LAKE HAVASU CITY

Mulberry WWTP Aeration Basins, Structural and MCC Upgrades

ITB NO. PW-107018 - 500388

CONTRACT DOCUMENTS
VOLUME I

LAKE HAVASU CITY Mulberry WWTP
Aeration Basins and MCC Upgrades

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SECTION 00020

NOTICE INVITING BIDS

Lake Havasu City

PROJECT NO.: **PW-107018-500388**

PROJECT NAME: **Mulberry WWTP Aeration Basin, Structural and MCC Upgrades**

PRE-BID MEETING: A **NON-MANDATORY Pre-Bid Meeting** will be held at MULBERRY WWTP 340 MULBERRY AVE., LAKE HAVASU CITY, AZ at 1:00 PM, Arizona Time, on Wednesday, July 12, 2023.

BID DUE DATE: **July 26, 2023**

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

PROJECT DESCRIPTION:

This project consists of repairs to the Mulberry Wastewater Treatment Plant (WWTP) Aeration Basins, Structural and MCC Upgrades in the rehabilitation two concrete aeriation basin walls and replacing and upgrading the Motor Control Center (MCC) and Dissolved Oxygen Control Panels.

QUESTIONS: All questions that arise relating to this solicitation shall be directed in writing to purchasing@lhcaz.gov . To be considered, written inquiries shall be received at the above-referenced email address by July 14, 2023, 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://bluejeans.com/2330864044?src=calendarLink
Meeting ID: 233 086 4044
Phone Dial-in
+1.408.740.7256 (US (San Jose))
+1.888.240.2560 (US Toll Free)

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.

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: 240 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 HEARLD - June 27th, 2023 and July 4th, 2023
ARIZONA BUSINESS GAZETTE - June 29th, 2023 and July 6th, 2023

** 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 **Mulberry WWTP Aeration Basin, Structural and MCC Upgrades, Project No. PW-107018-500388** 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, July 26, 2023,** 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.

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;

The number and scope of any conditions attached to the Bid; and;

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 **240 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
From More Than	To and Including	Calendar Day or Fixed Rate
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
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 **July 14, 2023, 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:

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

Dodge Data & Analytics, 3315 Central Avenue, Hot Springs, AR, 71913, 871.375.2946, FAX: 501.625.3544, www.construction.com, dodge.bidding@construction.com

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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 "**Mulberry WWTP Aeration Basin, Structural and MCC Upgrades, Project No. PW-107018-500388**" 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 **Mulberry WWTP Aeration Basin, Structural and MCC Upgrades, Project No. PW-107018-500388** 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.

Cooperative Use of Contract

This solicitation is being prepared by the City of Lake Havasu, Arizona ("City") for the use of the City. While this solicitation is for the use of the City, other eligible public agencies may have an interest in utilizing the resulting contract. After an award, and with the approval of the bidder, this solicitation may be utilized by eligible public agencies. Any such usage by other entities must be in accordance with the ordinance, charter and/or procurement rules and regulations of the respective political entity.

Please indicate below your acceptance or rejection regarding such participation of other governmental entities. Your response will not be considered a bid response requirement in awarding a contract. If you do not wish to grant such access to other eligible public agencies, please so state in your bid response below. In the absence of a statement to the contrary, the City will assume that you do wish to grant access to any contract that may result from this solicitation.

Bidder hereby grants _____, or does not grant_____, cooperative purchase access to other eligible public agencies.

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

Mulberry WWTP Aeration Basin, Structural and MCC Upgrades
PW-107018-500388

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

The City Council:

Pursuant to request for bids to be opened the July 26, 2023 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 **Mulberry WWTP Aeration Basin, Structural and MCC Upgrades, Project No. PW-107018-500388**

BID SCHEDULE – Mulberry WWTP Aeration Basin, Structural and MCC Upgrades PW-107018-500388

ITEM NO.	DESCRIPTION	EST QTY	UNIT OF MEASURE	UNIT PRICE[1] (Word)	UNIT PRICE (Figure)	ITEM TOTAL[2] COSTS
BASE BID						
1	Mobilization/Demobilization	1	L.S.		$	$
2	Perform concrete wall repairs as shown in the design drawings	1	L.S.		$	$
3	Install stainless steel plates and structural elements as shown in the drawings	1	L.S.		$	$
4	Perform all work related to the supply and installation of the Prefabricated Electrical Building.	1	L.S.		$	$
5	Perform all ~~work~~ electrical work as shown on drawings for the MCC upgrades.	1	L.S.		$	$
6	Force Account[3]	1	L.S.	Fifty Thousand Dollars	$ 50,000	$ 50,000
	BID TOTAL[4] + FORCE ACCOUNT				$	$
ADD ALT 1	Perform concrete crack repair	400	L.F.		$	$

[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 Force Account may only be utilized after first obtaining authorization from the City.
[4] The "Bid Total" amount shall be the sum of all costs listed in the "Item Total Costs" column.

ADD ALT 2	Perform concrete crack repair	400	S.F.	$	$	
BID TOTAL + FORCE ACCOUNT + ADD ALT 1 & 2[5]				$	$	

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

5 The "Additive Alternate" bids will be selected by the City and may include one or more.

The unit prices for **Mulberry WWTP Aeration Basin, Structural and MCC Upgrades, Project No. PW-107018-500388,** 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

Mulberry WWTP Aeration Basin, Structural and MCC Upgrades, PW-107018-500388

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: _____ Principal	By: _____ 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 **

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 Havasupai Wash #3, Project No. DR1030 ("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 **XX 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 shall indemnify and hold harmless City, its officers, volunteers 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.

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 $2,000,000

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. **Builders' Risk (Property) Insurance (Vertical Construction Only)**

a. CONTRACTOR shall purchase and maintain, on a replacement cost basis Builders' Risk insurance in the amount of the initial CONTRACT amount as well as subsequent modifications thereto, including modifications through Change Order, for the entire work at the site. Such Builders' Risk insurance shall be maintained until final payment has been made or until no person or entity other than CITY has an insurable interest in the property required to be covered, whichever is earlier. This insurance shall include interests of CITY, CONTRACTOR and any tier of CONTRACTOR's subcontractors in the work during the life of the CONTRACT and course of construction, and shall continue until the work is completed and accepted by CITY. For new construction projects, CONTRACTOR agrees to assume full responsibility for loss or damage to the work being performed and to the buildings or structures under construction. For renovation construction projects, CONTRACTOR agrees to assume responsibility for loss or damage to the work being performed at least up to the full CONTRACT amount, unless otherwise required by the Contract documents or amendments thereto.

b. Builders' Risk insurance shall be on an all-risk policy form and shall also cover false work and temporary buildings or structures and shall insure against risk of direct physical loss or damage from external causes including debris removal, demolition occasioned by enforcement of any applicable legal requirements and shall cover reasonable compensation for architects' and engineers' services and expenses, and other "soft costs," required as a result of such insured loss.

c. Builders' Risk insurance must provide coverage from the time any covered property falls within CONTRACTOR's control and/or responsibility and continue without interruption during construction or renovation or installation, including any time during which covered property is being transported to the construction or installation site, and while on the construction or installation site awaiting installation. The policy will provide coverage while the covered premises or any part thereof is occupied. Builders' Risk insurance shall be primary and not contributory.

d. If the CONTRACT requires testing of equipment or materials or other similar operations, at the option of CITY, CONTRACTOR will be responsible for providing property insurance for these exposures under a Boiler Machinery insurance policy.

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, Community Investment 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, Community Investment 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 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

Mulberry WWTP Aeration Basin, Structural and MCC Upgrades, PROJECT NUMBER PW-107018-500388

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

Mulberry WWTP Aeration Basin, Structural and MCC Upgrades,
PROJECT NUMBER PW-107018-500388

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: Mulberry WWTP Aeration Basin, Structural and MCC Upgrades

The OWNER has considered the BID submitted by you for the above described WORK in response to its Advertisement for BIDS dated July 26, 2023, 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:

Mulberry WWTP Aeration Basin, Structural and MCC Upgrades
Project No. PW-107018-500388

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:

Mulberry WWTP Aeration Basin, Structural and MCC Upgrades
Project No. PW-107018-500388

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

D. 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:

Mulberry WWTP Aeration Basin, Structural and MCC Upgrades, PROJECT NO. PW-107018-500388

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 **

SECTION 00800

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 his Subcontractors to protect

carefully his and 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 his subcontractors to so protect his 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 Department at no cost to the Contractor. The Contractor shall make application and obtain a hydrant meter from the Water Department 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 Department each month during the project for reading, and notification to the Water Department 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 his 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 his 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 his 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 his 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 his 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 his/her schedule of operations, the contractor shall review and update his/her 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 his/her 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 Specifications 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 bench marks, 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 his 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 specifications.

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 specifications 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 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 his 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, he 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, he does so at his 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. He 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 his 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 his 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 his 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 & 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 his 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 his 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. He 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 he 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 he may deem necessary for public safety and to protect his 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 his equipment, nor allow his 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. He 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 an 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 Office of the City Engineer 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 job, 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 Sum.

D. General Requirements

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

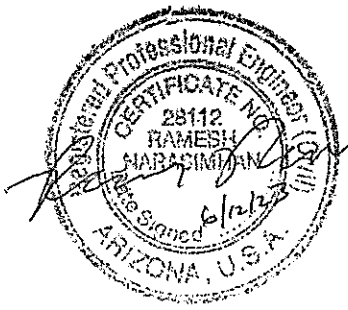
E. Project Electrical Service

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.

LAKE HAVASU CITY

TECHNICAL SPECIFICATIONS
VOLUME II

Mulberry WWTP Aeration Basins, Structural and MCC Upgrades
107018



Lake Havasu City
MULBERRY WWTP - AERATION BASINS,
STRUCTURAL AND MCC UPGRADES

LAKE HAVASU CITY

TECHNICAL SPECIFICATIONS
VOLUME II

Mulberry WWTP Aeration Basins,
Structural and MCC Upgrades

TABLE OF CONTENTS

The following specifications are contained within this Invitation for Bids:

DIVISION I- GENERAL REQUIREMENTS

DIVISION V – MISCELLANEOUS METALS

DIVISION XVI – ELECTRICAL TECHNICAL SPECIFICATIONS

DIVISION I

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 Mulberry Wastewater Treatment Plant (WWTP) aeration basins performing concrete wall repairs and installing 1/4-inch thick stainless steel plates with studs.
   2. The electrical and Motor Control Center (MCC) Upgrades include a new prefabricated building, MCC and all related panels and wiring.

1.02 LOCATION OF PROJECT

A. The Project is located at the following addresses:
Mulberry Wastewater Treatment Plant (WWTP): 340 Mulberry Ave., Lake Havasu City, AZ 86403.

1.03 WORK BY THE OWNER

A. Concurrent to this Project, the OWNER will:
   1. Provide site access.
   2. Drain the aeration basins.
   3. 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.

4.

1.05 OPERATION OF EXISTING FACILITIES

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

B. During the entire construction period, one of the existing aeration basins shall remain in operation. 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 shall limit his use of the premises for Work and storage, and allow for work by other contractors/subcontractors.

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. Conduct Work to interfere as little as possible with public travel, whether vehicular or pedestrian.

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.

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 aeration basins rehabilitation.

1. OWNER to isolate and drain the aeration basins, as required.
2. OWNER to rotate the aeration basins' bridge drive to accommodate the concrete repair work and installation of stainless steel plates.
3. One existing aeration basin shall always remain in service.
4. Rehab sequence of the aeration basins:
   a. Coordinate with the OWNER to isolate and drain one aeration basin.
   b. Perform concrete repair work
   c. Install stainless steel plates on aeration basins wall top surface.
   d. Coordinate with the OWNER to keep the aeration basin in service.
   e. Once the aeration basin is in service, repeat the above steps "a" thru "d" to rehab the second aeration basin.

5. Install new MCC and building and related wiring.
6. Any damage to existing property/equipment must be replaced to original working conditions.

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.

3.2 Measurement and Payment

A. Measurement

1. No measurement will be made.

B. Payment

Payment for mobilization will be made as follows:

1. When 5% of the total original contract amount is earned from other Bid Items, 50% of the amount bid for Mobilization, or 5% of the total original contract amount, whichever is the least, will be paid.
2. When 10% of the total original contract amount is earned from other Bid Items, 100% of the amount bid for Mobilization, or 10% of the total original contract amount, whichever is the least, will be paid.
3. Upon completion of all work on the project, payment of any amount bid for Mobilization in excess of 10% of the total original contract amount will be paid. Demobilization shall be considered incidental to the Mobilization Bid Item.

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

See Section 00310 Bid Schedule for Bid Items.

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 01320 **

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 CD's 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 01325 **

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. Contractor may use a reproduction of 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.

E. 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.

F. 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. Precast Electrical Building
   B. Electrical Switchgear
   C. Work Plan for Existing Basin Shutdown and Related Work

G. 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.

H. 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.

I. 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 APPROVED (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.

J. 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).

K. 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.

1.3 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 01330 **

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:_____ By_____
Owner's Authorized Signature Contractor's Receipt Acknowledged

Date:_____ 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_____

Method of determining change in Contract Times:

□ Contractor's records

□ OWNER's records

□ Other _____

Estimated increase (decrease) in Contract Price: $_____
If the change involves an increase, the estimated amount is not to be exceeded without further authorization.

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: NCS Engineers 202 E. Earll Drive, Suite 110 Phoenix, AZ 85012 Attn:	From: Attn:	NCS Job No.: Reviewed By: Date Reviewed: 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 Submitt
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: Sub Consultant 1: ____ Copies OWNER: _____ Copies

NCS: _____ Copies

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 s h a l l ," and " shall b e ," 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 01420 **

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
Temporary Utilities and Facilities ..... Section 01560

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 weathertight.

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 01520 **

SECTION 01530

TEMPORARY BARRIERS AND CONTROLS

PART 1 - GENERAL

1.1 Summary

A. This Section includes General Requirements for:

1. Safety and protection of Work.

2. Safety and protection of existing property.

3. Barriers.

4. Environmental controls.

5. Traffic control and use of roadways.

B. Related Work Specified Elsewhere

Temporary Utilities and Facilities ..... Section 01560
Traffic Control..... Section 02560

PART 2 - PRODUCTS – Not Applicable

PART 3 - EXECUTION

3.1 Safety and Protection of Work and Property

A. General

1. Provide for the safety and protection of the Work as set forth in GENERAL CONDITIONS. Provide protection at all times against rain, wind, storms, frost, freezing, condensation, or heat, so as to maintain all Work, Equipment, and Materials free from damage. At the end of each day, all new Work likely to be damaged shall be appropriately protected. Notify Engineer immediately, at any time operations are stopped, due to conditions which make it impossible to continue operations safely, or to obtain proper results.

2. Construct and maintain all necessary temporary drainage and do all pumping necessary to keep excavations, floors, pits, trenches, manholes, and ducts free of water.

3. Protect floors from damage by proper covering and care when handling heavy equipment, painting, or handling mortar or other such materials. Use proper cribbing and shoring to prevent overloading of floors while moving heavy equipment. Provide metal pans under machines and clean such pans daily, keeping oil off floors. Restore floors to former condition where damaged or stained.

4. Concrete floors less than 28 days old shall not be loaded without written permission from Engineer.

5. Restrict access to roofs except as required by the Work. Where access is required, provide protection with plywood, boards, or other suitable materials.

6. Any equipment or materials left in the Right-of-Way overnight shall be properly barricaded, including a minimum of two lighted barricades.

B. Property Other than Owner's

1. Provide for the safety and protection of property as set forth in the GENERAL CONDITIONS. Report immediately to the owners thereof and promptly repair damage to existing facilities resulting from construction operations.

2. Names and telephone numbers of representatives of agencies and utilities having jurisdiction over streets and utilities in the Work area can be obtained from Engineer for the agencies listed below. Concerned agencies or utilities shall be contacted a minimum of 24 hours prior to performing Work, closing streets and other traffic areas, or excavating near underground utilities or pole lines.

a. Water.

b. Gas.

c. Sanitary sewers.

d. Storm drains.

e. Pipeline companies.

f. Telephone.

g. Electric.

h. Municipal streets.

i. State highways.

j. City engineer.

k. Fire.

l. Police.

3. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility, unless otherwise directed by Engineer

4. Where fences are to be breached on private property, the owners thereof shall be contacted and arrangements made to ensure proper protection of any animals or other property thus exposed.

5. The applicable requirements specified for protection of the Work shall also apply to the protection of existing property of others.

6. Before acceptance of the Work by Engineer, restore all property affected by Contractor's operations to the original or better condition.

3.2 Barriers

A. General

1. Furnish, install, and maintain suitable barriers as required to prevent public entry, protect the public, and to protect the Work, existing facilities, trees, and plants from construction operations. Remove when no longer needed or at completion of Work.

2. Materials shall meet all MUTCD standards, new or used, suitable for the intended purpose, but shall not violate requirements of applicable codes and standards or regulatory agencies.

3. Barriers shall be of a neat and reasonable uniform appearance, structurally adequate for the required purposes.

4. Maintain barriers in good repair and clean condition for adequate visibility. Relocate barriers as required by progress of Work.

5. Repair any damage caused by installation and restore area to original or better condition. Clean the work area.

B. Tree and Plant Protection

1. Preserve and protect existing trees and plants.

2. Provide temporary barriers around each, or around each group of trees and plants. Construct to a height of 6 feet around trees, and to a height to adequately protect plants.

3. Employ qualified tree surgeon to remove and to treat cuts.

4. Protect root zones of trees and plants as follows:

a. Do not allow vehicular traffic or parking.

b. Do not store materials or products. Prevent dumping of refuse or chemically injurious materials or liquids.

c. Prevent piddling or continuous running water.

5. Carefully supervise excavating, grading and filling, and subsequent construction operations to prevent damage.

6. Remove and replace similar size & type (or agreed upon by tree owner), or suitably repair, trees and plants which are damaged or destroyed due to construction operations, and which were designated to remain.

3.3 Environmental Conditions

A. Dust Control

1. Provide proactive positive methods and apply dust control materials to minimize the raising of dust from construction operations; and to prevent airborne dust from dispersing into the atmosphere throughout the duration of the project day and night. ADEQ "Air Quality Permit Requirements" & AZNPDES (Arizona National Pollution Discharge Elimination System). shall be adhered to. Fines may result if out of compliance with permit requirements.

2. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.

3. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly-coated surfaces.

B. Water and Erosion Control

1. Provide methods to control surface water to prevent damage to the Project, the Site, or adjoining properties.

2. Plan and execute construction and earthwork by methods to control surface drainage from cuts and fills, and from borrowpit and waste disposal areas, to prevent erosion and sedimentation.
   a. Hold the areas of bare soil exposed at one time to a minimum.

   b. Provide temporary control measures such as berms, dikes, and drains.

3. Control fill, grading, and ditching to direct surface drainage away from excavations, pits, tunnels, and other construction areas; and to direct drainage to proper runoff.

4. Provide, operate, and maintain hydraulic equipment of adequate capacity to control surface and groundwater.

5. Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to any portion of the Site or to adjoining areas.

6. Provide temporary drainage where the roofing or similar

waterproof deck construction is completed prior to the connection and operation of the permanent drainage piping system.

C. Debris Control and Clean-Up

1. Keep the premises free at all times from accumulations of debris, waste materials, and rubbish caused by construction operations and employees. Responsibilities shall include:

a. Adequate trash receptacles about the Site, emptied promptly when filled.

b. Periodic cleanup to avoid hazards or interference with operations at the Site and to maintain the Site in a reasonably neat condition.

c. The keeping of construction materials such as forms and scaffolding neatly stacked.

d. Immediate cleanup to protect the Work by removing splattered concrete, asphalt, oil, paint, corrosive liquids, and cleaning solutions from walls, floors, and metal surfaces before surfaces are marred.

2. Prohibit overloading of trucks to prevent spillages on access and haul routes. Provide periodic inspection of traffic areas to enforce requirements.

3. Final cleanup is specified in Section 01780 - CONTRACT CLOSEOUT.

D. Pollution Control

1. Provide methods, means, and facilities required to prevent contamination of soil, water, or atmosphere by the discharge of hazardous or toxic substances from construction operations.

2. Provide equipment and personnel, perform emergency measures required to contain any spillages, and remove contaminated soils or liquids. Excavate and dispose of any contaminated earth off-Site in approved locations, and replace with suitable compacted fill and topsoil.

3. Take special measures to prevent harmful substances from entering public waters, sanitary, or storm sewers.

3.4 Traffic Control and Use of Roadways

A. Traffic Control:

Refer to Section 2650

B. Maintenance of Roadways

1. Repair roads, walkways, and other traffic areas damaged by operations. Keep traffic areas as free as possible of excavated materials and maintain in a manner to eliminate dust, mud, and hazardous conditions.

2. All operations and repairs shall meet the approval of owners or agencies having jurisdiction. The CONTRACTOR will provide dust control, be required to grade, smooth-out, fill holes, and generally maintain the streets where the pavement has been removed. This maintenance will be done daily, if necessary, to allow local traffic to travel through the area on an acceptable surface.

PART 4 - MEASUREMENT AND PAYMENT - Not Applicable.

** END OF SECTION 01530 **

SECTION 01560

TEMPORARY UTILITIES AND FACILITIES

PART 1 - GENERAL

1.1 Summary

A. This Section includes contractor requirements of a temporary nature not normally incorporated into final Work. It includes the following:

1. Utility services.

2. Construction and support facilities.

3. Construction aids.

4. Safety and health.

5. Fire protection.

B. Related Work Specified Elsewhere

Temporary Barriers and Controls ..... Section 01530
Field Offices and Sheds ..... Section 01520

1.2 Quality Assurance

A. Reference Standards and Specifications

1. American National Standards Association (ANSI)

A10 Series - Safety Requirements for Construction and Demolition.

2. National Electrical Contractors Association (NECA)

3. Electrical Design Library - Temporary Electrical Facilities.

4. National Fire Protection Association (NFPA)

10 - Portable Fire Extinguishers.

70 - National Electrical Code.

241 - Safeguarding Construction, Alterations, and Demolition Operations.

B. National Electrical Manufacturers Association (NEMA).

C. Underwriters Laboratories (UL).

D. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:

1. Building Code requirements.

2. Health and safety regulations.

3. Utility company regulations.

4. Environmental Protection Regulations.

E. Standards

1. Comply with NFPA 10 and 241, and ANSI A10 Series standards “Temporary Electrical Facilities."

2. Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70.

F. Inspections

Contractor shall obtain required certifications and permits. Arrange for authorities having jurisdiction to inspect and test each temporary utility before use.

1.3 Submittals

Temporary Utilities

Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

1.4 Project Conditions

Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not allow hazardous, dangerous, unsanitary conditions, or public nuisances to develop or persist on the Site.

PART 2 - PRODUCTS

2.1 Materials and Equipment

A. Provide new materials and equipment. Provide materials and equipment suitable for the use intended, of capacity for required usage, and meeting applicable codes and standards. Comply with requirements of DIVISIONS 2 through 16.

PART 3 - EXECUTION

3.1 Temporary Utilities

Furnish, install, and maintain temporary utilities required for adequate construction, safety, and security. Modify, relocate, and extend systems as Work progresses. Repair damage caused by installation or use of temporary facilities. Remove on completion of Work or until service or facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 Temporary Sanitary Facilities

Contractor-Furnished Facilities

1. Furnish, install, and maintain temporary sanitary facilities for use through construction period. Remove on completion of Work.

2. Provide for all construction workers under this Contract and representatives at the Site.

3. Toilet facilities shall be of the chemical, aerated recirculation, or combustion type, properly vented, and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

4. Drinking Water Fixtures: Provide containerized tap dispenser type

drinking water units.

5. Supply and maintain toilet tissue, paper towels, paper cups and similar disposable materials as appropriate for each facility. Provide appropriate covered waste containers for used material.

6. Supply garbage containers for misc. construction trash and debris, with cover.

3.3 Temporary Safety and Health

General: Contractor shall be responsible for development of safety and health programs for personnel at Project Site as specified in the GENERAL CONDITIONS.

3.4 Installation and Removal

A. Relocation: Relocate construction aids as required by progress of construction, storage limitations, or Work requirements and to accommodate requirements of Owner and other contractors at the Site.

B. Removal: Remove temporary materials, equipment, and services when construction needs can be met and allowed by use of permanent construction, or at completion of the Project.

C. Repair: Clean and repair damage caused by installation or by use of temporary facilities.

PART 4 - MEASUREMENT AND PAYMENT - Not Applicable.

** END OF SECTION 01560 **

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 01580 **

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.

1.6 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. 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 01600 **

SECTION 01612

SEISMIC DESIGN CRITERIA

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Seismic design criteria for the following:
   1. Anchorage of mechanical and electrical equipment.
   2. Seismic design and anchorage of tanks and vessels, unless indicated otherwise in tank and vessel specifications.
   3. Other structures or items as specified or indicated on the Drawings.

1.02 REFERENCES

A. International Building Code, 2015.

B. American Society of Civil Engineers Standard 7 - Minimum Design Loads for Buildings and Other Structures, to the extent referenced by the 2015 International Building Code

1.03 SYSTEM DESCRIPTION

A. Design requirements: Design in accordance with the requirements of the International Building Code:
   1. International Building Code Site Classification of "D" and Risk Category III shall be utilized for design, along with following:

Table 1 – 2015 International Building Code Seismic Design Criteria

Seismic Design Factors	**Value**
Site Class	D
Site Coefficient, F_a	1.6
Site Coefficient, F_v	2.4
Mapped Spectral Response Acceleration at 0.2-second Period, S_s	0.164 g
Mapped Spectral Response Acceleration at 1.0-second Period, S_1	0.055 g
Spectral Response Acceleration at 0.2-second Period Adjusted for Site Class. S_{MS}	0.262 g
Spectral Response Acceleration at 1.0-second Period Adjusted for Site Class. S_{M1}	0.132 g
Design Spectral Response Acceleration at 0.2-second Period, S_{DS}	0174 g
Design Spectral Response Acceleration at 1.0-second Period, S_{D1}	0.088 g

2. Seismic Importance factor For Anchorage of Mechanical and Electrical Equipment: 1.25.
3. Seismic Importance Factor For The Design Of Tanks And The Anchorage Of Tanks: 1.25.
4. Do not use friction to resist sliding due to seismic forces.
5. Use anchor bolts, bolts, studs for anchors for resisting seismic forces. Anchor bolts used to resist seismic forces shall have a standard hex bolt head. Do not use anchor bolts fabricated from rod stock with an L or J shape:
   a. Do not use concrete anchors, flush shells, chemical anchors, powder actuated fasteners, or other types of anchors unless indicated on the Drawings or accepted by the ENGINEER.
   b. Seismic forces must be resisted by direct bearing on the fasteners used to resist seismic forces. Do not use connections which use friction to resist seismic forces.

1.04 SUBMITTALS

A. Shop Drawings and Calculations: Provide seismic calculations and required details with the applicable equipment shop drawing.

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 01631 **

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 for manual operating mode.
12) Clean water testing of tankage for integrity.

13) Verify proper instrumentation and control signal generation, transmission, reception and response.
14) Check that all tagging/identification systems are in place.
15) Achieve successful bacteriological test for piping, equipment, and tanks.

b. OWNER shall witness CONTRACTOR operation of each 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. Startup pumping equipment and support systems.
b. Calibrate and adjust system.
c. 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 wells and the treatment plant, and the equipment is operational.
d. Maintain the facilities.

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.

B.

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 01780 **

DIVISION V

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

METAL FABRICATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. The following shop fabricated steel and aluminum items, including:
   1. Cage Ladders
   2. Bollards.
   3. Gates.
   4. Sheet Metal Fabrications.
   5. Miscellaneous Steel and Aluminum Shapes.
   6. Metal Strut Framing Components.
   7. Stud Anchors, Chemical Anchors, Expansion Anchors, and Miscellaneous Fasteners.

1.02 RELATED REQUIREMENTS

A. Not used.

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M-14 - Standard Specification for Carbon Structural Steel.

B. ASTM A53/A53M-18 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

C. ASTM A108-18 - Standard Specification for Steel Bars, Carbon, Cold Finished.

D. ASTM A123/A123M-17 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

E. ASTM A153/A153M-18 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

F. ASTM A276/A276M-17 - Standard Specification for Stainless Steel bars and Shapes.

G. ASTM A283/A283M-18 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates.

H. ASTM A307-14e1 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.

I. ASTM A500/A500M-18 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

J. ASTM A575-96(2018) Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.

K. ASTM A576-17 Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.

L. ASTM A635/A635M-15 - Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.

M. ASTM A653/A653M-18 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.

N. ASTM A666-15 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

O. ASTM A1011/A1011M-18a - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

P. ASTM B117-18 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

Q. ASTM B209-14 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

R. ASTM B209M-14 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric].

S. ASTM B210/B210M-19 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes.

T. ASTM B211/B211M-19 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.

U. ASTM B221-14 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
   1. ASTM B221M-13 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].

V. ASTM C1107/C1107M-17 - Standard Specification for Packaged, Dry, Hydraulic-Cement Grout (Non-shrink).

W. ASTM E488/E488M-18 - Standard Test Methods for Strength of Anchors in Concrete

Elements.

X. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.

Y. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2015.

Z. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; American Welding Society; 2007, and Errata 2004.

AA. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).

BB. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

CC. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 2018.

1.04 SUBMITTALS

A. See Section 01300 for submittal procedures.

B. Product Data: Provide data for the following.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Gates: Indicate materials, dimensions, connections, and screen wall locations.

D. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 - PRODUCTS

2.01 MATERIALS – STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A500, Grade B cold-formed structural tubing.

C. Bars: ASTM A 36/A 36M.

D. Plates: ASTM A283.

E. Pipe: ASTM A 53, Standard Weight, black finish.

F. Stud Anchors: ASTM A 108, Grade 1015.
   1. Product and Manufacturer: S3L, TRW Nelson Stud Welding Division; www.nelsonstudwelding.com or approved equal.

G. Bolts, Nuts, and Washers: ASTM A307.

H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

I. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 SHEET MATERIALS

A. Galvanized Steel Sheet: ASTM A 653/A 653M, with G90/Z275 zinc coating; gage as indicated.
   1. If gage is not indicated provide 16 gage sheets.

B. Stainless Steel Sheet: ASTM A 666 Type 304, soft temper, 0.015 inch thick; smooth No. 4 finish.

2.03 MATERIALS – ALUMINUM

A. Aluminum Plates, Shapes and Bars: ASTM B 308.

B. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T5 temper.

C. Sheet Aluminum: ASTM B209 (ASTM B209M), 5052 alloy, H32 or H22 temper.

D. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210 (ASTM B210M), 6063 alloy, T6 temper.

E. Aluminum-Alloy Bars: ASTM B211 (ASTM B211M), 6061 alloy, T6 temper.

F. Bolts, Nuts, and Washers: Stainless steel.

G. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.04 ANCHORS

A. Anchors with capability to sustain, without failure, load imposed within factors of safety

indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency; designed for use in concrete and masonry.

1. Expansion Anchors: Stud type zinc plated carbon steel expansion anchor with a single piece wedge.
   a. Location: Provide only at locations specifically indicated to receive expansion anchors.
2. Threaded Inserts: Internally threaded, flush mounted, expansion type zinc-plated carbon steel.
3. Chemical Anchors: Two-component injectable adhesive type.

2.05 METAL STRUT FRAMING MATERIALS

A. Metal Strut Framing System: Structural support system with capability to sustain, without failure, imposed loads; consisting of channels, angles, tubes, and accessories as recommended by manufacturer for application indicated.

1. Channels: Cold formed from structural grade steel conforming to ASTM A570, GR 33 or ASTM A 653, GR 33.
2. Fittings: Fabricated from steel conforming to ASTM A 36, ASTM A 575, ASTM A576, or ASTM A 635.
3. Accessories: Manufacturer's standard nuts, bolts, washers, clamps, hangers, plates, fittings, brackets, threaded rod, inserts, splices, and other fabrications as recommended by manufacturer.

B. Finish components in accordance with one of the following:

1. Rust-inhibiting acrylic enamel paint, thoroughly baked; conforming to ASTM B 117.
2. Zinc-coated by the hot-dipped process prior to roll-forming, G90 conforming to ASTM A 653.
3. Zinc coated after all manufacturing, conforming to ASTM A 123 or ASTM A 153.

C. Product and Manufacturer: Unistrut Metal Framing, Unistrut Corporation, Division of Tyco International LTD: www.unistrut.com or approved equal.

2.06 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.07 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints

butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.

E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.08 FABRICATED ITEMS

A. Not used.

2.09 FINISHES - STEEL

A. Stainless Steel Bars and Shapes: ASTM A 276, Type 316 finish.

B. Stainless Steel Plate: ASTM A 276, Type 316 finish.

C. Stainless Steel Sheet: ASTM A 666 Type 304, soft temper, 0.015 inch thick; smooth No.4 finish.

2.10 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation from Plane: 1/16 inch in 48 inches.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into

concrete or embedded in masonry.

3.03 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Field weld components indicated on shop drawings.

D. Perform field welding in accordance with AWS D1.1/D1.1M.

E. Obtain approval prior to site cutting or making adjustments not scheduled.

F. After erection, prime welds, abrasions, and surfaces not shop primed.

G. Ladders: Install in accordance with manufacturer's recommendations.

H. Ladder Safety Posts: Install in accordance with manufacturer's recommendations.

I. Metal Strut Framing Components: Install in accordance with manufacturer's recommendations.

J. Anchors: Provide anchorage devices and fasteners where necessary for securing metal fabrications; including, but not limited to: chemical anchors, expansion anchors, threaded inserts, toggle bolts, through-bolts, dowels, threaded rod, lag-bolts, and anchor bolts, and other connections as required to provide for loads; Install in accordance with manufacturer's instructions.

3.04 TOLERANCES

A. Maximum Variation from Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset from True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05501

MISCELLANEOUS METALS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Miscellaneous metal fabrications including:
   1. Miscellaneous aluminum.
   2. Miscellaneous cast iron.
   3. Miscellaneous stainless steel.
   4. Miscellaneous structural steel.
   5. Associated accessories to the above items.

B. Related Sections:
   1. Section 05052 - Anchor Bolts, Toggle Bolts, and Concrete Inserts.
   2. Section 09800 - Special Coatings.
   3. Section 09900 - Painting.

C. See Drawings.

1.02 REFERENCES

A. Aluminum Association (AA) - Specification M32-C22-A41 - Aluminum Finishes.

B. ANSI A12.1 - Safety Requirements for Floor and Wall Openings, Railings, and Toeboards.

C. American Society for Testing and Materials (ASTM):
   1. ASTM A36/ A36M-14 - Standard Specification for Carbon Structural Steel.
   2. ASTM A48/A48M-03(2016) - Standard Specification for Grey Iron Castings.
   3. ASTM A53/A53M-18 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   4. ASTM A123/A123M-17 - Standard Specification for Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products.
   5. ASTM A240/A240M-18 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
   6. ASTM A269/A269M-15a - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
   7. ASTM A276/A276M-17 - Standard Specification for Stainless Steel Bars and Shapes.
   8. ASTM A307-14e1 - Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.

9. ASTM A489-18e1 - Standard Specification for Carbon Steel Lifting Eyes.
10. ASTM A500/A500M-18 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
11. ASTM A501/A501M-14 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
12. ASTM A554-16 - Standard Specification for Welded Stainless Steel Mechanical Tubing.
13. ASTM A635/A635M-15 - Standard Specification for Steel, Sheet and Strip, Heavy Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High Strength Low Alloy with Improved Formability, General Requirements for.
14. ASTM A653/A653M-18 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-iron Alloy-coated (Galvanized) by the Hot-Dip Process.
15. ASTM B209-14 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
16. ASTM B221-14 - Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
17. ASTM F3125/F3125M-18 - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.

D. AWS D 1.1 - Structural Welding Code.

E. OSHA Part 1910.23 - Guarding Floor and Wall Openings and Holes.

F. International Building Code (IBC).

1.03 SUBMITTALS

A. Shop Drawings: Submit fabrication drawings for approval.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials: Unless otherwise specified or indicated on the Drawings, structural and miscellaneous metals shall conform with the standards of the American Society for Testing and Materials, including the following:

Item	ASTM Standard No.	Class, Grade Type or Alloy No.
Cast Iron		
Cast Iron	A 48	Class 40B

Steel		
Galvanized sheet iron or steel	A 653	Coating G90
Black steel, sheet or strip	A 569	–
Coil (plate)	A 635	–
Structural plate, bars, rolled shapes, and	A 36	–
Standard bolts, nuts, and washers	A 307	–
High strength bolts, nuts and hardened flat washers	F3125	–
Eyebolts	A 489	Type 1
Tubing, cold-formed	A 500	–
Tubing, hot-formed	A 501	–
Steel pipe	A 53	Grade B
Stainless Steel		
Plate, sheet and strip	A 240	Type 304 or 316*
Bars and shapes	A 276	Type 304 or 316*
Aluminum		
Sheet aluminum-flashing	B 209	Alloy 5005-H14, 0.032 inches minimum thickness
Sheet aluminum-structural	B 209	Alloy 6061-T6
Structural aluminum	B 308 B 209	Alloy 6061-T6
Extruded aluminum	B 221	Alloy 6063-T42
* Use Type 304L or Type 316L if material will be welded.		

B. Stainless steels are designated by type or series defined by ASTM.

C. Where stainless steel is welded, use low-carbon stainless steel.

2.02 MISCELLANEOUS ALUMINUM

A. General: Fabricate aluminum products, not covered separately herein, in accordance with the best practices of the trade and field assemble by riveting or bolting. Do not weld or flame cut.

2.03 MISCELLANEOUS CAST IRON

A. General:

1. Tough, gray iron, free from cracks, holes, swells, and cold shuts.

2. Quality such that hammer blow will produce indentation on rectangular edge of casting without flaking metal.
3. Before leaving the foundry, clean castings and apply 16 mil dry film thickness coating of coal-tar epoxy, unless otherwise specified in or indicated on the Drawings.

2.04 MISCELLANEOUS STAINLESS STEEL

A. Provide miscellaneous stainless steel items not specified herein as indicated on the Drawings or specified elsewhere. Fabricate and install in accordance with the best practices of the trade.

2.05 MISCELLANEOUS STRUCTURAL STEEL

A. Provide miscellaneous steel items not specified herein as indicted on the Drawings or specified elsewhere. Fabricate and install in accordance with the best practices of the trade.

2.06 LADDERS

A. General:
1. Type: Safety type conforming to local, State, or Occupational Safety and Health Administration standards as minimum. Furnish guards for ladder wells.
2. Size: Minimum 16 inches wide between side rails of length, size, shape, detail, and location indicated on the Drawings.

B. Aluminum Ladder:
1. Material shall be 6061-T6 Aluminum and anodized.
2. Ladder shall conform to OSHA Standard 1910.27.
3. Rungs shall have serrated surface for slip resistance.
4. 1-1/4" solid serrated safety rung designed to meet loading standards which are 4 times that which is recommended by OSHA Standard #1910.27.
5. Ladder Up Safety Post where shown: Factory assembled telescoping post, designed for mounting fixed ladder, complete with brackets, hardware, and fasteners.
   a. Material Finish: Aluminum mill finish.
   b. Product and Manufacturer: Model LU-4, The Bilco Company or approved equal.

2.07 RAILING

A. General: Design and fabricate assemblies to conform to current local, State, and Occupational Safety and Health Administration standards and requirements.

B. CONTRACTOR shall provide aluminum or stainless steel railing.

C. Aluminum Railings (Nonwelded Pipe):
1. Rails, Posts, and Fitting-assembly Spacers:

a. ASTM B 429, 6063-T5, minimum Schedule 40, extruded aluminum pipe of minimum 1.89 inch outside diameter and 0.14-inch wall thickness.
b. Alloy 6063-T6 may be used for pieces requiring bending only.
c. Railing shall be attached to concrete structure with sleeve or side mount brackets, as indicated on Drawings.

2. Kick Plates: 6061-T6 aluminum alloy.
3. Fastening and Fasteners: As recommended or furnished by the manufacturer.
4. Other Parts: 6063 extruded aluminum, or F214 or F514.0 aluminum castings.
   a. Fabrications: ASTM B 209 or ASTM B 221 extruded bars.
      1) Bases: 6061 or 6063 extruded aluminum alloy.
   b. Plus Screws or Blind Rivets: Type 305 stainless steel.
   c. Other Parts: Type 300 series stainless steel.
5. Finish of Aluminum Components:
   a. Anodized finish, 0.7 mil think, applied to exposed surfaces after cutting. Aluminum Association Specification M32-C22-A41.
   b. Pretreat aluminum for cleaning and removing markings before anodizing.
6. Fabrication and Assembly:
   a. Fabricate posts in single, un-spliced pipe length.
   b. Perform without welding.
   c. Do not epoxy bond the parts.
   d. Maximum clear opening between assembled railing components as indicted on the Drawings.
7. Manufacturers: One of the following or equal:
   a. Moultrie Manufacturing Company, Wesrail.
   b. Julius Blum and Company, Inc., Connectorail.
   c. Craneveyor Corporation Enerco Metals, C-V Rail.
   d. Or approved equal.

D. Stainless Steel Pipe Railing:
1. Manufacturers: One of the following or equal:
   a. R & B Wagner, Inc.
   b. Julius Blum and Company.
   c. Or approved equal.
2. General: Prefabricated shop-assembled type, field welded type, or mechanically joined type.
3. Materials: Type 304 or Type 316 stainless steel posts, rails, brackets, and accessory parts.
   a. Railings and Posts: Nominal 1-1/2 inch, Schedule 5 pipe with minimum 1.900 inch outer diameter and 0.065 inch wall thickness,
   b. Post Insert Reinforcing for All Posts: 1.750 inch outside diameter pipe, of 0.083 inch wall thickness, and 26 inches long.
   c. Fasteners, Connection Plates, Splice Bars, and Fittings: Type 304 or Type 316 stainless steel.
   d. Stainless Steel Finish: Number 4 NAAMM finish.
4. Fabrication:

a. Fabricate rails and posts to be in same plane.
b. Fabricate posts in single, un-spliced pipe length.
c. Make railing sections between splices 20 feet maximum.
d. Form bends in pipe without use of fittings where practical. Form with internal madrels on power benders.
e. Where railing is welded, make intersections and joints with continuous 360 degree welds and grind welds smooth.
f. Where railing is mechanically joined, make joints with mechanical connections utilizing stainless steel machine screws with lock washers and threaded tubular rivets.

E. Fastenings and Fasteners: As recommended or furnished by railing manufacturer for use with this system.

2.08 GRATING

A. General:
1. Fabricate grating to cover areas indicated on Drawings. Grating manufacturer shall obtain and review drawings, and pricing shall include grating design in drawings and these specifications.
2. Unless otherwise indicated on Drawings, grating over an opening shall cover entire opening.
3. Make cutouts in grating where required for equipment access, piping or protrusion, including valve operators or stems, and gate frames.
4. Band ends of grating and edges of cutouts in grating:
   a. End Banding: 1/4 inch less than height of grating, with top of grating and top edge of banding flush.
   b. Cutout Banding: Full-height of grating.
   c. Use banding of same material as grating.
   d. Panel Layout: Enable installation and subsequent removal of grating around protrusions or piping.
   e. Openings 6 inches and Larger: Lay out grating panels with edges of 2 adjacent panels located on centerline of opening.
   f. Openings Smaller than 6 inches: Locate opening at edge of single panel.
   g. Where an edge requires more than 1 grating section to cover area, clamp adjacent grating sections together at 1/4 points with fasteners acceptable to ENGINEER.
   h. Fabricate grating in units of maximum 50 pounds each.
5. When requested by ENGINEER, test 1 section of each size grating for each span length involved on the job under full load:
   a. Furnish a suitable dial gauge for measuring deflections.
6. Grating shall be aluminum, unless otherwise specified or indicated on the Drawings:
   a. Aluminum Grating:
      1) Materials for Gratings, Shelf Angles, and Rebates: 6063-T6 aluminum alloy, except cross bars may be 6063-T5 aluminum alloy.
      2) Shelf Angle Concrete Anchors: Type 304 or Type 316 stainless steel.

3) Grating Rebate Rod Anchors: 6063-T6 aluminum alloy.
4) Fabrication:
    a) Bar Size and Spacing: As determined by manufacturer to enable grating to support a minimum of 180 pounds per square foot uniform live load on entire grating area, using an extreme fiber stress of 12,000 pounds per square inch maximum.
    b) Maximum Deflection Under specified Loading: 1/4 inch of grating clear span maximum.
    c) Spacing of Main Grating Bars: 7/16 inch clear between bars.
    d) Minimum Grating Height: See Drawings.
5) Manufacturers:
    a) McNichols Co.
    b) Or approved equal.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine Work in place to verify that it is satisfactory to receive the Work of this Section. If unsatisfactory conditions exist, dot not begin this Work until such conditions have been corrected.

3.02 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.

3.03 LADDERS

A. Secure to supporting surface with bent plate clips providing minimum 8 inches between supporting surface and center of rungs.

B. 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.

C. Where exit from ladder is to side, extend ladder 5 feet 6 inches minimum above landing and rigidly secure at top.

D. 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.

E. Ladders to be fabricated of aluminum, unless noted otherwise.

3.04 RAILING

A. During construction, keep exterior surfaces of railing covered with 0.4 millimeters, minimum, heat shrink polyethylene film.

B. Do not remove protective film before railing have been accepted by OWNER nor before other Work in proximity of handrails and guardrails has been completed.

C. Discontinue railing at lighting fixtures.

D. Provide 1/8 inch diameter weep hole at base of each post.

E. Where protection is applied for prevention of dissimilar materials electrolysis, make application such that none of the protective material is visible in the completed assembly.

F. Space posts as indicated on the Drawings.

G. Anchor post into concrete by grouting posts into core drilled holes in concrete, into stainless steel sleeves cast in concrete; or bracket mount to face of concrete surfaces; as specified and indicated on the Drawings.

H. Space rails as indicated on the Drawings.

I. Make adequate provision for expansion and contraction of kickplates and rails. Make provisions for removable sections where indicated on the Drawings.

J. Make lower rails a single, unspliced length between posts, or continuous.

K. Make top rails continuous whenever possible, and attach single, unspliced length to 3 posts minimum.

L. Draw up fasteners tight with hand wrench or screw driver.

M. Space attachment brackets as indicated on shop drawings or in manufacturer’s installation instructions.

N. Completed installation shall have railing rigid and free of play at joints and attachments.

O. Protect railing finish from scratches, gouges, dents, stains, and other damage.

P. Replace damaged or disfigured railing with new.

Q. Shortly before final acceptance of the Work, and after removal of protective polyethylene film, clean railing with mild detergent or with soap water.

R. After cleaning, thoroughly rinse railing and wipe with soft cloth.

S. Erect railing straight, level, plumb, and true to the positions as indicated on the Drawings. Correct deviations from true line of grade which are visible to the eye.

3.05 MISCELLANEOUS ALUMINUM

A. Coat aluminum angles cast into concrete with bituminous materials.

END OF SECTION

DIVISION XVI

ELECTRICAL TECHNICAL SPECIFICATIONS

SECTION 16000

GENERAL ELECTRICAL REQUIREMENTS

PART 1 GENERAL

1.1 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.

1.2 RELATED WORK

A. Refer to all drawing sheets for the scope of the electrical work.

1.3 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.

1.4 SHOP DRAWINGS

A. Submit complete Shop Drawings for:

1. Conduit, Fittings and accessories, (See Section 16111)
2. Wire, Cable and accessories (See Section 16120)
3. Grounding (See Section 16450)
4. Panelboards (See Section 16462)

1.5 CERTIFICATES AND FEES

A. The Electrical Contractor will pay for all fees, connection charges, permits and inspections.

1.6 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.

1.7 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.

1.8 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 – NOT USED

PART 3 EXECUTION

3.1 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 16000 ****

SECTION 16111

CONDUIT, FITTINGS AND ACCESSORIES

PART 1 - GENERAL

1.1 Description: This Section includes all conduit, fittings and accessories.

1.2 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.

1.3 Submittals

. Submit as specified in SECTION 1330.

PART 2 - MATERIALS

2.1 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. Kraloy Plastic Pipe Company.

2. Certain-Teed Products Corporation.

3. Carlon Products Division

E. InnerDuct for Fiber Optic Cable

Smoothwall, HDPE Innerduct may be used only and exclusively for underground installation of fiber optic cable.

1. Kraloy Plastic Pipe Company.

2. Certain-Teed Products Corporation.

3. Carlon Products Division

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)

2.2 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.

2.3 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.

2.4 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.

2.5 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.

2.6 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.

2.7 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.

2.8 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.

2.9 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.

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

3.1 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.

3.2 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

4.1 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 16111 ****

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

Lighting..... Section 16500
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.

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.

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.

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 -40^{o}C to 85^{o}C.

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 16120 ****

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.

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. Joslyn Manufacturing and Supply Company.

2. Copperweld Bimetallics Group.

3. Knight-Metalcraft, Division of Whitaker Cable.

4. ITT Blackburn Company, a Division of International Telephone and Telegraph Corporation.

5. Harger

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. 4/0 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.

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 16450 ****

SECTION 16462

PANELBOARDS

PART 1 - GENERAL

1.1 Summary

A. This Section includes:

1. Panelboards.

B. **Related Work Specified Elsewhere**

Grounding……..…..Section 16450
Field Testing……..Section 16950

2.2 References

1. **Federal Specifications**

W-P-115b - Panelboards.

W-C-375b - Molded-Case Circuit Breakers.

2. **National Fire Protection Association (NFPA)**

3. **National Electrical Code (NEC)**

4. **National Electrical Manufacturers Association (NEMA)**

AB1 - Molded-Case Circuit Breakers.

ICS - Industrial Control and Systems.

PB1 - Panelboards.

ST20 - Dry-Type Transformers for General Applications.

5. **Underwriters' Laboratories, Inc. (UL)**

50 - Electrical Cabinets and Boxes.

67 - Electric Panelboards.

508 - Electric Industrial Control Equipment.

6. **National Electrical Safety Code**

7. **Standard for Electrical Safety in the Workplace – NFPA 70E**

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.

2.3 Submittals

A. Submit as specified in Section 1330.

B. Includes, but not limited to, the following:

1. Physical size, number of poles, ratings and nameplate information on panelboards.

2. Overall dimensions, weight, ratings, impedance and taps on transformers.

3. Schematic diagrams.

4. Factory test data if required.

5. Coating system.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers

A. Power Distribution Panelboards:

1. Square D Company.
2. Siemens ITE
3. Prior Approved Equal

B. Lighting Panelboards:

1. Square D Company.
2. Siemens ITE

3. Prior Approved Equal

2.2 Lighting and Small Power Panel-boards

A. Required final arrangement of breakers determined by system design.

B. Provide required components with ratings and voltages as indicated on the plans.

C. Heavy-duty type with size, number of poles, and quantity of breakers as indicated.

D. **Enclosure:**

1. NEMA Type as indicated on plans

2. Code gauge, hot-galvanized sheet steel boxes for surface and flush mounting.

3. Code gauge steel trim.

E. Wiring trough at top and bottom.

F. Hinged door with lock and latch combination in the front trim.

G. Phenolic nameplate approximately 1-inch x 3 inches on front of panel engraved with the panelboard title and designation such as shown on the project documentation.

H. Main circuit breaker for incoming line as indicated.

I. Spare space filler plate if required for panel symmetry.

J. Minimum symmetrical interrupting rating of as indicated on the plans.

K. Circuit directory in each panelboard filled in by typed lettering identifying the loads connected to each breaker.

L. Bus bar material to be copper

2.3 Painting

A. Paint all items this section with manufacturers standard system suitable for the service intended. System shall include surface preparation, prime and finish coats.

B. Submit with Submittals the type, color, and manufacturer of paint system used.

PART 3 - EXECUTION

3.1 Panelboard Installation

A. Install at locations indicated.

B. Surface-mount on wall (or equipment rack), as indicated, at an elevation 6'-6" to top of panel.

C. Arrange with proper clearances from other equipment and material to obtain good accessibility for operation and maintenance.

D. Install circuit directory in each panelboard.

E. Ground all neutral buses to the building ground system.

F. Connect feeder circuits as indicated in the panel schedules to obtain best balance of load between phases.

3.2 Field Painting

A. Preparation of surfaces and touch-up of scratched or damaged painted surfaces is specified in Section 9900.

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 16462 ****

SECTION 16482

MOTOR CONTROL CENTER

PART 1 GENERAL

1.1 SECTION INCLUDES

This section includes the furnishing and installation of the following:

A. Motor control centers.

1.2 RELATED SECTIONS

A. Section 16080 - Concrete Pads and Bases.

B. Section 16195 - Electrical Identification.

1.3 REFERENCES

A. NFPA 70 - National Electrical Code.

B. UL 198C - High-Interrupting Capacity Fuses; Current Limiting Type.

C. UL 198E - Class R Fuses.

D. NEMA AB 1 - Molded Case Circuit Breakers.

E. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.

F. NEMA ICS 2.3 - Instructions for the Handling, Installation, Operation, and Maintenance of Motor Control Centers.

G. UL 845.

1.4 SUBMITTALS

A. Submit under provisions of Section 1330.

B. Shop Drawings: Include front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral, and ground; electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and time/current curves of all equipment and components.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of Product.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 1330.

B. Product Data: Include factory record drawings.

C. Maintenance Data: Include spare parts data listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with NEMA ICS 2.3.

B. UL 845.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Section 16010.

B. Deliver wrapped for protection, and mounted on shipping skids.

C. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

D. Handle in accordance with NEMA ICS 2.3. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to motor control center components, enclosure, and finish.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Conform to NEMA ICS 2 service conditions during and after installation of motor control centers.

1.9 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Square D.

B. Siemens Electrical Products.

C. Cutler Hammer.

D. Allen Bradley.

2.2 MOTOR CONTROL CENTER

A. Motor Control Centers: NEMA ICS 2, Class I, Type B.

B. Main incoming lugs.

C. Feeder Tap Units: Molded case thermal-magnetic circuit breakers.

D. Voltage Rating: As indicated on Drawings.

E. Horizontal Bus: Tin plated copper with a continuous current rating as indicated on Drawings. Include copper ground bus entire length of control center.

F. Vertical Bus: Tin plated copper. Provide barriers and provisions for stub-on type unit connections.

G. Integrated Equipment Short Circuit Rating: As indicated on Drawings.

H. Configuration: Units front mounting only, accessible from the front only.

I. Enclosure: NEMA ICS 6, Type 1, 90 inches high with 12 inch top wireway, 6 inch bottom wireway and 4 inch vertical wireway

J. Finish: Manufacturer's standard #49, gray enamel, UL 50 and ASTM B117.

K. Neutral Bus entire length of control center, half size.

2.3 AUTOMATIC CONTROLLERS

A. Magnetic Motor Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower. Non-reversing type unless otherwise noted on Drawings. Minimum size 1.

B. Overload Relay: NEMA ICS; solid state with phase failure, phase unbalance, self-powered, ambient insensitive, trip Class 10 or 20, and mechanical test function.

C. Size: As required for motor served. NEMA size 1 minimum.

2.4 COMBINATION SOFT START CONTROLLERS – Not Used

2.5 VARIABLE FREQUENCY CONTROLLERS – Not Used

2.6 PRODUCT OPTIONS AND FEATURES

A. Auxiliary Contacts: NEMA ICS 2, 2 field convertible contacts in addition to seal-in contact.

B. Cover Mounted Pilot Devices: NEMA ICS 2, heavy duty type.

C. Pilot Device Contacts: NEMA ICS 2, Form Z.

D. Indicating Lights: LED Red and green LED type to indicate controller position.

E. Selector Switches: Rotary type. Hand-off-auto. Heavy Duty oil-tight.

F. Control Power Transformers: 120 volt secondary in each motor starter. Provide fused primary and secondary, and bond unfused leg of secondary to enclosure.

G. Manual overload reset button.

2.7 DISCONNECTS

A. Combination Controllers: Combine motor controllers with motor circuit protector. Provide means for locking disconnect handle, and means for defeating cover interlock.

B. Motor Circuit Protector: NEMA AB 1, with circuit breakers with integral instantaneous magnetic trip in each pole. Size and adjust based on rated motor horsepower.

2.8 CAPACITORS – Not Used

PART 3 EXECUTION

2.1 EXAMINATION

A. Verify that surface is suitable for motor control center installation.

2.2 PREPARATION

A. Provide housekeeping pads under the provisions of Section 16080.

2.3 INSTALLATION

A. Install motor control centers in accordance with manufacturer's instructions.

B. Tighten accessible bus connections and mechanical fasteners after placing motor control center.

C. Install fuses in fusible switches.

D. Adjust overload relay to match installed motor characteristics.

E. Provide engraved plastic nameplates under the provisions of Section 16195.

2.4 FIELD QUALITY CONTROL

A. Inspect and test motor control center and each controller to NEMA ICS 2.

END OF SECTION

SECTION 16900

GENERAL REQUIREMENTS INSTRUMENTATION AND CONTROLS

PART 1-GENERAL

1.1 SUMMARY

A. Work Includes:

a. The Engineering, furnishing, installing, calibrating, adjusting, testing, documenting, starting up, and Owner training for complete Process Instrumentation and Control (PIC) for each well site.

B. Major Components:

a. Programmable logic controllers and remote I/O modules.
b. Coordinated startup activities for new PLCs Division includes instruments, meters, control devices. and control panels as specified in each Section.

C. Complete Detailed PIC Design: PIC as shown and specified includes functional and performance requirements and component specifications.

D. Coordinated Startup and Commissioning: Coordinate with other trades, vendors, and programmers for testing, startup, and commissioning.

E. Work performed by Others - Owner/Engineer

a. Programming of PLC.
b. Programming of SCADA Interface.
c. Review of contractor provided submittals, control panels, including I/O tables and tag names, etc.
d. Assistance during Startup and Commissioning.

1.2 Related Work

1. Section 16901 - Control Panels Instrumentation and Controls

2. Section 16924 PLC and Accessories

1.3 References

1. Instrument Society of America (ISA)

S20 - Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves.

2. Others as specified in applicable Sections.

3. National Fire Protection Association

National Electrical Code, NFPA 70

Standard for Electrical Safety in the Workplace, NFPA 70E

4. National Electrical Safety Code, IEEE C2.

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 System Responsibility – System Integrator

Systems may utilize equipment of different manufacturers but one System Integrator is to assume overall responsibility for the complete system.

A. Approved System Integrator

1.Alliance Service and Control Specialists, Inc.
2.Darcor and Associates, Inc.
3.PRIMEX
4.Engineer prior approved equal.

B. System Integrator Pre-Qualification

System Integrator shall be provided by a firm specializing in control panel construction. Request for approval shall be submitted to engineer a minimum of 10 days prior to bid.

1.4 Submittals

A. Compliance Submittals

1. Submit as specified in Section 1330.

2. Manufacturer with prime responsibility shall assume responsibility for all Compliance Submittals.

3. Includes, but not limited to, the following:

a. Fabrication drawings, front elevation, wiring, diagrams, and bills of material for control panels.

b. Engraving schedule and physical dimensions for nameplates and phenolic overlays.

c. Electrical and mechanical connection diagrams for all separately mounted instruments.

d. Individual specification or descriptive sheets for instruments, annunciators and similar major system components to conform to ISA S20.

e. Instruction Books

For all instruments, transducers, and similar major system equipment.

In addition to the requirements as specified in DIVISION 1, submit single-page specification sheets for each instrument which lists the type, model number, function, scale, input, actuation, output and other specific features of that instrument.

B. Action Submittals:

1. General:
   a. Shop Drawings, full-scaled details, wiring diagrams, catalog cuts, and descriptive literature.
   b. Identify proposed items and options. Identify installed spares and other provisions for future work (for example, reserved panel space; unused components, wiring, and terminals).
   c. Legends and Abbreviation Lists: Complete definition of symbols and abbreviations used on this Project (for example, engineering units, flow streams, instruments, structures, and other process items used in nameplates, legends, and data sheets).

2. Bill of Materials: List of required equipment.
   a. Group equipment items as follows:
      1) I&C Components: By component identification code.
      2) Other Equipment: By equipment type.
   b. Data Included:

1) Equipment tag number.
2) Description.
3) Manufacturer, complete model number, and all options not defined by model number.
4) Quantity supplied.
5) Component identification code where applicable.

3. Catalog Cuts:
   a. I&C Components, Electrical Devices, and Mechanical Devices:
      1) Catalog information, mark to identify proposed items and options.
      2) Descriptive literature.
      3) External power and signal connections.
      4) Scaled drawings showing exterior dimensions and locations of electrical and mechanical interfaces.

4. Component Data Sheets: Data sheets for I&C components.
   a. Format and Level of Detail: In accordance with ISA-S20.
   b. Include component type identification code and tag number on data sheet.
   c. Specific features and configuration data for each component:
      1) Location or service.
      2) Manufacturer and complete model number.
      3) Size and scale range.
      4) Setpoints.
      5) Materials of construction.
      6) Options included.
   d. Name, address, and telephone number of manufacturer's local office, representative, distributor, or service facility.

5. Sizing and Selection Calculations:
   a. Primary Elements: Complete calculations plus process data used. Example, for flow elements, minimum and maximum values, permanent head loss, and assumptions made.
   b. Controlling, Computing and Function Generating Modules: Actual scaling factors with units and how they were computed.

6. Panel Construction Drawings:
   a. Scale Drawings: Show dimensions and location of panel mounted devices, doors, louvers, and subpanels, internal and external.
   b. Panel Legend: List front of panel devices by tag numbers, nameplate inscriptions, service legends, and annunciator inscriptions.

c. Bill of Materials: List devices mounted within panel that are not listed in panel legend. Include tag number, description, manufacturer, and model number.
d. Construction Details: NEMA rating, materials, material thickness, structural stiffeners and brackets, lifting lugs, mounting brackets and tabs, door hinges and latches, and welding and other connection callouts and details.
e. Construction Notes: Finishes, wire color schemes, wire ratings, wire and terminal block, numbering and labeling scheme.

7. Panel Control Diagrams: For discrete control and power circuits.
   a. Diagram Type: Ladder diagrams. Include devices, related to discrete functions, that are mounted in or on the panel and that require electrical connections. Show unique rung numbers on left side of each rung.
   b. Item Identification: Identify each item with attributes listed.
      1) Wires: Wire number and color. Cable number if part of multiconductor cable.
      2) Terminals: Location (enclosure number, terminal junction box number, or MCC number), terminal strip number, and terminal block number.
      3) Discrete Components:
         a) Tag number, terminal numbers, and location ("FIELD", enclosure number, or MCC number).
         b) Switching action (open or close on rising or falling process variable), setpoint value and units, and process variable description (for example, Sump Level High).
      4) Relay Coils:
         a) Tag number and its function.
         b) On right side of run where coil is located, list contact location by ladder number and sheet number. Underline normally closed contacts.
      5) Relay Contacts: Coil tag number, function, and coil location (ladder rung number and sheet number).
   c. Show each circuit individually. No "typical" diagrams or "typical" wire lists will be permitted.
   d. Ground wires, surge protectors, and connections.
   e. Circuit Names: Show names corresponding to Circuit and Raceway Schedule for circuits entering and leaving a panel.

8. Panel Wiring Diagrams: Show point-to-point and terminal-to-

terminal wiring within panel.

9. Installation Details: Include modifications or further details required to adequately define installation of I&C components.

10. List of spares, expendables, test equipment and tools.

11. Additional Equipment Recommended: List of, and descriptive literature for, additional spares, expendables, test equipment and tools recommended.

B. Informational Submittals:

Provide Manufacturer's Certificate of Proper Installation and readiness for operation.

1. Operation and Maintenance (O&M) Manuals: Operation and Maintenance Data, unless otherwise specified in this section.
   a. Content and Format:
      1) Complete sets O&M manuals.
      2) Sufficient detail to allow operation, removal, installation, adjustment, calibration, maintenance and purchasing replacements for each PIC component.
      3) Final versions of Legend and Abbreviation Lists.
   b. Include:
      1) Process and Instrumentation Diagrams: One reproducible copy of revised P&ID to reflect as-built PIC design.
      2) Refer to Paragraph Shop Drawings for the following items:
         a) Bill of Materials.
         b) Catalog Cuts.
         c) Component Data Sheets.
         d) Panel Control Diagrams.
         e) Panel Wiring Diagrams, one reproducible copy.
         f) Panel Plumbing Diagrams, one reproducible copy.
         g) Loop Diagrams, one reproducible copy.
         h) Interconnecting Wiring Diagrams, one reproducible copy.
         i) Application Software Documentation.
      3) Device O&M manuals for components, electrical devices, and mechanical devices include:
         a) Operations procedures.
         b) Installation requirements and procedures.
         c) Maintenance requirements and procedures.
         d) Troubleshooting procedures.
         e) Calibration procedures.

f) Internal schematic and wiring diagrams.
g) Component Calibration Sheets from field quality control calibrations.

4) List of spares, expendables, test equipment and tools provided.
5) List of additional spares, expendables, test equipment and tools recommended.

2. **Performance Acceptance Tests (PAT)** Submittals:
   a. Preliminary Test Procedures: Outlines of proposed tests, forms, and checklists.
   b. Final Test Procedures: Proposed test procedures, forms, and checklists.
   c. Test Documentation: Copy of signed off test procedures when tests are completed.

PART 2 - MATERIALS - Specified in applicable sections, SECTIONS 16901-16924.

PART 3 - EXECUTION

3.1 Testing

A. As a minimum, the manufacturer's standard tests and calibration procedures shall be conducted on all instruments.

B. **Performance Acceptance Tests (PAT):** All field devices to be calibrated at factory prior to shipment to site. Applicable test reports to be shipped with field device.

C. Conduct all tests in the presence of Engineer or Owner under the supervision of equipment manufacturer's field engineer.

1. Notify Engineer two weeks prior to the commencement of all tests.

2. Include all tests recommended by the equipment manufacturer unless specifically waived by Engineer.

3. Include all additional tests recommended by Engineer that he deems necessary because of field conditions, to determine that equipment and material and systems meet requirements of Contract Documents.

4. Be responsible for all damage to equipment and material due to improper test procedures or test apparatus handling.

3.2 Acceptance Testing Procedures – Systems Integrator

1. Prior to Startup and Performance Evaluation period, inspect, test, and document that associated PIC equipment is ready for operation. Divide Functional Test into two parts.
   Functional Test Part 1.
   Functional Test Part 2.

2. **Functional Test Part 1**: Performed by Systems Integrator to test and document that PIC is ready for operation. Excluding Owner/Programmer provided applications software.
   a. Loop/Component Inspections and Tests:
      1) These inspections and tests do not require witnessing will be spot checked by Engineer.
      2) Check PIC for proper installation, calibration, and adjustment on loop-by-loop and component-by-component basis.
      3) Provide space on forms for signoff by PICS Subcontractor.
      4) Use loop status report to organize and track inspection, adjustment, and calibration of each loop and include the following:
         a) Project name.
         b) Loop number.
         c) Tag number for each component.
         d) Checkoffs/Signoffs for Each Component:
            (1) Tag/identification.
            (2) Installation.
            (3) Termination wiring.
            (4) Termination tubing.
            (5) Calibration/adjustment.
         e) Checkoffs/Signoffs for the Loop:
            (1) Panel interface terminations.
            (2) I/O interface terminations with PLCs.
         f) I/O Signals for PLCs, RTUs are Operational: Received/sent, processed, adjusted.
         g) Total loop operational.
         h) Space for comments.
      5) Component calibration sheet for each active I&C component (except simple hand switches, lights, gauges, and similar items) and each PLCs, I/O module and include the following:
         a) Project name.
         b) Loop number.
         c) Component tag number or I/O module number.
         d) Component code number for I&C elements.

e) Manufacturer for I&C elements.
f) Model number/serial number for I&C elements.
g) Summary of Functional Requirements; For Example:
(1) Indicators and recorders, scale and chart ranges.
(2) Transmitters/converters, input and output ranges.
(3) Computing elements' function.
(4) Controllers, action (direct/reverse) and control modes (P, I, D).
(5) Switching elements, unit range, differential (fixed/adjustable), reset (auto/manual).
(6) I/O Modules: Input or output.
h) Calibrations, for example, but not limited to:
(1) Analog Devices: Actual inputs and outputs at 0, 10, 50, and 100 percent of span, rising and falling.
(2) Discrete Devices: Actual trip points and reset points.
(3) Controllers: Mode settings (P&ID).
(4) I/O Modules: Actual inputs or outputs of 0, 10, 50, and 100 percent of span, rising and falling.
(5) Space for comments.

b. Maintain loop status reports, and component calibration sheets at Site and make them available to Engineer at all times.
c. Engineer reviews loop status sheets and component calibration sheets and spot-check their entries periodically, and upon completion of Preparation for Testing. Correct deficiencies found.
d. Forms: See example Performance Acceptance Test Sheet in Article Supplements.

3. **Functional Test Part 2:** Combined effort between Contractor, Systems Integrator, and Owner/Programmer/Engineer to confirm PIC is ready for operation. This is to include the software and Owner/Programmer/Engineer provided software configurations.
a. Prerequisite:
1) Completion of Functional Test Part 1.
b. Joint test with Owner/Programmer.
c. Test procedures provided by Engineer based on Functional Test Part 1 and application software tests.
d. Completed when Functional Test has been conducted and Engineer has approved associated test forms and checklists in field.
4. Required Test Documentation: Test procedures, forms, and checklists. Signed by Engineer and Contractor except for Functional Test items signed only by Contractor.

B. Performance Test During and After Facility Startup:

1. Some control processes cannot be completely tested until the facility is up and able to pump water. These functions require an additional performance testing after or during facility startup. Once a facility's Functional Test has been completed, perform jointly with Engineer, and Owner/Programmer. Make O&M data available to Engineer at Site both before and during testing.
2. Determination of Ready for Operation: When Functional Test has been completed.

3.3 System Integrator Field Services

A. **Testing and Startup Period**: Provide Systems Integrator Field Services for a minimum of **five working days**, with additional days as necessary to accommodate the commissioning and startup. Coordinate startup periods with the engineer, owner and general contractor.

C. Test and start-up supervision shall continue until the system is in proper operating condition as determined by the Engineer.

D. Provide Systems Integrator Field Services during Work to correct deficiencies in equipment and to correct deficiencies in the installation and wiring of equipment. Corrections shall be at no increase in the contract price.

F. Provide Systems Integrator Field Services for all instruments, control devices, and other devices furnished as a part of the control panel or instruments and associated control devices separately mounted to assure proper installation, setting, connection. and functioning.

PART 4 CONTROL DESCRIPTION

4.1 GENERAL

Blower Basin PLC: Replace existing AB-505 series PLC and display with new. Retain existing enclosure. Mount Display and keboard on panel cover. Retain existing interior mounted enclosure. Retrofit new PLC into enclosure.

Blower Basin Remote I/O: Provide a new Remote I/O panel located within the new Electrical Equipment Building. Relocate control cables to the new Remote I/O panel. The existing exterior enclosure of the remote I/O may be retained as a termination enclosure. Provide new termination strips.

The new PLC I/O panel is to be fully operational and connected to the Plant Control System prior to I/O being relocated to the new panel.

PLC I/O and PLC Panels shall be fabricated, configured and tested by the Systems Integrator in accordance with these Specifications and Contract Requirements.

Programming and extension of the Existing Mullberry Waste Water Treatment Control and SCADA System is provided by OWNER/ENGINEER

4.2 I/O List Blower Basin PLC

Replace Blower Basin PLC I/O with the following:
One 16 point 120V Digital Input Module
One 16 point Digital Output Module
Match I/O cables and labels from existing.

4.3 I/O List Blower Basin Remote I/O

POINT	DESCRIPTION
O : 0/0	Bridge Drive No. 1 Motor Call to Run Output OTE - File #21 I/O INTERF – 19
O : 0/1	Clarifier 1 Motor Call to Run Output OTE - File #21 I/O INTERF - 20
O : 0/2	Scum Pump 1 Motor Call to Run Output OTE - File #21 I/O INTERF - 21
O : 0/3	Bridge Drive No. 2 Motor Call to Run Output OTE - File #21 I/O INTERF - 22
O : 0/4	Clarifier 2 Motor Call to Run Output OTE - File #21 I/O INTERF - 23
O : 0/5	Scum Pump 2 Motor Call to Run Output OTE - File #21 I/O INTERF - 24
O : 0/7	Spare OTE - File #21 INTERF - 25
O : 0/8	Spare OTE - File #21 INTERF - 26

POINT	DESCRIPTION
I : 0/0	Bridge No. 1 Stall Prox Switch XIC - File #21 I/O INTERF - 2
I : 0/1	Bridge No 1 Drive Motor Running Feedback XIC - File #21 I/O INTERF - 3
I : 0/2	Clarifier 1 Motor Running Feedback XIC - File #21 I/O INTERF - 4
I : 0/3	Scum Pump 1 Motor Running Feedback XIC - File #21 I/O INTERF - 5
I : 0/4	Aeration Bridge No. 1 Ready Signal XIC - File #21 I/O INTERF - 9
I : 0/5	Alum Mixer Runnning Feedback XIC - File #21 I/O INTERF - 12
I : 0/6	Alum Mixer Motor Overload Tripped XIC - File #21 I/O INTERF - 13
I : 0/10	Aeration Bridge No. 2 Ready Signal XIC - File #21 I/O INTERF - 10
I : 0/11	Spare XIC - File #21 I/O INTERF - 11

POINT	DESCRIPTION
I : 1/0	Bridge No. 2 Stall Prox Switch XIC - File #21 I/O INTERF - 14
I : 1/1	Bridge No 2 Drive Motor Running Feedback XIC - File #21 I/O INTERF - 15
I : 1/2	Clarifier 2 Motor Running Feedback XIC - File #21 I/O INTERF - 16
I : 1/3	Scum Pump 2 Motor Running Feedback XIC - File #21 I/O INTERF - 17
I : 1/4	Aeration Bridge No. 2 Ready Signal XIC - File #21 I/O INTERF - 18

POINT	DESCRIPTION
I : 2/0	SCP - File #7 ANALOG - 0
I : 2/1	SCP - File #7 ANALOG - 5
I : 2/2	Aeration Basin No. 1 Discharge Flow Raw Input Data SCP - File #22 FLOW RATES - 0
I : 2/3	Aeration Basin No. 2 Discharge Flow Raw Input Data SCP - File #22 FLOW RATES - 0

POINT	DESCRIPTION
I : 3/0	Clarifier Basin No. 1 RAS Flow Raw Input Data SCP - File #22 FLOW RATES - 2
I : 3/1	Clarifier Basin No. 2 RAS Flow Raw Input Data SCP - File #22 FLOW RATES - 3
I : 3/2	WAS Flow Raw Input Data SCP - File #22 FLOW RATES - 4

PART 5 MEASUREMENT AND PAYMENT

5.1 Measurement

A. No measurement will be made for this item.

5.2 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 16900 ****

SECTION 16901
CONTROL PANELS - INSTRUMENTS AND CONTROLS

PART 1 - GENERAL

1.1 Description

A. This Section includes the furnishing and installation of the PLC's and PLC Remote I/O panels and connections to other controls and instruments for the Project.

B. The Contractor shall have overall responsibility for providing a complete operable system and shall have sole responsibility for the functioning of all equipment.

C. The Contractor having overall responsibility for providing a complete operable system shall have sole responsible for the following work:

1. Provision of and installation of PLC's, PLC Remote I/O, with analog and digital input/output for control and monitoring of facilities.

2. Instrumentation and controls for this project includes: level transmitters, pressure transmitters, flow transmitters, ad activated flow control valves, for control, alarms, and pump operation.

3. Integrate all motor control , valve control and remote SCADA controls signals into the control system.

1.2 Work Performed by Owner/Others

1. Programming Configuration of Mullberry Waste Water Treatment Plant Control System, SCADA and PLC's is PERFORMED BY OWNER/OTHERS.

a. Programming and modifications to the existing SCADA programming to be provided by Owner/Others.

b. Programming for PLC logic to be provided by Owner/Others.

1.3 References

1. American Society for Testing and Materials (ASTM)

ASTM D1248 - Polyethylene Plastics Molding and Extrusion Materials.

2. National Electrical Manufacturers Association (NEMA)

ICS - Industrial Controls and Systems.

3. As specified in each applicable section, this Division.

4. National Fire Protection Association

National Electrical Code, NFPA 70

Standard for Electrical Safety in the Workplace, NFPA 70E

5. National Electrical Safety Code, IEEE C2.

6. Occupational Safety and Health Administration, OSHA.

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.

1.3 Submittals: Submit as specified in Section 16900

PART 2 - MATERIALS

2.1 Acceptable Manufacturers

A. Prefabricated Panel Enclosures

1. Hoffman Engineering Company (Hoffman).

2. Engineer approved equal.

B. Wire Terminals and Connectors

1. Alpha Wire Corporation (Alpha).

2. Amp, Inc.

3. Belden Corporation (Belden).

4. General Electric Company (General Electric).

5. Thomas and Betts.

C. Wire Markers

1. Brady.

2. Electrovert.

3. Floy Tag & Manufacturing, Inc. (Floy Tag).

4. Panduit Corporation.

D. Terminal Blocks and Test Switches

1. Allen-Bradley.

2. Buchanan.

3. Marathon Special Products.

4. Phoenix Contact.

5. Weidmuller.

E. Circuit Breakers

1. Square D
2. Allen Bradley
3. Eaton-Cutler Hammer

F. Interior Illumination (LED)

1. Cree.

2. Lithonia.

2.2 Control Panels

A. Pre-Fabricated Panel Design Requirements

1. UL 508A Listed Control panel and assembly. Totally enclosed cabinet with front door and continuous hinge.

2. Formed and welded construction, 14 gauge minimum steel.

3. NEMA Type 4/12 indoor with ventilation into a climate controlled indoor setting.

4. Interior 12-gauge minimum steel mounting panel.

5. Sized to house all equipment and devices indicated.

6. Provide lockable design.

7. Exterior free standing or strut mounted as required.

8. Furnish Hoffman vapor action corrosion inhibitor sized for enclosure volume

9. Painting

a. Paint system shall be manufacturer's standard system, suitable for service intended.

b. Prepare all surfaces prior to painting.

c. Provide special color finish of light gray.

d. Provide one pint of touch-up paint of each color.

10. Manufactured by Hoffman Engineering Company.

2.3 Control Panel and Recording and Indicating Instruments Nameplates

A. Fabricate from laminated phenolic sheeting with white core and satin finish melamine overlay.

B. Color shall be Manufacturers standard (if not specified designate black).

C. Thickness: 1/16-inch nominal.

D. Bevel edges to expose white core on perimeter.

E. Engraved legend through overlay to expose core.

F. Attach to panels and instruments with contact cement or double-faced tape.

2.4 PLC and PLC I/O Panel

A. PLC and PLC I/O PANELS The PLC Panel contains PLC Remote I/O modules with inputs and outputs to interface local instrumentation and Manual Hardwired Switches to the existing Waste Water Treatment Plant SCADA and Control System. The PLC Panel includes communication modems and fiber cable splice patch panels. The PLC Panel shall operate on a service voltage of 120VAC, 1-phase, 3-wire, 60 hertz. Provide free standing enclosure. Provide conduit penetrations only from the bottom of the enclosure. Seal conduit penetrations with approved conduit/duct sealant.

2.5 Electrical System

A. Wiring

1. P&IDs and Control Diagrams on Drawings show function only. Use following rules to determine field circuit wiring:

- **a.** Devices on Single Circuit: 20, maximum.
- **b.** Multiple Units Performing Parallel Operations: To prevent failure of any single branch circuit from shutting down entire operation, do not group all units on same branch circuit.
- **c.** Branch Circuit Loading: 12 amperes continuous, maximum.
- **d.** Panel Lighting and Service Outlets: Put on separate 15-amp, 120V ac branch circuit.
- **e.** Provide 120V ac plugmold for panel components with line cords.

2. Alpha or Belden 600V, 105^{o}C, UL style 1015 wire or Houston Wire and Cable SI-57275, SIS Vulkene insulated switchboard wire. Dc signal wiring shall be as specified in this Division.

3. Wire Sizes

- **a.** No. 14 AWG, 41 strand, for all convenience outlets, interior lighting, and other similar loads.
- **b.** No. 16 or 18 AWG, 16- to 41-strand, for low power loads of 115V or lower voltage.

4. Wire Markers

a. Hot-stamped tube-type, Brady Ty-grip, Electrovert slip-on Type Z, or Floy Tag FT200C wire markers sized for snug fit for wire size.

b. Identify both ends of wire with the same unique wire number.

c. Assign wire numbers where specific designations are not indicated.

5. Wiring Methods

a. Route main groups of wires in plastic nonflammable wiring duct.

b. Smaller groups of wire shall be cabled and secured with nylon cable clamps and ties or plastic spiral wraps.

c. Route instrument dc signal wiring in separate ducts or groups from ac power and control wiring.

d. Equipment and Terminal Block Connections

(1) Make all connections with insulated locking spade lug terminals except where devices specified are available only with solder type terminals, or tubular clamp terminals.

(2) Install terminals with tool as recommended by manufacturer to apply required amount of pressure correctly.

e. Solder Connections: Soldering iron used shall not exceed 100 W.

f. Provide terminal blocks for all external connections.

B. Terminal Blocks

1. 600V, sectional type nylon polypropylene blocks.

2. Tubular clamp contacts.

3. Slide-in vinyl marking strip for terminal identification.

4. Provide a minimum of 10% spare terminals.

C. Switch Action Fuse Blocks

1. Rated 600V, 30-A.

2. Sectional type nylon or polypropylene blocks.

3. Tubular clamp contacts.

3. Pressure sensitive marking tape for terminal identifications.

D. Circuit Breakers

1. Manufacturer per this Section 2.1E. E-frame breaker for each instrument system, annunciator, lighting circuit, control system or similar major device requiring 24 Vdc or 115Vac power.

2. Manufacturer per this Section 2.1E. Series CF, Curve 3, for devices or systems requiring 26V, dc power.

3. Trip rating as indicated or recommended by manufacturer of equipment being protected.

4. Necessary space on panel for a minimum of three future circuit breakers.

5. Mounted on a panel inside control panel in a readily accessible location.

N. Electronic Filters – Provide Electronic Filters on incoming power to prevent local harmonic currents from effecting panel instrument operation.

PART 3 - EXECUTION

3.1 Installation

A. Control Panels

1. Seal all unnecessary openings in enclosures and cast or drilled in the housekeeping pad.

2. Mount to equipment rack as indicated using compatible metal nuts and bolts.

3. Shim plumb and level.

4. Install all electrical connections to remote mounted controls as specified in DIVISION 16.

5. Close all unnecessary and unused openings in the enclosures with Dow Corning 3-6548 silicone RTV or General Electric RTF762 foam after piping and wiring are installed to prevent dirt from entering the panel.

B. Electrical Connections

1. Install wire and cable as specified in Section 16120.

2. Install circuits to field-mounted equipment as indicated and required.

3. Connect all lightning and surge arresters to panels and ground system.

C. Commissioning and Start-Up Services

1. See Section 16900

3.2 Field Quality Control

A. Factory Tests: Specified in Section 16900.

B. Field Tests: Specified in Section 16900.

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 16901****

SECTION 16924

PROGRAMMABLE LOGIC CONTROLLER (PLC) AND ACCESSORIES

PART 1 GENERAL

1.1 Summary

A. Furnish PLC Remote I/O, and ancillary equipment. Incorporate into PLC Panel.

B. **Coordinate with OWNER/Others for related work that is provided outside of this contract. See 16924-1.5.**

C. Related Work:

1. Section 16900 General Requirements Instrumentation and Control

2. Section 16901 Control Panels

1.2 References:

A. Applicable Codes and Standards:

1. Contractor shall furnish Equipment which conforms in all respects to applicable industry standards and sound engineering practice.

2. Design, fabricate, assemble, install, and test Equipment to conform to the applicable provisions of the following standards:

a. Institute of Electrical and Electronics Engineers (IEEE):
1) 472 – Surge Withstand Capability Test.

2) 518- IEEE Guide for the Installation of Electrical Equipment to Minimize Electrical Noise Inputs to Controllers from External Sources.

b. National Fire Protection Association (NFPA):
1) 70 - National Electrical Code (NEC).

c. National Electrical Manufacturers Association (NEMA):
1) ICS – Industrial Controls and Systems.

d. Underwriters Laboratories (UL):

1) 508 - Industrial Control Equipment

e. Scientific Apparatus Manufacturer's Association (SAMA).

f. Instrument Society of America (ISA).

g. National Electrical Safety Code (NESC).

3. Safety Codes:

a. National Fire Protection Association

i. National Electrical Code, NFPA 70
ii. Standard for Electrical Safety in the Workplace, NFPA 70E

b. National Electrical Safety Code, IEEE C2.

c. Occupational Safety and Health Administration, OSHA.

1.3 Submittals:

A. Submit as specified in SECTION 16900.

B. Specific Submittals to be furnished for Equipment shall include at least the following:

1. Device list and bills of material.

2. Data sheets on all PLC and touchscreen components.

3. System architecture drawing (Control System Block Diagram) showing all input/output cabinets, communications interfaces controller cabinets, operator interfaces devices, data storage devices, prefabricated cables and interfaces to other systems, and related components. This drawing shall represent the physical composition of the system.

5. Instruction manuals.

6. Description of operation of control Equipment.

7. Description of power failure and restoration mode.

1.4 Quality Assurance

A. Experience:

1. All Equipment and Materials furnished shall have an acceptable

history of satisfactory reliable service in similar use for a period of at least two years.

2. Equivalent newly developed Equipment with less than two years' actual service will be considered from established manufacturers, if it has been adequately tested, meet the requirements of this Contract, and is approved by Engineer. Such Equipment shall be noted in the proposal for review.

1.5 WORK TO BE PERFORMED BY OWNER/OTHERS

1. Control System Programming of PLC.

2. Update programming of SCADA Interface.

3. Review of contractor submittals, I/O tables and tag names.

4. Programming Assistance during Startup and Commissioning.

5. Program documentation for all software operating systems, editors, compilers, utilities, application, control, and logic programs, both for the control, data acquisition, and processing functions.

6. Programming: BY OWNER/OTHERS

a. PLC Programming:

i. The PLC shall be programmed to perform the required logic functions and control loops for proper operation of the equipment as indicated.

ii. The PLC shall monitor power status to the control panel. Logic shall implemented that shall clear run contacts when power is lost and perform routine startup of equipment after a power restoration.

iii. The PLC program shall be thoroughly documented with explanations in the program of the operation performed in each program line or rung.

iv. Shall be programmed utilizing the latest version of Windows based programming software from the manufacturer.

v. Both a hard and soft copy of the program shall be provided to the Owner.

b. Touchscreen: Not Used

7. Programming O&M Manual: BY OWNER/OTHERS
Provide O&M Manuals for the complete system including hard copy documentation of all PLC and touchscreen programming and I/O addressing including programming documentation comments.

PART 2 - PRODUCTS

2.1 Acceptable Manufacturers:

A. PLC's:
1. Allen-Bradley – 5069-L320ER.

B. PLC Remote I/O

1. Allen-Bradley 5069 I/O

C. PLC Software License

Provide One License : Rockwell Automation RS Logix Studio RS Logix Studio 5000 Part #9324M-RLDT31. ESD - Studio 5000 Professional Perpetual with 8-5, M-F Support. 50005000

2.2 General

A. Contractor shall provide a complete system with all I/O, communications modules, processors, power suppliers, and other necessary items to meet the functional requirements of this Part.

B. The system shall consist of at least the following:

1. Base unit including power supply.
2. Processor, including memory.
3. Communication hardware.
4. Input/output hardware.
5. Real-time clock/memory module.
6. Cables.
7. Touchscreen.
8. Spare parts.

2.3 Programmable Logic Controller and Remote I/O (CompactLogix):

A. General:

1. The programmable controller shall receive status intelligence, perform logic functions, issue control commands, and provide alarms and status information for this systems described in these Specifications.

2. The programmable controller Equipment shall consist of a solid-state control system which has user programmable memory for storage of instructions to implement specific functions.

3. The PLC Equipment shall be purposely designed as an industrial control system which can perform functions equivalent to a relay panel or a wired sold-state logic system.

4. All PLC Equipment provided shall be capable of operation in ambient temperatures of 0^{o}C to 55^{o}C, and 5 to 95% relative humidity (non-condensing), without fans or other cooling equipment.

5. All external connection points shall be capable withstanding the ANSI surge withstand capability (SWC) test as defined in ANSI C37.90a.

6. The PLC's shall operate without damage according to IEEE Standard 281.

7. The PLC's shall be capable of reporting by exception to a master PLC.

8. The PLC shall operate from 120 VAC, 60-hertz, single-phase power.

D. Communications Hardware:

1. Allen Bradley 5069-AENTR to match existing.

2. Communications shall be Ethernet/IP (Ethernet). Provide interface module for connection of the PLC to the Ethernet network. Provide all required cable between the PLC and interface module.

2. All data within a PLC shall be accessible via Ethernet ports.

3. Programming functions shall be possible through the Ethernet ports.

4. Unloading and downloading of programs shall be possible through the Ethernet ports.

5. The operating mode of the PLC shall be changeable through the Ethernet ports.

E. PLC Input and Output Modules:

PLC Panel Remote I/O Modules: Provide Remote I/O Modules with Ethernet communication to Existing PLC's. Provide modules to accommodate a minimum of

125% of the inputs and outputs used in the project. Include module quantity calculations in shop drawing submittal.

Combination I/O Modules are not allowed.

1.

2. Digital Input Modules: Allen-Bradley 5069-IA16

a. Provide 16, 120VDC digital inputs.
b. Maximum signal delay time of 20 ms

3. Relay Output Modules: Allen-Bradey 5069-OW16

a. Provide 16 individually isolated 120Vac relay outputs.
b. Current per output of 1.0 Amp.

4. Analog Input Modules: Allen-Bradley 5069-IF8

a. Provide 8 4-20 mA current inputs.
b. 16 bit resolution.

5. Analog Output Modules: Allen-Bradley 5069-OF4

a. Provide 4, 4-20 mA current outputs.
b. 16 bit resolution.

F. Expansion Power Supply:

1. Provide expansion power supply as indicated.
2. Input voltage 120Vac.
3. Output of 2 Amps at 5Vdc and 0.8 Amps at 24Vdc.
4. Over-voltage and short circuit protection.

2.4 Operator Interface Touchscreen: Blower Basin PLC

A. Provide Panel Mounted Monitor : New Hope Industries.

HIS-ML 19.5-FTVB with VESA Mounting Bracket, VB-19E and Wall Mount Keyboard, KB-R3-WMT-SS4-4X-USB.

2.6 Spare Parts:

A. Provide the following spare parts:

1. One spare input/output module of each type provided.

2. One spare communication module for each type provided.

B. Provide five (5) spare fuses of each type used.

2.7 Test Equipment: Any special test kits, cables, software, or other test accessories that are unique to the manufacturers' Equipment, used in operation or maintenance of this Equipment shall be provided.

PART 3 - EXECUTION

3.1 Installation:

A. Programmable Logic Controllers and Remote I/O Modules:

1. Install Remote I/O Modules in PLC PANEL enclosure as indicated and specified.

2. Wire all inputs and outputs to terminal blocks within the PLC Panel.

3. Install all communication modules and required cables.

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 16924 ****