameter of Letters Pipe or Covering	Size of Letters and Arrows	Width of Banding
Less than 3/4"	Approved metal tag or band	6"
3/4" to 1-1/4"	1/2"	8"
1-1/2" to 2"	3/4"	8"
2-1/2" to 6"	1-1/4"	12"
8" to 10"	2-1/2"	24"
Over 10"	3-1/2"	32"

5. Vent lines, electrical conduit and related electrical accessories shall be painted to match adjacent wall surfaces as directed by ceiling space shall be painted same as surfaces adjacent to the wall surfaces.

PART 3 - EXECUTION

3.1 Surface Preparation

A. Prepare surfaces for each coating system conforming to SSPC or ASTM surface preparation specifications listed.

1. If grease or oils are present, SSPC-SP1 must precede any other method specified.

2. Remove surface irregularities such as weld spatter, burrs, or sharp edges prior to specified surface preparation.

3. Undertake specified surface preparation in accordance with the coating manufacturer’s recommendations.

B. Depth of profile will be as specified or as recommended by the manufacturer for each system, but in no instance shall it exceed one-third of the total dry film thickness of complete system.

C. Prepare only those areas which will receive the first coat of the system on the same day.

1. On steel substrates, apply coating before rust bloom forms.

D. Concrete surfaces shall be adequately cured in accordance with SECTION 3300 and a minimum of 28 days old prior to coating application.

E. Abrasives for blasting shall be free of oil, washed and dry, unused silica sand, coal, copper or nickel slag that have sharp and hard cutting surfaces. Abrasives approved by Powertech Laboratories are strongly recommended.

F. Sharp projections and weld splatter shall be ground smooth. All areas ground smooth shall be reblasted prior to the coating application.

G. Sharp edges shall be ground round and smooth to radius = 1/8 prior to the coating applications for structural steel in Highly Corrosive Areas and for Immersion Services.

H. After abrasive blasting, steel surfaces must be completely dust free (cleaned by vacuum and/or blown off with oil/water-free compressed air), oil and grease free, and have a chloride concentration of less than 3 µg/cm2.

I. Unless otherwise specified, the steel profile must be 1.5 - 2.5 mils in depth and jagged as opposed to a peen pattern.

J. All welds shall be stripe coated by brush with the primer, prior to the application of the full primer coat. Note that inorganic zinc coatings shall not be applied by brush except to very small areas. Stripe coating shall be by spray.

K. Unless approved by the Paint Manufacturer to the contrary, the blast surface shall be primed prior to the development of rust bloom or other contaminants and not later than 8 hours after surface preparation.

L. Oxidation of the steel due to deleterious conditions may necessitate reblasting or sweep blasting the surface to restore the specified cleanliness standard.

3.2 Application

A. Apply coatings in accordance with coating manufacturer's recommendations.

B. All work shall be undertaken by skilled applicators who are qualified to perform the required work and have a minimum of 5 years experience in similar applications. The work shall be done in a manner comparable to the best standards of practice found in that trade. All materials shall be evenly

applied so as to be free from sags, runs, crawls, wrinkles, holidays, or any other defects. All coats shall be of the minimum of brush marks. When finished and dried, brush strokes shall appear in one direction only, and there shall be no curved brush marks showing. All coats shall be thoroughly dry before the succeeding coat is applied. All coats that are intended to hide shall be given another coat if the coating does not properly hide the undercoat.

C. Use properly designed brushes, rollers, and spray equipment for all applications.

D. Spraying shall be done in the cross lap method of spraying, streaking first in one direction and shortly later spraying across this section at right angles to the first set of passes.

E. On unprimed surfaces apply first coat of the system the same day as surface preparation.

F. Dry film thickness of each system shall meet the minimum specified. Maximum dry film thickness shall not exceed the minimum more than 20% or coating manufacturer's requirements if less. Where a dry film thickness range is specified, the range shall not be less than or exceeded.

G. Shop and field painting shall remain 3 inches away from unprepared surface of any substrate such as areas to be welded or bolted. H. Environmental Conditions:

1. Do not apply coatings when inclement weather or freezing temperature may occur within coating curing time requirements. Atmospheric temperature must be maintained between 60ºF and 85ºF for at least 48 hours prior to and during application, unless otherwise approved by coating manufacturer.

2. Wind velocities for exterior applications shall be at a minimum to prevent overspray or fallout and not greater than coating manufacturer's limits.

3. Relative humidity must be less than 85% and the temperature of the surface to be painted must be at least 5ºF above the dew point.

4. Provide adequate ventilation in all areas of application to ensure that at no time does the content of air exceed the Threshold Limit Value given on the manufacturer's Material Safety Data Sheets for the specific coatings being applied.

I. Recoat Time: In the event a coating, such as an epoxy, has exceeded its recoat time limit, prepare the applied coating in accordance with manufacturer's recommendations.

J. Protection

1. Cover or otherwise protect surfaces not to be painted. Remove protective materials when appropriate.

2. Provide signs to indicate fresh paint areas.

3. Provide daily cleanup of both storage and working areas and removal of all paint refuse, trash, rags, and thinners. Dispose of leftover containers, thinners, rags, brushes, and rollers which cannot be reused in accordance with applicable regulations.

4. Do not remove or paint over Equipment data plates or code stamps on piping.

5. Mask, remove, or otherwise protect finish hardware, machined surfaces, grilles, lighting fixtures, and prefinished units as necessary.

6. Provide cover to prevent paints from entering orifices in electrical or mechanical equipment.

3.3 Inspection

A. Contractor shall provide and use a wet film gauges to check each application approximately every 15 minutes in order to immediately correct film thickness under or over that specified.

B. Contractor shall provide and use a dry film gauge to check each coat mm (mil) thickness when dry, and the total system mm (mil) thickness when completed.

C. Use holiday or pinhole detector on systems over metal substrates to detect and correct voids when indicated on system sheet.

D. Furnish a sling psychrometer and perform periodic checks on both relative humidity and temperature limits.

E. Check temperature of the substrate at regular intervals to be certain surface is 5ºF or more above the dew point.

3.4 Cleaning and Repairs

A. Remove spilled, dripped, or splattered paint from surfaces.

B. Touch up and restore damaged finishes to original condition. This includes surface preparation and application of coatings specified.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Measurement: No measurement will be made for this item, Protective Coatings.

4.2 Payment: Payment will be made at the contract lump sum price bid and shall be considered full payment for providing labor and materials to perform this work.

COATING REPORT

Contract Name: _____ Contract No.:_____
Coating Contractor: _____ Foreman: _____
Unit or Surface Identification: _____
Unit or Surface Location: Exterior: _____, Interior: _____

Surface Preparation:
Date _____; Air Temp _____ºF; Relative Humidity _____%
Method of Surface Preparation: _____
Profile achieved _____ mils (if applicable).

Touch-Up:
Date _____; Time _____; Air Temp _____ºF; Surface Temp _____ºF
Relative Humidity _____%; Dew Point _____ºF
Coating Used _____; Dry Film Obtained _____mils.

First Coat:
Date _____; Time _____; Air Temp _____ºF; Surface Temp _____ºF
Relative Humidity _____%; Dew Point _____ºF
Coating Used _____; Dry Time Before Recoat _____hrs.
Dry Film Obtained _____ mils.

Second Coat:
Date _____; Time _____; Air Temp _____ºF; Surface Temp _____ºF
Relative Humidity _____%; Dew Point _____ºF
Coating Used _____; Dry Time Before Recoat _____hrs.
Dry Film Obtained _____ mils.

Third Coat:
Date _____; Time _____; Air Temp _____ºF; Surface Temp _____ºF
Relative Humidity _____%; Dew Point _____ºF

Coating Used _____; Dry Film Obtained _____mils.

END OF SECTION

DIVISION 15
MECHANICAL

SECTION 15501

AUTOMATIC BACKWASH SAND FILTER

PART 1: GENERAL

1.01 SCOPE OF WORK

A. Contractor to furnish all labor, materials, equipment and incidentals required for rebuild of two (2) 9' x 46 automatic backwash filter mechanisms as shown on the drawings and as specified herein, installed, tested and ready for operation.

B. Components for the rebuild shall include: porous plates, retaining angles/sealant and hardware, spacer rods and hardware, filter media, cleaning and backwash mechanism bridge assembly complete with interconnected automatic operating controls including electrical wires, electrical feed line system and suspension system, rails, rail anchor bolts, and the removal and reinstallation of the washwater launders with new support brackets and hardware. The washwater launders and the cell dividers will be bid adders and the Owner will inform the Contractor if they will be replaced.

C. After the filter media is removed, the Contractor, Owner, and Engineer will inspect the condition of the existing porous plates. The filter manufacturer will be present for the inspection and will include the travel and inspection cost in their pricing. Replacement of the porous plates will be a bid adder. Owner will inform Contractor if the porous plates will be replaced.

D. The concrete structure with influent and effluent ports, cell dividers and hardware, and festoon posts are to be reused. Any other components not listed below are to be reused.

1.02 QUALIFICATIONS

A. To assure unity of responsibility, the backwash mechanism, the porous plates assembly, the filter media, the washwater launder and brackets, and the bridge rail and components (including anchor bolts) shall be furnished (as necessary) and/or coordinated by a single manufacturer.

B. The automatic backwash filter replacement components shall be manufactured by:
   1. Aqua-Aerobic Systems, Inc., of Loves Park Illinois
   2. Veolia ABW* Automatic Backwash Filter
   3. Or pre-bid approved equal. Submittals for alternative systems must be submitted a minimum of 5 days prior to the bid due date or approval.

C. The manufacturer must have a minimum of ten separate installations of this same specified design (only the length of the filter bed may vary) installed in concrete tankage, and have been in operation a minimum of five years, filtering flow from secondary clarifiers for tertiary filtration at a municipal wastewater treatment plant.

1.03 SUBMITTALS

A. Shop Drawings: Submit for approval thr following:

1. Copies of manufacturer's specifications, dimension diagrams, and installation instructions for the devices.

1.04 SPECIFICATION PRECEDENCE

A. The specifications for equipment and controls under this section supercede specifications for equipment and controls specified elsewhere in the contract documents and drawings. Purchased components such as gear reducers, pumps, motors, and valves, shall be provided with standard recommended manufacturers paint, unless otherwise specified within this section.

1.05 WARRANTY

A. The Manufacturer shall provide a written warranty against defects in materials and workmanship. Manufacturer shall warrant the goods provided by the Manufacturer to be free from defects in materials and workmanship under normal conditions and use for a period of one (1) year from the date the goods are put into service, or eighteen (18) months from shipment of equipment, whichever first shall occur. This warranty shall not apply to any goods or part which has been altered, applied, operated or installed contrary to the Manufacturer's instructions or subject to misuse, chemical attack/degradation, negligence or accident.

1.06 OPERATING INSTRUCTIONS

A. Operation and maintenance manuals shall be furnished. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, description, etc., that are required to instruct operation and maintenance personnel unfamiliar with such equipment.

B. A factory representative who has complete knowledge of proper operation and maintenance shall be provided for to instruct representatives of the Owner and the Engineer on proper operation and maintenance. This work shall be conducted in conjunction with the inspection of the installation and test run as provided under PART 3.

PART 2: PRODUCTS

This specification is based on the Agua Aerobics Automatic Backwash Sand Filter. Standard components and systems associated with the Veolia ABW* Automatic Backwash Filter are also acceptable.

2.01 DESIGN CRITERIA

A. Filtered water shall average less than 2 NTU over 24-hours with a maximum single reading of 5 NTU per day. Each filter shall be capable of 1.25 MGD at average flow and 2.5 MGD at peak flow. Minimum performance standards are as follows:

Operating Condition	Flow Rate, mgd	Duration, hours	Clarifier Effluent TSS, mg/L	Filter Effluent Turbidity, NTU
Average Design Conditions	2.5	Indefinite	10-15	<1, 90% of time, Never > 2
Peak Flow	5	3 hours	23.8	2
Process upset	5	8 hours	23.8	5

B. Filters will provide tertiary filtration via gravity flow through a minimum 11-inch deep sand bed. The filter provides continous service while backwashing the individual cells with a conventional traveling bridge system.

C. Filter is fully automatic and is controlled locally by a control panel.

2.02 MATERIALS AND EQUIPMENT

A. All structural steel used in the fabrication of the equipment shall be stainless steel and conform to the requirements of "Specifications", ASTM Designation A-240. All welding shall conform to the latest standards of the American Welding Society.

B. Spare Parts - The equipment manufacturer shall include their recommended spare parts in their bid and will provide with the equipment.

C. Spare Parts Price Sheet – Manufacturer to provide a parts price sheet for all filter components. Pricing shall be guaranteed for five years after bid date.

2.03 POROUS PLATES SYSTEM

A. The Contractor Shall notify the Owner/Engineer atleast 48 hours in advance to inspect porous plates after the removal of filter media. Based on the condition of

the filter beds the Owner may request for a replacement or to reuse the existing porous plates

B. *The existing cell dividers, leveling angles, foot angles, and associated hardware shall be reused.*

C. *The existing fiberglass influent and effluent headers shall be reused. The existing recessed ports shall be reused.*

D. Filter Media Support System: The filter media support system shall consist of HDPE porous plates that meet the following requirements:

1. Porosity: 500 micron
2. Modulus of Rupture: 700lbs./sq. in.
3. Air Permeability: 100 S.C.F.M. per ft² per 3/4" thick plate at 1" water column pressure
4. Thickness: 3/4 (nominal)

E. The porous plates shall be completely sealed in place with a gasket-forming type sealant such as polyurethane. The porous plates shall be held down by a fiberglass reinforced polyester retaining angle attached to the cell divider with 1/4" stainless steel fasteners through factory pre-drilled holes.

2.04 GRANULAR MEDIA

A. The filter shall have a nominal sand media depth of 11" . The depth specified shall be obtained when the filter is completely submerged and after thorough backwashing to remove all media fines. The sand media shall be a high-grade silica sand with a minimum of 85% silica dioxide complying with Sections 1, 2.2 and 5 of the Standard Specifications for Filtering Material (AWWA Designation: B100-09). The sand shall be well graded and materials showing abnormal grading will be rejected. The particle size distribution shall be determined by screening through standard U.S. Series sieves. The percent size shall be determined from a plot of the percentages of the material passing each sieve, against the rated openings of the sieve. The 10% size or effective size shall be between 0.55 and 0.65 millimeters. The uniformity coefficient (ratio of 60% size to 10% size) shall not exceed 1.50.

2.05 RAILS AND ANCHOR PLATE ASSEMBLIES

A. Rails shall be 30 lb. ASCE with splice plates, 304 stainless steel anchor assemblies, 304 stainless steel rail caps and bridge stops are to be included. A sufficient number of anchor plate assemblies to allow clamping the rail every 4

feet along its length shall be included. Each rail anchor assembly shall include two (2) galvanized rail retaining clips.

B. Each anchor plate installation shall be Type 304 stainless steel consisting of two(2) anchor bolt assemblies, two (2) leveling nuts, and a floating leveling plate. After the walls have been set, the workman shall level and true the rail by the use of the nuts and leveling plate. Upon completion of this operation, the exposed anchor plate, nuts, leveling plates, and rail shall be grouted in place by the contractor.

2.06 WASHWATER LAUNDER

A. The existing washwater launders shall be removed and reinstalled after the completion of the conrete repair and filter replacement work. Contractor to replace the existing hardware and support brackets. 304 stainless steel mounting brackets and stainless steel hardware shall be provided to fasten the trough assembly to the basin wall at 8 foot intervals the full basin length. The stainless steel mounting bracket shall encompass 75% of the outer surface of the trough. A weir shall be furnished and designed to mount in the launder to calibrate the washwater and backwash pumps.

2.07 BACKWASH MECHANISM ASSEMBLY

A. Bridge: The bridge mechanism shall contain and support the drive mechanism, pumps, backwash piping and valves, washwater hood and controls. The bridge frame shall be welded 304 stainless steel construction allowing a maximum deflection of 1/720 of the span with a 100 lb./sq. ft. live load. The bridge shall be 48" wide with a walkway of 1/4" aluminum check plate. The handrails shall be of 1.5" diameter aluminum pipe along each side of the bridge walkway, with removable chains across the ends.

B. Bridge Construction: The bridge weldment shall consist of two (2) parallel beams, formed from a minimum of 3/8" thick stainless steel plate, and 1/4" thick cross supports. The beam formations shall be at least 14" high and have a flanged leg of 3-1/2" minimum. All other bridge supports welded to the frame shall be a minimum of 1/4" thick. All welded stainless steel shall be type 304.

C. Drive Mechanism: The bridge drive unit consists of one single speed, 1/2 HP (T.E.F.C.), 460 volt, 3 phase, 60 hertz motor with 1.15 service factor, ambient temperature rating of degrees celsius, a gear reducer having minimum torque rating of 5100 inch-lbs., a drive shaft and self aligning, flanged bearings.

1. All gearing shall be fully enclosed in an oil-tight cast housing with the gears running in oil and all bearings of anti-friction type.

2. The steel drive shaft shall be a minimum diameter of 1-15/16", turned, ground, polished and shall have a rust inhibiting PVC covering.

3. The drive shaft shall be supported by self-aligning anti-friction ball bearings. All bearings shall have lubrication fittings easily accessible from the bridge walkway.

4. All bridge wheels shall be solid, double-flanged, 316 stainless steel. Both wheels on backwash end of the bridge shall be locked to the shafts to maintain proper alignment with backwash wear strip. The wheels on the influent end of the bridge shall be capable of compensating for minor misalignment of rails by sliding on the shafts.

D. Pumps: The backwash and washwater systems shall each be powered by submersible pumps that shall have mountings suspended from the filter bridge. The pumps shall be constructed of cast iron. A single pump system shall not be allowed.

1. Each pump shall be capable of a minimum pumping rate of 17 gallons per minute per ft^2 of cell area. The pumps shall be equipped with stainless steel shafts and trim.

2. All motors shall be provided with sealed conduit boxes. Motors shall be rate 3 horsepower (maximum) designed for 3 phase, 60 hertz, 460 volt power supply, NEMA B design, single-speed with Class B insulation.

E. Backwash Frame and Shoe: A 304 stainless steel fabricated backwash frame shall be attached to the traveling bridge on the effluent channel side. The backwash shoe shall be mounted on the backwash frame such that it can independently follow any irregularities of the matching backwash wear strip. This flexible movement shall be controlled by 300 series stainless steel springs and fasteners. The shoe shall attach to Schedule 80 PVC piping by means of a flexible hose. A pivoting backwash frame is not allowed.

1. There shall be provided a replaceable wear strip against which the backwash shoe will slide. The strip shall be fastened to the effluent header sections by means of threaded 3/8" counter-sunk 304 stainless steel fasteners and internally threaded concrete insert anchors, formed within the effluent wall. The wear strip shall extend one foot beyond the headers on both ends of the basin. Its joints shall not superimpose the effluent header joints, but shall overlap the effluent header joints. The wear strip shall be recessed into the effluent wall with its face only exposed and flush with the outside of the wall.

F. Washwater Hood: The washwater hood shall be fabricated from 304 stainless steel. It shall be designed to permit the uniform expansion of the filter media. The hood width shall be 2.0 times the cell width. A stainless steel manifold shall be an integral part of the upper portion of the washwater hood and shall connect with the washwater pump. The washwater hood shall contain two full-length scarifier blades constructed from high density polyethylene. Fiberglass hoods with PVC manifolds will not be allowed. The hood shall be capable of supporting the washwater pump without additional supports or hangers connected to the pump.

2.08 STRETCH CABLE ELECTRICAL SYSTEM

A. The electrical supply cable will be four-conductor, #10. The supporting cable will be 3/8" diameter x 7 x 19 stainless steel aircraft type stranded wire with galvanized turnbuckle and stainless steel fittings. The electrical cable will be supported every 8 feet for the length of the basin by nylon trolley carriers. Each carrier clamps and supports the electrical cable. Cable shall be rated for use in wet environments and exposure to sun. Insulation shall be rated for 75 degrees celsius (minimum).

B. Upon traveling to the end of the basin, the looped cable is extended to form a draped cable; as the cable returns, the loops are retracted by the action of the cable guide fastened to the bridge, towing the lead carrier.

Note: The existing festoon posts are to be reused.

2.09 FACTORY PAINTING

A. Shop painting (prime and finish) shall be carefully done by the filter manufacturer and all coatings applied in a workmanlike manner in strict accordance with the paint manufacturer's published recommendation.

1. All ferrous metal purchase components including gear-motors, pumps, and bearings shall given an additional top coat of safety blue enamel over the manufactures original finish prior to assembly.

B. Rails shall be shop cleaned by sandblasting in accordance with the steel structures painting council specification (SSPC) SP-6 prior to priming.

1. Rails shall be prime coated only with Tnemec Series N69-1211 primer. One (1) coat of primer shall be applied resulting in a finished dry film thickness of 3.0 to 5.0 mils.

2.10 CONTROL SYSTEM

A. The automatic and manual controls for operation of the ABW filter system shall be furnished fully assembled, wired in a NEMA 4X rated and UL certified control enclosure.

B. Included in the panel shall be controls, a manually adjusted timing device, relays and motor starters for each pump motor and carriage motor. These motors may be actuated automatically by a predetermined increase in hydraulic head, or by the timing device to control the interval between each cleaning cycle. The cleaning cycle is terminated by a low water level signal. The "off time" of the cleaning cycle shall be controlled by a reset timer with a range of one minute to sixty hours. When the timer times out, the motors shall be actuated. During the "on time," the timer shall be de-energized and reset for starting "off time" at the end of the cycle. Should high water occur during "off time," the motors shall be started by a relay actuated from the high water signal, with a corresponding resetting of the timer.

C. The control system shall include the following control components and practices:

2.10.1 CONTROL PANEL WIRING AND ASSEMBLY

A. All control enclosures shall be custom assembled and wired in an Underwriters Laboratories (UL) certified cabinet shop using quality materials and labor.

B. All control panel wire shall be 16 AWG multi-strand machine tool wire (MTW) minimum, with PVC insulation. All convenience outlet and interior lighting wiring shall be 14 AWG minimum.

C. Wire colors are as follows:

208 VAC or higher	-	Black
120 VAC control power	-	Red
Neutral	-	White
Ground	-	Green
AC Power from remote source	-	Yellow
Neutral from remote source	-	White with Yellow Stripe
24 VDC (+)	-	Blue
24 VDC (-)	-	White with Blue Stripe
VDC (+) from remote source	-	Orange
VDC (-) from remote source	-	White with Orange Stripe
Intrinsically Safe	-	Light Blue

D. All wires shall be clearly marked with an identification number consistent with the wiring schematic drawing. Wire markers shall be a thermal transfer printable

type. The material shall be a self-laminating vinyl. Labels shall be Brady THT-9-427-10 or approved equal.

E. Wiring inside the control panel shall be run in PVC wiring duct rated for continuous temperatures up to 122° F (50°C). Devices mounted in the enclosure door shall have wires run in spiral wrap to avoid pinch points when opening and closing the door.

F. Control components mounted internal and external to the enclosure shall be mounted with stainless steel hardware and clearly labeled with a plastic identification nametag. The tag shall be white with black lettering.

2.10.2 CONTROL PANEL QUALITY ASSURANCE

A. All Control panels shall be UL certified. Testing by manufacturer's electrical engineering prior to releasing for shipment shall be completed. Testing shall consist of the following:

Point to point testing of all wiring prior to application of power
Intended supply voltage shall be applied to the enclosure
All components shall be tested for proper operation and calibration
The timer function and level controls shall be functionally checked
All components shall be checked to confirm proper mounting specifications have been followed
Enclosure shall be inspected for defects and repaired if necessary
All labeling of wires and devices are correct, properly installed and clean

B. The manufacturer shall finalize the factory checkout by completing a control panel checklist to document all testing completed above. This document must be signed by Engineering, prior to release for shipment.

C. Upon the successful completion of the control testing of the enclosure assembly, all applicable documentation (i.e. finalized drawing set, signed control checklist cover page, device data sheets, etc.) shall be placed in the drawing pocket of the enclosure.

2.10.3 CONTROL ENCLOSURE

A. The automatic controls shall be provided in a UL listed, NEMA Type 4X stainless steel (14 gauge) enclosure that provides insulation and protection for electrical controls and components indoors and outdoors. Enclosure shall include a seamless foam-in-place gasket to assure watertight and dust-tight seal. An internal 3-point latch and 316SS padlocking handle shall be provided. Enclosure shall include a painted white mild steel (12 gauge) sub-panel mounted with collar studs. Enclosure shall be manufactured by Hoffman or approved equal.

2.10.4 CORROSION INHIBITOR

A. Each control enclosure assembly shall be provided with corrosion inhibitors to protect interior electrical components from damage caused by high humidity. The corrosion inhibitors shall be installed prior to shipment to provide protection during shipment and storage of the enclosure. The corrosion inhibitor shall be Hoffman AHCI5E or approved equal.

2.10.5 MAIN DISCONNECT CIRCUIT BREAKER

A. A UL listed, automatic molded case 3-pole disconnect breaker shall be provided in the control enclosure(s). The primary function of the disconnect switch shall be to provide a means to manually open a circuit and automatically open a circuit under overload or short circuit conditions. The disconnect breaker shall have a door mounted operating mechanism with trip indication. Power distribution connectors shall be mounted integrally to the circuit breaker for multiple load connections. Integral connectors shall be provided. The disconnect circuit breaker shall be a Square D/FAL, HDL, JDL, LAL, MGL, PGL or approved equal.

2.10.6 MOTOR STARTER

A. Starters shall be full voltage reversing and non-reversing. Each starter shall consist of a contactor and overload relay. Assembled starter shall comply with NEMA, UL, EEMAC, CSA, IEC, VDE and other international standards. Contactors shall be rated 600 V, 60 hertz AC and sized to accommodate the associated motor to be controlled as indicated on the drawings, unless otherwise noted. Mechanical-life of 10 million make/break operations. Auxilliary contacts shall be rated for 120 V minimum. Overload relay shall have NEMA class 10 tripping characteristics, ambient compensation, time delay and phase loss sensitivity, reset button with trip-free feature, manual/automatic reset, circuit test button and field adjustable.

2.10.7 TRANSFORMER

A. A step-down multi-tap transformer shall be supplied when there is a necessity to reduce incoming 3-phase power to 120 VAC single-phase. The transformer power wire connections (incoming and outgoing) shall be protected with a finger-safe cover to protect against accidental contact. Primary and secondary fuse protection shall be provided. Transformer shall be UL listed and of continuous wound construction with vacuum impregnated with non-hygroscopic thermosetting varnish. Transformer shall be Square D 9070T or approved equal.

2.10.8 TRANSFORMER PRIMARY AND SECONDARY FUSE

A. Properly rated fuses and fuse blocks shall be provided for primary and secondary protection of the transformer. Each fuse shall be equipped with a thermoplastic

cover to protect against accidental contact. Clip style fuse block shall be rated up to 600 VAC and 100 amps, dual element, time delay fuses shall be rated up to 600 VAC. Fuse blocks and fuses shall be UL listed. Fuses shall be Littelfuse Class CC or approved equal. Fuse blocks and fuse covers shall be manufactured by Marathon or approved equal.

2.10.9 CIRCUIT BREAKER

A. All single phase branch or supplementary circuits shall be protected with a single-pole, C-Curve rated circuit breaker. Circuit breakers shall be rated for 240 VAC maximum, 50/60 Hz and UL 489 listed. Supplementary and branch protection circuit breakers shall be Merlin Gerin Multi 9 or approved equal.

2.10.10 FUSE

A. Properly rated fuses and fuse holders shall be provided for protection of individual control devices (discrete and analog signals) mounted outside of the enclosure. Each fuse shall be housed in a hinged type fuse block to protect against contact with the fuse. Fuses shall be rated up to 250 VAC and be Littelfuse or approved equal. Fuse holders for discrete devices shall be rated to 600 VAC and 30 Amps. Fuse holders for analog devices shall be rated to 300 VAC and 15 Amps. Fuse holders shall be Allen Bradley 1492 or approved equal.

2.10.11 OPERATOR DEVICE

A. Operator devices (pushbuttons and selector switches) shall be mounted through the control enclosure door for manual operation of the filter. Transformer type pilot lights and illuminated pushbuttons shall be provided for indication of an operation status. Lights shall be a 6 VAC incandescent type lamp. Color coding shall be applied as required and is as follows:

Amber – Alarm active, caution
Green – Valve open, motor running
Red – Valve closed
White - Information

B. All operator devices shall be UL Listed, 30.5mm style, NEMA Type 4X rated, oil and water tight with finger safe guards located on the contact blocks to prevent accidental contact with wire connections. Operator device function shall be identified with an engraved white Gravoply nameplate with black letters. Operator devices shall be Allen-Bradley 800H, Square D 9001, or approved equal.

2.10.12 INDUCTION RELAY

A. An induction relay shall be provided for liquid level alarming and control of pumps and motors utilizing level sensing probes. The induction relay shall provide field convertible contacts rated for 25 amps at 120 VAC or 240VAC. Induction relay shall be B/W Controls 1500 or approved equal.

2.10.13 INDUSTRIAL RELAY

A. UL listed NEMA industrial relays shall be supplied for general control purposes. The relay shall be DIN rail mounted inside the enclosure. The relays shall provide the following ratings: 120VAC coil, 10A contact rating at 600 VAC and 10 million mechanical life cycles. Relays shall be Allen Bradley 700-P, Square D, or approved equal.

2.10.14 TIME DELAY RELAY

A. A time delay relay shall be provided for control of the drive motor, wash water pump, and skimmer. The time delay relay shall have an on-delay time range of 0.3 seconds to 30 minutes. The time delay relay shall have a light emitting diode (LED) which is on during the time cycle and off at the end of timing. Contact type shall be DPDT (2 form C) with life rating of 50 million operations. Time delay relay shall be ATC 319 or approved equal.

2.10.15 TIMER

A. A microprocessor based timer shall be provided for timed control of the filter operation. The timer shall have timing range of 0 to 999 hours. The timer shall have a three-digit cycle progress display which shall time up or down from the set point. Contact type shall be DPDT (2 form C) with life rating of 100 million operations. Timer shall be ATC 365C or approved equal.

2.10.16 TERMINAL BLOCK

A. Standard feed-through screw terminal blocks, DIN rail mounted, shall be supplied for all point to point wiring connections. All terminals shall be numbered per the wiring schematic with printed markers. Terminals shall carry a 600V AC/DC voltage rating. Terminal blocks shall be Allen-Bradley 1492-J4 (35A max) and 1492-J16 (85A max) or approved equal.

PART 3: SERVICES

3.01 EQUIPMENT SUPPLIERS SERVICES

A. The equipment manufacturer shall furnish the services of a competent field technician for a minimum of 24 working days on site and twelve (12) separate trips.

3.02 PERFORMANCE TEST

A. Coordinate with City staff and ENGINEER to perform filter performance testing and for sampling. Plant staff will perform and pay any lab costs associated with the sampling. Contractor to assume that no additional piping or pumps are necessary for filter performance test. If the plant is able to simulate the variable design condition, test each filter at each flow and loading scenario shown in the Table in Section 2.01.A. Divert flows from secondary clarifier to a single filter. Test each filter individually.

B. During the peak flow test, measure NTU upstream and downstream of the rehabilitated filter four times, spaced evenly apart during the test duration. For example, if the test is one hour in duration, test NTU levels every 15 minutes. Test total suspended solids in the backwash flow if a backwash is triggered during the test.

C. At a minimum, the filters will be tested at the average flow design condition for 48 hours to ensure all components are working as intended and allow for the backwash to perform a full backwash cycle during the test. Eight sets of NTU samples will be taken during the test and spaced out evenly during the test duration. A minimum of two sets of NTU samples will be taken during backwashing. Each set of NTU samples will consist of one sample from the influent and one sample of the filtered water.Two samples are to be taken during a backwash cycle and analyzed for total suspended solids.The samples are to be spaced out equally for the duration of the backwash cycle.

D. Contractor to provide documentation and sample results of all performance tests.

END OF SECTION

Division 16
ELECTRICAL

SECTION 16000

GENERAL ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Furnish and install all electrical Work as shown on the Drawings and specified. Work includes electrical connections to equipment, wiring devices, disconnects, panelboards for electrical distribution, service entrance, conduit, conductors, and control panels.

1.02 RELATED WORK

A. Refer to all drawing sheets for the scope of the electrical work.

1.03 QUALITY ASSURANCE

A. All work to be completed to latest edition of National Electrical Code.

B. All material to be U.L. listed.

C. All equipment to conform to ANSI and NEMA standards.

1.04 SHOP DRAWINGS

A. Submit complete Shop Drawings for:

1. Wiring Devices

2. Tertiary Filter Control Panel

1.05 CERTIFICATES AND FEES

A. The Electrical Contractor will pay for all fees, connection charges, permits and inspections.

1.06 GROUNDING

A. All grounding, as a minimum, will be according to the latest edition of the National Electrical Code, Article 250. Provide a full-size grounding conductor in all conduits.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver all materials and equipment direct to the job site utilizing Contractor's personnel and not to the Owner's receiving area.

B. Store all materials and equipment in a dry area, protected from the weather. Verify location of storage areas with the Owner.

1.08 EXISTING CONDITIONS

A. Visit the site and become familiar with existing conditions and limitations.

B. Perform all cutting necessary to install the electrical work indicated and all patching, painting, etc. to return the finished surfaces to the original condition. All wiring devices to be installed flush unless noted otherwise.

PART 2 PRODUCTS

2.01 CONDUIT

A. PVC below grade. Rigid steel conduit (RSC) for exterior above grade.

2.02 CONDUCTORS

A. Copper, THHN-2. Minimum size is #12 with other sizes as shown on Drawings.

2.03 WIRING DEVICES

A. Equal to Hubbell, specification grade, ivory in color.

2.04 DEVICE PLATES

A. Plastic, ivory, equal to Sierra "P" series.

2.05 MANUAL MOTOR STARTERS

A. Equal to Square D, size as required for motor, fractional horsepower controller.

PART 3 EXECUTION

3.01 GENERAL

A. Install all electrical Work as shown on the Drawings.

B. Utilize conduit for all feeders, branch circuiting, and control wiring.

END OF SECTION

SECTION 16010

GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 Description

A. This Division includes the complete installation of power, control, instrumentation, wiring, lighting, and other electrical systems as specified in the Sections of Division 16. In general, work includes, but is not limited to, the following:

1. Electrical work associated with this Project. This includes the provision and installation of grounding, power distribution, lighting, instrumentation, process equipment, and data gathering systems (SCADA System).

2. Provision and installation of wiring connections to equipment specified in this and all other divisions, unless indicated otherwise.

3. Provision and installation of wiring connections to Equipment furnished by Owner.

4. Assist electrical utility with installation of utility equipment dedicated to this project.

5. SCADA System equipment installation (PLC, Radio, Termination Cabinet, etc.)

6. All necessary SCADA System programming modifications required to make system operational.

B. Related Work Specified Elsewhere

1. All sections this Division.

1.02 References

A. As specified in each applicable section, this Division.

B. National Fire Protection Association

National Electrical Code, NFPA 70

Standard for Electrical Safety in the Workplace, NFPA 70E

C. National Electrical Safety Code, IEEE C2.

D. Occupational Safety and Health Administration, OSHA.

1.03 Submittals

A. As specified in each applicable Section, this Division.

PART 2 - MATERIALS

2.01 General

A. All equipment and materials shall be in accordance with the latest edition of the National Electrical Code (NEC) as adopted by Lake Havasu City.

B. All equipment conductor termination provisions shall be UL listed for the conductor temperatures specified.

C. All electrical and control equipment and material shall bear the recognized Underwriters Laboratories, Inc. (UL) seal of approval. It is Vendor's responsibility to obtain local inspection approval for all non-UL labeled equipment and pay all fees in connection with the same.

2.02 Systems to be Installed

A. Power - 480-VAC, 3-phase, 60-Hertz, 4-wire power system.

B. Power – 208/120-VAC, 3- phase, 60-Hertz, 4-wire power system.

C. Grounding systems.

D. Control systems.

E. Underground conduit system.

F. Instrumentation systems.

G. Electrical utility transformer secondary conduits and wiring and metering equipment, CT cabinet, and assistance to local utility.

H. SCADA System equipment (radio, PLC, antenna mast antenna, wiring) and programming.

I. Temporary lighting and power facilities during construction.

2.03 Warranty

A. All electrical equipment and workmanship shall be warranted for a minimum period of one (1) year or as designated in Section 700 of this document by the contractor. Where manufacturers' warranty exceeds the one (1) year general warranty period of the contractor, the manufacturers' extended warranty period shall be the governing factor.

PART 3 - EXECUTION

3.01 Installation

A. As specified in each applicable section, this Division.

B. All work shall be in accordance with the National Electrical Code (NEC) and all other applicable standards, refer to clause 1.2 above.

C. Equipment power ratings, horsepower and kilowatt indicated are approximate. If equipment of a different size is furnished, the Contractor shall furnish and install the proper motor starter, fuses, circuit breaker, disconnect switch, wire, and conduit required for the equipment furnished, at no additional cost to the Owner.

D. Provide temporary power to all on site construction trailers.

E. Provide temporary power as required to support construction trades.

Note: all work, including temporary construction related activities shall be in accordance with the NEC, and all other requirements of the standards and safety codes.

3.02 Work on Existing Equipment

A. Do not remove any Equipment from service without obtaining permission from Owner and Engineer. A minimum of 48 hours notice to be given to the Owner and Engineer by contractor before work is begun.

B. Perform work that requires taking Equipment out of service at times designated by Owner so as to cause minimum interruption in plant operation.

C. Continue work with as many workmen as can be efficiently used from the time any Equipment is removed from service until Equipment is tested and back in service.

D. Connect electrical equipment to provide same phasing as existing equipment, unless otherwise specified or indicated.

E. Any work on energized (live) equipment shall meet the requirements of NEC 2005 110.16.

3.03 Testing

A. Test all electrical equipment upon completion of installation to ensure that the equipment operates satisfactorily and to conform to Contract Documents.

B. Furnish temporary power source of proper type for testing purposes when normal supply is not available at the time of testing.

C. Upon successful completion of testing and acceptance by owner provide physical protection of equipment to prevent damage.

3.04 Coordination and Scheduling

A. Coordinate Electrical Installation with other trades to avoid interference of exposed conduit, lighting fixtures, or other equipment until all piping, pipe hangers, ducts, and equipment which are above or behind have been installed, unless release is given in specific cases by Engineer.

B. Coordinate installation of equipment and wiring with the established construction schedule.

PART 4 - MEASUREMENT AND PAYMENT

4.01 Measurement

A. No measurement will be made for this item.

4.02 Payment

A. Payment will be made at the contract lump sum price bid and shall be considered full payment for providing labor and materials to perform this work.

END OF SECTION

SECTION 16111

CONDUIT, FITTINGS AND ACCESSORIES

PART 1 - GENERAL

1.01 Description: This Section includes all conduit, fittings and accessories.

1.02 References

1. American National Standards Institute (ANSI)

   ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated.

2. American Society For Testing and Materials (ASTM)

   ASTM A123 - Zinc (Hot Galvanized) Coating on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strips.

   ASTM A153 - Zinc Coating (Hot Dip) on Iron and Steel Hardware.

3. National Electrical Code (NEC)

4. National Electrical Manufacturers Association (NEMA)

   FB1 - Fittings and Supports for Conduit and Cable Assemblies.

   RN1 - Polyvinyl-Chloride Externally Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing.

5. Underwriters' Laboratories, Inc. (UL)

   1 - Flexible Metal Electric Conduit.

   6 - Rigid Metal Electrical Conduit.

   263 - Fire Tests of Building Construction and Materials.

   360 – Liquid tight Flexible Steel Conduit

   514A - Metallic Outlet Boxes, Electrical.

   514B - Fittings for conduit and Outlet Boxes.

514C - Nonmetallic Outlet Boxes, Flush Device Boxes and Covers.

6. Steel Structures Painting Council (SSPC)

SP3 - Power Tool Cleaning.

SP11 - Power Tool Cleaning to Bare Metal.

7. All electrical and control equipment and material shall bear the recognized Underwriters Laboratories, Inc. (UL) seal of approval. It is Vendor's responsibility to obtain local inspection approval for all non-UL labeled equipment and pay all fees in connection with the same.

1.03 Submittals

. Submit as specified in SECTION 1330.

PART 2 - MATERIALS

2.01 Acceptable Manufacturers

A. Rigid Steel Conduit

1. Allied Tube and Conduit Corporation.

2. LTV Steel.

B. Rigid Steel Conduit with Bonded Polyvinyl Chloride (PVC) Jacket

1. OCAL Inc.

2. Robroy Industries.

3. Perma-Cote Industries.

C. Liquid-tight: Flexible Metal Conduit:

1. Anamet, Inc.

2. Electri-Flex Company.

D. Rigid Polyvinyl Chloride (PVC) Conduit

1. Cantex

2. Allied Tube & Conduit

3. Carlon

Or equal.

E. Rigid Steel Conduit Fittings

1. Heavy-duty Cast Malleable Iron Fittings

a. Appleton Electric Company.

b. Crouse Hinds Company.

2. Conduit Expansion and Deflection Fittings

a. O-Z /Gedney Company.

F. Rigid Steel Conduit Boxes

1. Indoor and Outdoor Boxes

a. Hoffman Engineering Company of Anoka, Minnesota.

2. Conduit Hubs

a. Appleton Electric Company.

b. Myers Industries, Inc. (ITT).

c. Crouse-Hinds Company.

d. O-Z /Gedney Company.

G. Supports

1. B-Line Company.

2. Midland-Ross Corporation.

3. Unistrut Products Corporation.

4. U.S. Gypsum Company.

5. Van-Huffel Tube Corporation.

H. Wall Entrance Seals

1. O-Z/Gedney Company.

I. Explosion-proof Fittings

1. Crouse-Hinds Company

2. Appleton Electric Company

J. Fire-stopping Materials

1. 3M, (Minnesota Mining and Manufacturing Company)

2. Thomas and Betts

3. Hilti

4. Dow Corning

K. Duct Seal

1. Ideal Industries

2. 3M, (Minnesota Mining and Manufacturing Company)

2.02 Design Requirements

A. Each length of threaded conduit furnished with coupling on one end and metal or plastic thread protector on other end.

B. UL listed and labeled conduit, on each length, fittings and accessories.

C. Sizes of conduit, fittings and accessories as indicated, specified or as required by Electrical Codes and Standards.

D. Provide and meet the requirements of the following sections for the conduit, fittings and accessories indicated.

2.03 Rigid Steel Conduit

A. Conform to ANSI C80.1 and UL-6.

B. Mild ductile steel, circular in cross section with uniform wall thickness sufficiently accurate to cut clean threads.

C. Each length threaded on both ends with threads protected.

D. All scale, grease, dirt, burrs and other foreign matter removed from inside and outside prior to application of coating materials.

E. Galvanized by the hot-dip process as follows:

1. Interior and exterior surfaces coated with a solid, unbroken layer of 99% virgin zinc by dipping.
2. Coating not to show fixed deposits of copper after four 1-minute immersions in a standard copper sulfate solution.
3. One coat of zinc chromate finish on inside and outside surfaces to prevent oxidation and white rust.

F. Couplings and elbows fabricated, coated and finished by the same process as conduit.

2.04 Rigid Steel Conduit and Fittings with Bonded Polyvinyl Chloride (PVC) Jacket

A. Conform to hot-dipped galvanized rigid steel conduit as specified in NEMA-RN1, RIGID STEEL CONDUIT, this Section, and as follows.

B. Prior to application of PVC coating, clean interior and exterior surfaces to remove contaminates to provide a suitable surface for bonding.

C. Bond the PVC coating to the conduit. Extruded PVC jackets are unacceptable.

D. Coated externally with PVC to a nominal 40 mils, 0.035-inch to 0.045-inch.

E. Uniformly coat around outside diameter and full length of the conduit.

F. Coat the prethreaded ends with a urethane coating having a nominal thickness of 2 mils (0.002-inch).

G. Coat the interior surfaces of all conduits and feed-through fittings (except where prohibited by design) with a two-part, chemically cured, urethane coating having a nominal thickness of 2 mils (0.002-inch).

H. Exceed the tensile strength of coating with bond between metal and jacket.

I. Couplings, elbows, and other conduit fittings, boxes, cover-plates, supports, hardware and related items shall be treated and coated with the same process as conduit.

J. Each coupling and fitting shall include a PVC sleeve that overlaps the conduit.

K. Length of the overlapping sleeve equals diameter of the conduit or 2 inches, whichever is least.

L. Final cured PVC coating capable of withstanding a minimum electrical potential of 2000V.

M. All conduit accessories, clamps, and hardware that are uncoated shall be stainless steel.

2.05 Liquid-Tight Flexible Metal Conduit

A. Conform to UL-360.

B. Liquid-tight conduit with flexible galvanized-steel core and a synthetic rubber, polyvinyl chloride, or thermoplastic covering.

C. Spiral encased copper bonding conductors for conduit in sizes 1-1/4 inches and smaller.

D. External grounding jumper as required.

E. Polyvinyl chloride (PVC) jacket, Type HA or Type O.R. "Seal-Tite" for oil-resistant applications.

2.06 Rigid Polyvinyl Chloride (PVC) Conduit

A. Fabricated from self-extinguishing high-impact polyvinyl chloride designed for aboveground and underground installations.

B. Type EPC Schedule 80 heavy-wall rigid conduit.

C. Fittings and accessories fabricated from same materials as conduit.

D. Solvent-cement-type joints as recommended by manufacturer.

2.07 Rigid Steel Fittings

A. Heavy-Duty Cast Malleable Iron Fittings

1. Mogul type for conduit sizes 1-1/2 inches and larger.

2. LBD or roller action type LB for right angle fittings for conduit sizes 2 inches and larger.

3. Full-threaded hubs and rubber-gasketed covers.

4. Zinc, cadmium-plated or bronze hardware bolts and screws for assembly.

5. Finish with cadmium-plated or galvanizing.

6. Standard and junction fittings.

B. Conduit Expansion Fittings

1. Line of Conduit Type

a. Galvanized expansion fittings for rigid conduit movement up to 4 inches.

b. Insulated metal bushing on ends of the conduit, bonding jumper, and with expansion head sealed with a high-grade graphite packing.

c. O-Z/Gedney Company, Type AX with Type AJ bonding jumper or Thomas and Betts Corporation, Type XJG.

2. End Type

a. For conduit terminating in a junction box.

b. O-Z/Gedney Company, Type EXE with Type BJ-E bonding jumper.

C. Conduit Expansion and Deflection Fittings

1. Provide for movement of 3/4-inch from normal in all directions between two rigid conduits.

2. Integral bonding jumper.

3. O-Z/Gedney Company, Type DX.

D. Conduit Wall Entrance Seals

1. Provide where required or indicated.

2. O-Z/Gedney Company Type FSK.

E. Conform to NEMA Type 3R enclosure in all nonhazardous areas except as specified or indicated otherwise.

2.08 Fittings, Couplings and Boxes for Rigid Steel Conduit

A. Fittings

1. Explosion-proof or weather-proof as specified.

2. Cast malleable iron.

3. Threaded cover to conform to NEC.

4. Full thread hubs.

5. Seal compound well for seal.

6. Drain seals as indicated or required to provide a continuous automatic drain of water.

7. Chico compound for all sealing fittings.

8. PVC jacketed in corrosive areas and where indicated.

B. Couplings

1. Explosion-proof or weather-proof as specified.

2. Flexible.

3. Conform to NEC.

4. Threaded, steel or bronze end fittings securely fastened to the core and braided to ensure electrical continuity.

5. Vinyl plastic coating in severely corrosive locations as indicated.

2.09 Rigid Steel Conduit Boxes

A. Indoor Boxes

1. Hot-dipped galvanized steel.

2. Galvanized steel covers.

2. For special boxes where it is not possible to provide hot-dip galvanizing, apply organic zinc-rich primer at 3 mils dry film thickness after SSPC-SP3 Power Tool Cleaning.

3. Minimum gage requirements:

No surface area exceeds	No single dimension exceeds	Steel Gage
1000 sq in.	40 in.	14
1500 sq in.	60 in.	12
over 1500 sq in.	over 60 in.	10

4. Explosion-proof or weather-proof as specified.

5. Threaded conduit entrances or rigid conduit hubs on all boxes.

6. Include piano-hinged, gasketed cover, and interior mounting panel when used for enclosing terminal blocks and control relays.

9. Oiltight JIC boxes modified for NEMA Type 3R or Type 4 enclosure for non-explosion-proof areas. Stainless steel as required on engineering drawings.

B. Outdoor Boxes

1. 11-gauge minimum galvanized steel with drip lip and galvanized-steel covers fastened with bronze or cadmium-plated screws or bolts, or cast iron with galvanized finish and flanged bolted covers.

2. For special boxes where it is not possible to provide hot-dip galvanizing, apply organic zinc-rich primer at 3 mils dry film thickness after SSPC-SP3 Power Tool Cleaning.

3. Threaded conduit entrances or rigid conduit hubs on all boxes.

4. Rubber or neoprene gasket for cover.

5. Explosion-proof or weather-proof as specified. Conform to NEMA Type 3R enclosure for non-explosion-proof applications in all outdoor installations unless indicated otherwise.

6. Include piano-hinged, gasketed cover, and interior mounting panel when used for enclosing terminal blocks and control relays.

7. Oiltight JIC boxes modified for NEMA Type 3R or Type 4 enclosure in non-explosion-proof applications.

B. Metallic Barriers

1. Designed not to separate phases of a power circuit.

2. Provide as indicated for the isolation of power circuits from other type circuits.

C. Box size as required, or as indicated, for each particular installation.

D. Include provisions for mounting cable supports where indicated, specified or as required by NEC.

E. Provide as required for cable pulling, junctions, terminals, and for mounting of switches, outlets and control devices.

2.10 Support System

A. Fabricated from structural steel or manufactured framing members equal to "Unistrut" P-3000 series as manufactured by Unistrut Corporation.

B. Minimum 12 gage.

C. Construct as required to rigidly support all conduit runs and boxes.

D. Hot-dip galvanized steel conduit clamps or stainless steel, sized for the specific conduit size, to support all exposed metallic conduit.

E. Nonmagnetic clamps to support nonmetallic conduits.

F. Provide stainless steel rods, anchors, inserts, bolts, washer, and nuts.

G. Materials shall be compatible with the equipment supported.

H. Manufactured Framing Members

1. Wet Locations

a. Channel hot-dipped galvanized after all manufacturing operations are completed.

b. Galvanizing zinc weight of 2 ounces per square foot on surface to conform to ASTM A123 and ASTM A153.

2.11 Fire-stopping and Duct Seal

A. Fire-stopping

1. Weather-resistant silicone sealant.

2. Provide 4-hour fire rating.

3. UL tested system.

B. Duct Seal

1. Non-corrosive, permanently soft compound.

2. Nontoxic.

3. Provide flexible re-enterable and repairable seal around cables in conduit.

4. Prevent air movement and drafts through conduits.

5.

PART 3 - EXECUTION

3.01 Preparation

A. Provide suitable protection for conduit risers against damage during construction.

B. Cap ends of all conduits before concrete is poured.

C. Cap all conduits and provide pullstring after cleaning where conduits are to be left empty by this contract.

D. Carefully ream ends of all conduit lengths after cutting to eliminate sharp burrs.

E. Clean out all conduit before pulling wire.

F. Clean out all conduits immediately after concrete work is finished.

3.02 Installation

A. General Requirements

1. Location

a. Install conduit as near as possible to the routing indicated.

b. Shift locations as required to avoid interference with other equipment and piping being installed.

c. Where routing of conduit is not indicated, such as for lighting home run circuits and other systems requiring small conduit runs, route conduit as specified subject to approval by Engineer.

2. Do not use conduit in sizes smaller than 3/4-inch, except 1/2-inch may be used for connections to control devices and thermocouples where necessary.

3. Holes and Sleeves

a. Provide through floors, walls and roofs as necessary for conduit runs, including approved flashing and weather proofing at outside walls and on roofs.

b. Install sleeves or forms for all openings in new work.

c. Provide the required inserts and holes, completely sleeved, bonded, curbed, flashed and finished off in an approved manner, whether in concrete, steel grating, metal panels or roofs.

d. Core-drill all holes required in existing building work using a dustless method.

e. Place nonshrinking grout or Dow Corning 3-6548 Silicone RTV (or equivalent General Electric RTF 762) foam as specified, in the following locations:

(1) All holes in concrete, walls, floor and roof slabs after installation of conduit.

(2) All unused holes and sleeves as approved by Engineer.

f. Install wall entrance seals where conduit enters the building or vaults from exterior underground.

g. Install fire-stopping at all conduit penetration of fire rated walls, ceilings and floors. Fire-stopping shall equal or exceed the fire rating of the wall, ceiling or floor in which it is installed.

4. Make connections to boxes, panels, and other equipment as follows:

a. For Indoor Dry Locations: Double locknuts, one inside and one outside.

b. For Outdoor and Damp Locations: Rigid weather-proof conduit hubs.

c. For Explosion-proof Locations: Use conduit connector seals approved for the hazardous location specified.

d. Bushings

(1) Threaded malleable iron or steel.

(2) Insulated with Bakelite, molded and bonded into the bushing.

(3) Placed on end of conduit in addition to locknuts.

(4) Install with integral grounding connector and conductor where all conduits pass through multiple concentric panel knockouts and where the conduit must be bonded to equipment it is not attached to.

e. Install duct seal in conduits around cables in non-hazardous locations at all conduit terminations at control panels and boxes containing terminations and splices.

5. Running threads will not be permitted.

6. Coat all field cut threads in galvanized conduit with aluminum paint.

7. Comply with applicable requirements of NEC pertaining to installation of conduit systems.

8. Place drainage fittings or weep holes at unavoidable low points where moisture can collect.

9. Install an entire conduit system that is electrically continuous with bonding jumpers provided as necessary to conform to NEC.

10. Install expansion fittings at all building expansion joints and every 100 feet of continuous conduit.

11. Provide all spare or empty conduits with pullstrings for future use.

B. Rigid Steel Conduit

1. Exposed

a. Install where specified or indicated on drawings.

b. Install above grade outdoors.

c. Install horizontal runs as high above floor as possible and in no case lower than 7 feet above floor, walkway or platforms in passage areas.

d. Run conduit parallel or perpendicular to walls, ceiling, beams, and columns unless indicated otherwise.

e. Route to clear all doors, windows, access wells, and openings.

f. Group parallel runs in neatly aligned banks where possible with minimum of 1-inch clearance between conduits.

g. Maintain 6-inch clearance between conduit and coverings on all hot lines; steam, hot water, etc.

h. Do not exceed a distance of 8 feet between supports on horizontal or vertical runs.

i. When terminating at cable tray, attach conduit to tray and electrically bond conduit with ground wire to the cable tray. Install duct seal in conduits around cables to prevent ingress of water.

2. Concealed

a. Conceal conduit for lighting, convenience outlets, and other circuits in walls, ceiling and floors where possible.

b. Do not install conduit in concrete where conduit outside diameter exceeds one-third of concrete thickness.

c. Install parallel runs with a minimum spacing of three conduit diameters between conduits.

d. Use expansion and deflection fitting with bonding jumpers at all concrete expansion joints.

e. Tie securely in place to prevent movement when concrete is poured.

f. Install in floor slabs in as straight a run as possible. Conduit crossovers are not permitted unless conduit total outside diameter is one-third of the concrete thickness or less.

g. Use long radius elbows except on risers where curved portion of elbow would extend above the finished floor or foundation.

h. Make all joints watertight after installation by coating all finished joints with coal tar solution applied at 15 mils minimum dry film.

(1) Kop-Coat - No. 50.

(2) Tnemec - 46-449.

3. Buried

a. Place where indicated.

b. Use PVC jacketed conduit or rigid PVC Schedule 80 as indicated.

c. Make all joints watertight by field-applied coat of vinyl plastic compound or PVC welding solution furnished by the conduit manufacturer.

d. Use bender one size larger for conduit sized 1 inch or less and conventional bender for conduit sized above 1 inch.

e. Use strap wrench to tighten conduit. Repair damaged coating with liquid patching compound recommended by conduit manufacturer.

f. Install in as straight a run as possible between termination points of exact routing to be determined in the field and subject to approval by Engineer.

g. Bury conduits a minimum of 24 inches (to top of conduit) below finish grade unless indicated otherwise or required by code.

h. Slope conduit away from conduit risers where possible.

i. Maintain 6-inch separation from underground piping.

j. Use long radius bends at all risers unless indicated otherwise.

k. After trench bottom has been finished to grade, lay conduit. Backfilling shall be as specified in DIVISION 2.

l. Cap ends of all conduit risers before backfilling.

m. Provide watertight seal around wires where conduit terminates in pull box.

n. Use PVC coated rigid galvanized steel conduit when making transitions from buried to above ground conduit runs.

C. Liquid-Tight Flexible Metal Conduit

1. Use between rigid conduit and motor terminal boxes except where conduit runs down from above and cannot be conveniently supported by a floor flange.

2. Place between rigid conduit or conduit box and control device cases where direct connection is not desirable for reasons of equipment movement, vibration, or for ease of maintenance.

3. Install at all points of connection to equipment mounted on supports to allow for expansion and contraction.

4. Conform to NEC with installation of conductors.

5. Install at locations where rigid conduit connections are impractical.

6. Use minimum length consistent with manufacturer's standard lengths, the acceptable bending radius, and with required movement of equipment.

7. Maximum length of 3 feet unless otherwise approved by Engineer.

8. Install an external bonding jumper to conform to NEC on conduit sized 1-1/2 inches and larger.

D. Flexible Metal Conduit

1. Use between rigid conduit and devices, except in hazardous areas and areas subject to dampness, water, and corrosive fumes. Do not use with vapor-tight fixtures. Use in accordance with the National Electrical Code Article 350.

2. Use in lieu of direct connection of rigid conduit where it is not desirable for reasons of equipment movement, vibration, or for ease of maintenance.

3. Install as required for expansion and contraction.

4. Use minimum length consistent with manufacturers' standard lengths, the acceptable bending radius, and with required movement of equipment.

5. Maximum length of 3 feet unless otherwise approved by Engineer.

6. Install in sizes smaller than 3 inches.

7. Install an external bonding jumper to conform to the National Electrical Code on conduit sized 1-1/2 inches and larger.

E. Conduit Fittings

1. Installations of special fittings as required.

2. All materials shall be compatible.

3. Install as required.

F. Boxes

1. Install special boxes as indicated of size required for conduits and cables entering and leaving box.

2. Install where required for pull or junction boxes and for mounting or connecting to switches, outlets, intermediate terminal blocks or control devices.

3. Provide 1/4-inch weep holes in interior boxes where conduits enter from exterior or buried installation.

G. Supports

1. Construct with sufficient rigidity to hold all mounted equipment and material in permanent and neat alignment.

2. Design to provide 1/4-inch space between equipment housings and walls or columns upon which they are mounted.

3. Do not exceed load requirements in NEC and NEMA standards.

4. After Power Tool Cleaning SSPC-SP11, paint all welds, field cuts and damaged areas with organic zinc-rich primer at 3 mils dry film thickness.

   a. Ameron - 68HS.

   b. Carboline - Carbozinc 858.

   c. Porter - Zinc-Lock 308.

   d. Tnemec-Tneme Zinc 90-93.

5. Use electrogalvanized steel conduit clamps and nonmagnetic conduit clamps to support electrogalvanized steel conduit and nonmagnetic conduit, respectively.

6. Provide stainless steel rods, anchors, inserts, bolts, washers and nuts.

I. Explosion-proof Fittings

1. Install explosion-proof fittings in the rigid steel conduit system as required by the NEC.

2. Install necessary fittings where not indicated but required by code.

PART 4 MEASUREMENT AND PAYMENT

4.01 Measurement

A. No measurement will be made for this item.

4.02 Payment

A. Payment will be made at the contract lump sum price bid and shall be considered full payment for providing labor and materials to perform this work.

END OF SECTION

SECTION 16120

WIRE, CABLE, AND ACCESSORIES

PART 1 - GENERAL

1.1 Description

A. This Section includes furnishing and installing (including terminations) of all electrical wire, cable, and accessories.

B. Related Work Specified Elsewhere
Grounding ..... Section 16450
Field Testing ..... Section 16950

1.2 References

1. American Society for Testing and Materials (ASTM)

ASTM B3 - Soft or Annealed Copper Wire.

ASTM B8 - Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.

ASTM B33 - Tinned Soft or Annealed Copper Wire for Electrical Purposes.

ASTM B172 - Rope-Lay-Stranded Copper Conductors, Having Bunch Stranded Members, for Electrical Conductors.

ASTM B189 - Lead-Coated and Lead-Alloy-Coated Soft Copper Wire for Electrical Purposes.

2. Insulated Cable Engineers Association (ICEA)

S-19-81 - Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

S-61-402 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

S-66-524 - Cross-Linked Thermosetting-Polyethylene-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

S-68-516 - Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

S-81-570 – 600-Volt Rated Cables of Ruggedized Design for Direct Burial.

S-105-692 – 600Volt Single Layer Thermoset Insulated Utility Underground Distribution Cables.

T-29-520 – Vertical Cable Tray Flame Tests at 210,000 Btu.

3. National Electric Manufacturers Association (NEMA) and Insulated Cable Engineers Association (ICEA)

   WC55/S-82-552 – Instrumentation Cables and T.C. Wire.

   WC57/S-73-532 – Standard for Control Cables.

   WC70/95-658 - Non-Shielded Power Cables Rated 2000V or Less.

4. Institute of Electrical and Electronic Engineers (IEEE)

   48 - Test Procedures and Requirements for High Voltage Alternating-Current Cable Terminations.

5. National Fire Protection Association

   National Electrical Code (NEC) NFPA-70.

   Standard for Electrical Safety in the Workplace, NFPA 70E

6. Underwriters Laboratories, Inc. (UL)

   44 - Rubber-Insulated Wires and Cables.

   83 - Thermoplastic-Insulated Wires and Cables.

   263 - Fire Tests of Building Construction and Materials.

   854 - Service Entrance Cables.

   1277 - Electrical Power and Control Tray Cables with Optional Optical Fiber Members.

7. National Electrical Safety Code, IEEE C2.

8. Occupational Safety and Health Administration, OSHA.

9. All electrical and control equipment and material shall bear the recognized Underwriters Laboratories, Inc. (UL) seal of approval. It is Vendor's responsibility to obtain local inspection approval for all non-UL labeled equipment and pay all fees in connection with the same.

1.3 Submittals

A. Submit as specified in Section 1330.

B. Includes, but not limited to, the following:

1. Data sheets for each wire and cable type specified.

2. Data sheets for wire and cable accessories.

3. Cable manufacturer's approval of splicing and terminating materials.

4. Cable manufacturer's approval of pulling compounds.

5. Cable manufacturer's installation requirements such as maximum pulling tensions, sidewall pressures, minimum bending radii, etc.

6. Other equipment and materials to be used.

PART 2 - MATERIALS

2.1 Acceptable Manufacturers

A. Wire and Cable

Acceptable manufacturers for each wire and cable type will be manufacturers that have been manufacturing the specified cable for a minimum of five years and meet all the requirements listed on the Wire and Cable Specification Sheets.

B. Wire and Cable Accessories

1. Cable Connectors for Control and Instrument Cable

a. AMP Special Industries.

b. Hollingsworth Solderless Terminal Company.

c. Panduit Corporation.

d. Minnesota Mining and Manufacturing (3M).

e. Thomas and Betts Company, Inc.

2. Cable Connectors for Power Cable

   a. AMP Special Industries.

   b. Thomas and Betts Company, Inc.

   c. Minnesota Mining and Manufacturing (3M).

   d. Panduit Corporation.

3. Termination and Splice Kits

   a. Minnesota Mining and Manufacturing (3M).

   b. Raychem.

4. Tape and Insulation Putty: Minnesota Mining and Manufacturing (3M).

5. Cable Ties

   a. AMP Special Industries.

   b. Dennison Manufacturing Company.

   c. Panduit Corporation.

   d. Minnesota Mining and Manufacturing (3M).

   e. Thomas and Betts Company, Inc.

6. Cable Supports

   a. O-Z/Gedney Company.

   b. Hubbell, Kellems Grips.

7. Terminal Blocks

   a. Allen-Bradley.

   b. Buchanan.

c. Phoenix Contact.

d. Weidmuller.

8. Cable Identification Tags

a. Allen Marking Products, Kansas City, MO.

b. Floy Tag and Manufacturing Co., Seattle, WA.

c. Panduit Corporation (Panduit).

d. Specialty Products Company, Rock Hill, SC.

e. Thomas and Betts Company, Inc. (Thomas and Betts).

9. Cable Fire and Smoke Stop Fittings

a. Crouse Hinds.

b. Nelson Electric.

c. O-Z/Gedney Company.

2.2 Wire and Cable

A. Building Wires

1. Conductors: stranded for 12 AWG and larger. Minimum size: 12 AWG.

2. Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90 or as indicated on drawings.

B. MC, Metal Clad Cables

1. Conductors:

.1 Grounding conductor: copper.

.2 Circuit conductors: copper, size as indicated.

2. Insulation: Chemically cross-linked thermosetting polyethylene rated type RW90, 600 V or as indicated on drawings.

3. Inner jacket.

4. Armour: continuous aluminum.

5. Overall covering: flame retardant polyvinyl chloride material meeting requirements of Vertical Tray Fire Test.

C. Instrument Cable – Shielded Twisted Pairs/Triads

1. Conductors: stranded for 16 AWG and larger. Minimum size: 16 AWG.

2. Copper conductors: size as indicated, with 600 V insulation of PVC material rated RW90. Color code shall use pigmented compounds, white and black for pairs, white, black and red for triads. Each conductor shall include sequential numbers printed on surface of conductors.

3. Conductor jacket: nylon.

4. Shields: aluminized mylar or polyester tape with tinned copper drain wire.

5. Jacket: Polyvinyl chloride (PVC).

D. Control Cables

1. Class B or C soft annealed stranded copper conductors, sized as indicated, with cross-linked thermosetting polyethylene, outer PVC jacket rated for outdoor use.

2. 600 V type: with cross-linked polyethylene type, RW90 (x-link) and overall jacket.

E. Temperature Rating

Cables shall be suitable for operation with a maximum conductor temperature of 90ºC, continuous, wet or dry locations.

F. Insulation and Jacket Thickness

See references, Section 1.2.

G. Factory Tests

See references, Section 1.2, including the flame test requirement, ICEA T-29-520 and UL 1277.

H. Certification

Cables shall be certified to be in conformance with all applicable codes and standards as referenced.

All cables shall include surface identification showing manufacturer's name, insulation type, conductor size, conductor type, voltage rating and UL label.

2.3 Connectors

A. General Requirements

1. Designed and sized for specific cable being connected.

2. Solderless, pressure-type connectors constructed of non-corrodible tin-plated copper.

3. Rated current-carrying capacity equal to or greater than the cable being connected.

4. Application tooling for connectors shall contain die or piston stops to prevent over-crimping and cycling or pressure relief to prevent under-crimping. Dies of all application tooling shall provide dot or wire size coding for quality control verification. All tooling shall be manufactured by the connector manufacturer.

5. All terminations shall be installed with protective heat shrink.

B. Power Connectors (10 AWG and Smaller) 600V and Below

1. "Scotchlok" preinsulated spring wire connectors.

2. Buchanan open-end copper splicing caps, applied with "Lok-Seal" tool, with nylon snap-on insulators.

C. Power Connectors (sizes 8-4 AWG) 600V and Below

1. Noninsulated ring-tongue type.

2. Ring tongue sized to match terminal stud size.

3. Brazed barrel seam.

4. Application tooling designed to crimp the wire barrel (conductor grip) with a one-step crimp.

D. Power Connectors (sizes 2 AWG - 750 kcmil) 600V and Below

1. Non-insulated one-hole rectangular tongue for sizes 2 AWG through 3/0 AWG and two-hole rectangular tongue for 4/0 AWG through 750 kcmil.

2. Application tooling shall be hydraulically operated.

E. Control, Instrument, and Specialty Cable Connectors

1. Tin-plated copper.

2. Vinyl preinsulated spring-type spade terminals. (Hollingsworth "Mini Spring Spades"; Thomas and Betts "Locking-Fork"; Panduit "Locking Fork.")

3. Sized to match terminal stud size.

4. Have insulation grip sleeve to firmly hold to cable insulation.

5. Insulation grip sleeve shall be funneled to facilitate wire insertion and prevent turned-back strands.

6. Application tooling designed to crimp the wire barrel (conductor grip) and the insulation grip sleeve with a one-step crimp.

2.4 Motor Lead Termination/Splice (Low-Voltage, 600v and Below, Power Cable)

A. Splices shall be made using compression-type connectors bolted together. The compression-type connectors shall be properly sized for the cables.

B. Splice to be covered with heat-shrinkable tubing connector insulators or slip-on rubber boot or sleeve.

C. Splicing shall be done in accordance with the instructions provided with the Raychem brand MCK Motor Connector Kit or 3M Company 5300 Series Motor Lead Splice Kit.

2.5 Cable Supports

A. Cable supports for cables in vertical conduit risers shall be O-Z/Gedney Type "R" wedging plug type or approved equal.

B. Kellems basket type wire mesh grip for cables in vertical installations.

2.6 Cable Ties

A. Nylon self-locking type.

B. Have a normal service temperature range of -40ºC to 85ºC.

C. Be weather-resistant and sun-light resistant type for outdoor use.

D. Meet requirements of Military Specifications MIL-S-23190D.

E. AMP Special Industries "AMP-TY," Dennison Manufacturing Company "BAR-LOK," Panduit Corporation "PAN-TY," Thomas & Betts "TY-RAP," or Minnesota Mining and Manufacturing 3M Brand cable ties.

2.7 Terminal Blocks

A. For mounting in terminal boxes (TBs)

1. Designed and sized for the cables being terminated.

2. Block rated 600V.

3. Binding screw-type terminals for power cables and strap screw or tubular clamp terminals for control and instrument cables.

4. Rated current carrying capacity equal to or greater than the cable being terminated.

5. Marking strip.

B. For Mounting in Cabinets, Panels, Control Boards, Etc.

1. Designed and sized for the cables being terminated.

2. Block rated 600V.

3. Binding screw type terminals for power cables and current transformer circuits and strap screw or tubular clamp terminals for control and instrument cables.

4. Rated current carrying capacity equal to or greater than the cable being terminated.

5. Marking strip on blocks for power cables and control and instrument cables.

6. Short-circuit strips with one shorting screw for each terminal for current transformer circuits.

2.8 Cable Identification Tags

A. Designed to provide a permanent wire and cable identification system.

B. Show complete cable number. Cable numbers are defined in the Cable Schedule and/or Contract Drawings.

C. Cable numbers may be stamped or typed in a legible and permanent manner. Hand-lettering is not acceptable.

D. Character size for cable numbers shall be a minimum of 1/8-inch.

E. Material shall be nonmetallic and impervious to moisture and resistant to fading in sun-light.

F. Be securely attached to cables and accessible for inspection.

G. Cable identification tags, marking and attachment methods shall be subject to approval of the Engineer.

2.9 Fastenings

1. One hole malleable iron straps to secure surface cables 2 inch diameter and smaller. Two hole steel straps for cables larger than 2 inches.

2. Channel type supports for two or more cables.

3. Threaded rods: 3/8 inch dia. stainless steel to support suspended channels.

PART 3 – EXECUTION

3.1 Installation

A. Wire and Cable

1. General Requirements

a. Install in conduit, duct system or tray as indicated.

b. Do not subject cable to pulling tensions or sidewall pressures in excess of manufacturer's recommendations.

c. Attach pulling grips over the cable sheath to prevent slipping of the insulation.

d. Do not subject cable to bending radius less than those recommended by the cable manufacturer or as noted below (whichever is greater) during or after installation:

(1) Eight times the cable outside diameter for 600V or lower rated cables.

e. Install intermediate splices only as indicated or as required to avoid subjecting cable to excessive pulling tension or sidewall pressures. Cable splicing locations shall be approved by Engineer prior to cable installation.

f. Support cables at connections or termination points such that any strain on cable will not be transmitted to the connection or termination.

g. Install cable supports in vertical runs of conduit, at boxes and at terminations in equipment, and as required to meet intermediate support requirements of National Electrical Code (NEC).

h. All pulling compounds shall be approved by wire and cable manufacturer as being compatible with cable materials.

i. Attach a cable identification tag to each cable at all termination or end points.

j. Install fire and smoke stop fittings at all cable penetration of fire rated walls, floors and ceilings.

2. Power (600V and Below), Control, Instrument, and Specialty Cable

a. Install metallic barrier in all tray and boxes to separate power, control and instrumentation from low-level signal (50V or less) instrumentation circuits where run in the same box.

b. Cables in vertical trays shall be secured every 3 feet or less.

c. Tie together with cable ties all single conductor cable on each individual circuit in each junction box, and equipment at intervals not to exceed 6 feet.

d. Attach a cable identification tag to each cable.

(1) At each terminal to identify the circuit and cable.

(2) Use nylon ties and identification tabs color coded as follows:

(a) 480V circuits - Red.

(b) 277, 240, or 208Vac circuits - Orange.

(c) 120V circuits - White.

(d) Control cables - Natural Nylon.

e. Insulation Color Coding

(1) Conductors shall be coded or numbered over the entire length.

(2) Colors shall not be changed between source and device. No white wire shall be used in lighting and convenience outlets except as a grounded neutral conductor.

f. Tag each individual conductor or wire with wire markers as follows:

(1) With terminal designation indicated on schematic diagrams or given on manufacturer's equipment drawings.

(2) At each terminal.

(3) In addition to specified circuit tags.

g. Terminate and ground, control, instrument, and specialty cable shields as indicated and recommended by the manufacturer of the equipment being connected. In general, ground the shields at the control boards for control cables and at the receiving end equipment for instrumentation and specialty cables.

h. Control and instrument cable splices shall be as follows:

(1) Made only in junction or terminal boxes.

(2) Made on terminal blocks with marking strips.

(3) Conductor color coding shall be maintained.

(4) For shielded cables, shield continuity and isolation shall be maintained.

i. Power cable (600V or below) splices and motor terminations shall be as follows:

(1) Made only in junction or terminal boxes.

(2) Splices shall be made using compression type connectors bolted together.

(3) Splice to be covered with a heat-shrinkable connector insulator.

j. Lighting Cable: Install as specified in this Division.

k. Ground Cable: Install as specified in this Division.

l. Install fire and smoke stop fittings at all cable penetrations of fire-rated walls, floors, and ceilings.

3. Cable Connections and Terminations

a. Make up clean and tight to assure a low-resistance joint.

b. Make only in terminal boxes, equipment or other accepted enclosures and not in conduit.

c. Install all connectors with tooling manufactured by the connector manufacturer and as specified.

3.2 Field Quality Control

A. Manufacturer's Field Services: Provide as specified in DIVISION 1.

B. Field Testing: Specified in Section 16950.

PART 4 - MEASUREMENT AND PAYMENT

4.1 Measurement

A. No measurement will be made for this item.

4.2 Payment

A. Payment will be made at the contract lump sum price bid and shall be considered full payment for providing labor and materials to perform this work.

END OF SECTION

SECTION 16450

GROUNDING

PART 1 - GENERAL

1.1 Description

A. This Section includes the following:

1. Facility ground grid and ground rod system.

2. Ground riser extensions to structural steel, electrical equipment, and mechanical equipment.

B. Related Work Specified Elsewhere

Field Testing .....Section 16950

1.2 References

1. American Society For Testing and Materials (ASTM)

ASTM B8 - Concentric-Lay Stranded-Copper Conductors, Hard, Medium-Hard, or Soft.

2. National Electrical Safety Code (NESC)

3. National Fire Protection Association (NFPA)

70 - National Electrical Code.

70E – Standard for Electrical Safety in the Workplace

4. Underwriters' Laboratories (UL)

467 - Electrical Grounding and Bonding Equipment.

5. Occupational Safety and Health Administration, OSHA.

6. All electrical and control equipment and material shall bear the recognized Underwriters Laboratories, Inc. (UL) seal of approval. It is Vendor’s responsibility to obtain local inspection approval for all non-UL labeled equipment and pay all fees in connection with the same.

1.3 Submittals

A. Submit as specified in Section 1330.

B. Includes, but not limited to, catalog cuts for the following:

1. Ground Rods.

2. Cable.

3. Grounding Lugs.

PART 2 - MATERIALS

2.1 Acceptable Manufacturers

A. Ground Rods

1. ERICO

2. A.B. Chance Company

3. Harger

Or Equal.

B. Cable-to-Equipment Ground Lugs

1. Burndy Corporation (Burndy).

2. Knight-Metalcraft, Division of Whitaker Cable.

3. Harger

2.2 Wire and Cable

A. Type BC2 as specified in this Division (Section 16120).

B. Conductor Sizes

1. As indicated for specific connections.

2. For required connections not indicated, use conductor size not less than No. 2/0 AWG if buried in earth or cast in concrete, or No.2 AWG at other locations, unless otherwise noted.

2.3 Ground Rods

A. Copper-clad steel or copper-alloy sectional-type rods.

B. One end pointed to facilitate driving.

C. 3/4-inch diameter x 10 feet long with diameter and length stamped near top of rod.

2.4 Connection Materials

A. Cable-to-cable and cable-to-rod cable-to-connector connections of exothermic-welding-type process.

B. Cable-To-Equipment Ground Lugs

1. Compression type.

2. Bolted to equipment housing with silicon bronze bolts and lock washers.

2.5 Coatings

A. Coal Tar

1. Kop Coat - No. 50.

2. Tnemec - 46-449.

PART 3 - EXECUTION

3.1 Inspection: Do not cover up connections before they are inspected by Engineer.

3.2 Installation

A. Wire and Cable

1. Install using as few joints as possible.

2. Protect against abrasion by several wrappings of rubber tape at all points where cable leaves concrete in exposed areas.

3. Suitably protect cable against damage during construction.

4. Replace or suitably repair cable if damaged by anyone before final acceptance.

5. All Connections to be metal to metal. Remove all paint, grease, dirt, etc. before making connections.

6. In Exposed Installations

   a. Route runs as indicated.

   b. Route along the webs of columns and beams, and in corners where possible for maximum physical protection.

   c. Support at intervals of 3 feet or less with nonmagnetic clamp-type supports.

   d. Where exposed and no natural protection available, provide physical protection as required to protect ground conductor.

7. In Buried Installations

   a. Lay in bottom of trench or in other excavations at least 30 inches below finished grade.

   b. Maintain clearance of at least 12 inches from all underground metal piping or structures, except where connections thereto are specifically indicated.

   c. Backfill as specified in DIVISION 2 where applicable to the scope of work.

B. Ground Rods

1. Install rods as indicated by driving and not by drilling or jetting.

2. Drive rods into undisturbed earth where possible.

3. Where rods must be installed in excavated areas, drive rods into earth after compaction of backfill is completed.

4. Drive to a depth such that top of rods will be approximately 18 inches below final grade or subgrade, and connect main grid ground cable thereto.

C. Connections

1. Conform to manufacturer's instructions.

2. Chemically degrease and dry completely before welding.

3. Apply one coat of coal tar coating at 15 mils dry film thickness to all exothermic-welded connections to be buried.

4. Make connections to equipment as follows:

   a. Make up clean and tight to assure a low-resistance connection with resistance not exceeding 1 ohm.

   b. Install so as not to be susceptible to mechanical damage during operation or maintenance of equipment.

   c. Provide direct copper connection to buried ground grid system.

   d. Prior to making connections remove all paint, grease, etc. from connection location.

D. Metallic Conduit Grounds

1. Adequately and properly ground at all terminal points and wherever isolated from equipment or grounded steel.

2. Where extending into floor-mounted equipment from below, connect to equipment ground bus or frame.

3. Where extending into manholes, handholes, or cable trenches, connect to the ground riser or cable at that structure using grounding bushings.

E. Rack Grounds

1. Ground at intervals not to exceed 20 feet.

2. Ground all continuous runs as well as isolated sections at least at one point.

F. Box Grounds: Unless grounded by conduit system, ground all boxes by direct copper connection to the buried ground grid system.

G. Motor Grounds: Ground all motors with "identified" ground conductor in addition to conduit system. Route in conduit with phase conductors unless external ground is indicated.

3.3 Field Testing: Specified in Section 16950.

PART 4 MEASUREMENT AND PAYMENT

4.1 Measurement

A. No measurement will be made for this item.

4.2 Payment

A. Payment will be made at the contract lump sum price bid and shall be considered full payment for providing labor and materials to perform this work.

END OF SECTION

SECTION 16950
FIELD TESTING

PART 1 - GENERAL

1.1 Description

A. This Section covers field testing of all wire, cable, and electrical equipment.

B. Related Work Specified Elsewhere

Grounding ..... Section 16450

1.2 References

1. American Society For Testing and Material (ASTM):

ASTM D877 - Dielectric Breakdown Voltage of Insulating Liquids Using Disk Electrodes.

2. Insulated Cable Engineers Association (ICEA):

S-19-81 - Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

S-66-524 - Cross-Linked Thermosetting Polyethylene - Insulated Wire and Cable for the Transmission and Distribution of Electric Energy.

S-68-516 - Ethylene-Propylene-Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

3. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE):

C37.20 - Switchgear Assemblies, Including Metal-Enclosed Bus.

4. National Electrical Code (NEC).

5. National Electrical Manufacturers Association (NEMA).

6. International Electrical Testing Association (NETA)

7. National Fire Protection Association

8. Standard for Electrical Safety in the Workplace, NFPA 70E

9. National Electrical Safety Code,.IEEE C2.

10. Occupational Safety and Health Administration, OSHA.

11. As specified in each applicable section, this Division.

1.3 Quality Assurance

A. Test Reports

1. Submit as specified in Section 1330.

2. Maintain a written record of all tests showing date, personnel making tests, equipment used, equipment or material tested, tests performed, and results.

3. Notify Engineer two weeks prior to commencement of all testing except for megger tests.

PART 2 - MATERIALS

2.1 Acceptable Manufacturers

A. Ground Test Set

1. Associated Research, Inc.

2. James G. Biddle Company.

B. Multimeter

1. Simpson Electric Company.

C. Insulation Test Set

1. Associated Research, Inc.

2. James G. Biddle Company.

2.2 Provide all testing equipment required which includes all or some of the following

A. Wet- and dry-bulb thermometer.

B. 500V meggers.

C. Battery-powered portable telephone sets and portable radios.

D. One Multimeter (Volt-Ohm-Milliammeter) rated 20 K ohms per volt (dc) or better, or digital readout multimeter.

E. One phase rotation meter, 60-Hz.

F. Commercial model three-point ground test set, James G. Biddle Company "Megger" Ground Tester or Associated Research, Inc., "Vibroground" tester.

G. Miscellaneous cable, test lights, buzzers, bells, switches, receptacles, plugs, and other equipment as required.

PART 3 - EXECUTION

3.1 General Requirements

A. Test all wire, cable, and electrical equipment installed or connected by Contractor to assure proper installation, setting, connection, and functioning as indicated or to conform to Contract Documents and manufacturer's instructions.

B. Conduct all tests except megger insulation testing in the presence of Engineer or Owner and under the supervision of equipment manufacturer's field engineer.

C. Include all tests recommended by the equipment manufacturer unless specifically waived by Engineer.

D. Include all additional tests issued by Engineer that he deems necessary because of field conditions to determine that equipment and material and systems meet requirements of Contract Documents.

E. Be responsible for all damage to equipment or material due to improper test procedures or test apparatus handling.

F. Provide written reports of all testing to engineer within five (5) days of completion of test and prior to energizing.

3.2 Execution

A. Molded Case Circuit Breaker Tests

1. Visually inspect and manually operate each breaker, to insure proper alignment and smooth operation note any defects or operational problems.

2. Check nameplate data to drawing and specifications.

3. Check adjustable magnetic trip settings against values furnished by Engineer.

4. Megger each pole for freedom from grounds.

5. For breakers provided with shunt trips, check operation of shunt trip circuit.

6. Check all connections.

7. Check for proper current rating for circuit to which breaker is connected.

B. Motor Tests on All Motors

1. Check equipment ground to assure continuity of connections as specified in this Division.

2. Measure the insulation resistance of the stator winding before applying voltage. Compare this measured value against the manufacturer's value. If there is no insulation resistance value furnished by manufacturer, use the following:

Motor Voltage	Insulation Resistance
600 volts and below	5 megohms

If measured resistance values are lower than above, record room temperature and humidity and submit readings to Engineer before energizing. Dry out motors as required by accepted method of application of external heat, and do not apply voltage to motor until substandard resistance condition is corrected. Megger readings are to be one-minute duration, using a 500V megger for all motors 600V and below.

3. Prior to final equipment alignment, disconnect motor from driven equipment where necessary to check lubrication, starter, and control circuits. If motor is free of dirt and dust, rotate rotor by hand to determine that motor turns freely. Clean out motor if necessary. Apply voltage momentarily and note direction of rotation. Correct rotation if necessary. Reconnect motor to driven equipment.

4. After the motor is placed in operation, observe the motor for heating at the bearings or windings. If the motor appears to be running hot, notify Engineer. Note: General purpose motors may reach temperatures up to 176 degrees F with a room temperature of 104 degrees F.

5. If motor is conrolled by a VFD, Take motor load ampere readings (on all three legs of three-phase motors) at 60%, 70%, 80%, 90% and 100% of full speed. Submit results to Engineer.

C. Power Switches (Disconnects and Safety)

1. Inspect contacts and clean if required.

2. Inspect arc chutes if provided on switch.

3. Inspect fuses for proper rating if furnished on switch.

4. Operate switches (de-energized) for proper functioning.

D. Float Switches

1. Inspect and test switches to conform to manufacturer's recommended field tests.

2. Adjust switches to perform the design function for proper equipment operation.

E. Wire and Cable Tests: (Feeders and Control Circuits Only)

1. Megger all 600V insulated wire with a 500V megger for one minute, and values must be approximately as follows:

Conductor Capacity Amperes	Resistance Ohms
0-24	1,000,000
25-50	250,000
51-100	100,000
101-200	50,000
201-400	25,000
501-800	12,000
Over 800	5,000

Determine the values with all switchboards, panelboards, fuse holders, switches, and overcurrent devices in place. Do not connect

motors and transformers during meggering. Megger wire and cable after installation and not on the cable reel.

2. Check all control cable by megger tests similar to those described for 600V insulated wire. Check all control wiring for tightness of terminal contacts and continuity (especially of current transformer leads) through each "run" of control circuiting. Thoroughly verify all wiring by means of battery-powered lights, buzzers, bells, or telephones.
After completing these checks and tests on a given control circuit, attach a temporary cardboard tag on each end of cable tested which bears date and name of Contractor's representative responsible for checking. Follow this procedure for each control circuit cable. Provide all phasing tests and make all changes necessary to assure proper rotation of all motors, the correct phasing and phase sequence of all circuits susceptible to being paralleled, the proper polarity on all instrument transformer wiring, and such other phasing tests as may be required for the equipment being connected under this Contract.

Do not test cable with an ac test set. Disconnect cables from all equipment during testing. Testing cable on reel will not be acceptable. Make testing after installation but before final connection of equipment. Make high-potential tests phase-to- ground on each individual conductor.

F. Control Schemes Tests

1. Test all electrical controls by trial operation of control equipment after all wiring is completed to see that each interlock and control function operates to conform to the description of operation, as well as with the manufacturer's operating instructions.

G. Miscellaneous Equipment Tests

Test all miscellaneous equipment furnished by equipment manufacturer as recommended by manufacturer.

H. Lighting Tests

1. Test all systems for proper operation and correct phasing prior to final acceptance.

I. Grounding Tests

1. Measure resistance of ground system at each ground riser.

2. Record results and notify Engineer if any reading exceeds 1 ohms.

3. Test at least three of each type of ground connections and not less than 25 percent of all ground connections.

4. Test by one of the following methods for resistance measurement:

   a. Three-point method using an ammeter and voltmeter with ac or dc power supply.

   b. Commercial instrument method using equipment as specified in this Section.

J. SCADA SYSTEM TESTING

1. Activate each monitored point in the new pump station and verify that the associated signal is received at the Central Monitoring Station at the Island Wastewater Treatment Plant.

PART 4 MEASUREMENT AND PAYMENT

4.1 Measurement

A. No measurement will be made for this item.

4.2 Payment

A. Payment will be made at the contract lump sum price bid and shall be considered full payment for providing labor and materials to perform this work.

END OF SECTION