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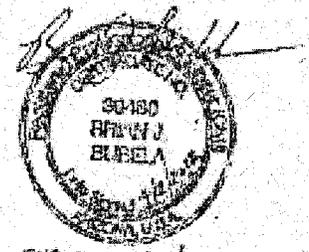
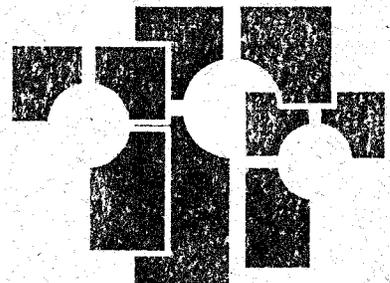
**CITY CLERK
ORIGINAL**
**PROJECT SPECIFICATIONS AND
CONTRACT DOCUMENTS**

C-8072
06/13/2012

PROJECT NO. 111213

GLENDALE WEST AREA WATER RECLAMATION FACILITY
MISCELLANEOUS IMPROVEMENTS PROJECT – UV VENTILATION
IMPROVEMENTS

APRIL 2012



EX-105: 9/20/2012

GLENDALE

CITY OF GLENDALE

ENGINEERING DEPARTMENT
5850 W. Glendale Avenue, Glendale, Arizona 85301 (623) 930-3630

PROJECT SPECIFICATIONS AND CONTRACT DOCUMENTS

MAYOR

Elaine M. Scruggs

VICE-MAYOR

Steven E. Frate

COUNCIL MEMBERS

Norma S. Alvarez

Joyce V. Clark

Yvonne J. Knaack

H. Philip Lieberman

Manuel D. Martinez

CITY MANAGER

Ed Beasley

CITY CLERK

Pamela Hanna

CITY ATTORNEY

Craig D. Tindall

ACTING CITY ENGINEER

Gregory Rodzenko



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NOTICE TO CONTRACTORS

Sealed bids shall be either mailed to the City of Glendale Engineering Department, 5850 West Glendale Avenue, Glendale, Arizona, 85301, or hand-delivered to the Engineering Department office, third floor, 5850 West Glendale Avenue, Glendale, Arizona, for furnishing all plant, material, equipment and labor, and to complete construction of: **PROJECT NO. 111213 GLENDALE WEST AREA WATER RECLAMATION FACILITY MISCELLANEOUS IMPROVEMENTS PROJECT - UV VENTILATION IMPROVEMENTS.** This project is located at the Arrowhead West Area Water Reclamation Facility (WARF) and includes installation of fiberglass reinforced plastic (FRP) foul air ductwork, dampers, and accessories for ventilation improvements at the existing UV Effluent Channel and Backwash Supply/NPW Pump Station.

Bids must be received by the Engineering Department of the City of Glendale no later than 2:00 P.M., APRIL 26, 2012. Any bid received after that time will not be considered and will be returned to the bidder. At that time, the bids will be publicly opened and read aloud in the Engineering Department Conference Room, 5850 West Glendale Avenue, Glendale, Arizona.

A pre-bid conference will be held on APRIL 17, 2012, at 1:00 P.M., in the Engineering Department Conference Room, 5850 West Glendale Avenue, Glendale, Arizona. Bidders, contractors, and other interested parties are invited to attend this conference which will be conducted by the Owner and Engineer to answer any questions.

Plans, specifications and contract documents may be examined, and copies may be obtained at City of Glendale Engineering Department, 5850 West Glendale Avenue, Glendale, Arizona. A non-refundable charge of \$50 shall be paid for each set of plans and specifications issued from this office.

Each bid shall be in accordance with the plans, specifications and contract documents, and shall be set forth and submitted on the BID DOCUMENTS included with the project specifications book. The BID DOCUMENTS may be removed from the project specifications book and submitted independently of such book. Each bid shall be accompanied by a proposal guarantee, in the form of a certified or cashier's check or bid bond for ten percent (10%) of the amount of bid, made payable to the order of the City of Glendale, Arizona, to insure that the successful bidder will enter into the contract if awarded to him and submit the required Certificate of Insurance, Payment Bond and Performance Bond. All proposal guarantees, except those of the three lowest qualified bidders, will be returned immediately following the opening and checking of proposals. The proposal guarantees of the three lowest qualified bidders will be returned immediately after the contract documents have been executed by the successful bidder. The proposal guarantee shall be declared forfeited as liquidated damages if the successful bidder refuses to enter into said contract or submit the Certificate of Insurance, Payment Bond and Performance Bond after being requested to do so by the City of Glendale, Arizona.

The City of Glendale reserves the right to reject any or all bids or waive any informality or irregularity in a bid. No bidder may withdraw his bid for a period of fifty (50) days after opening and reading of the bids.

The City of Glendale is an equal opportunity employer and minority business enterprises and women's business enterprises are encouraged to submit bids.

CITY OF GLENDALE, ARIZONA

Published: APRIL 5, 2012 & APRIL 12, 2012
The Glendale Star

INFORMATION FOR BIDDERS

1. **ELIGIBILITY OF CONTRACTORS:** When calling for bids for contracts for public work to be performed on behalf of the State or any political subdivision thereof, which will be paid for from public funds, no bid shall be considered for performance of a contract, including construction work which is not submitted by a bidder duly licensed as a contractor in this State. No bid shall be awarded to any contractor or entity not authorized to do business in the State of Arizona by the Arizona Corporation Commission, as required by statute.

2. **PROPOSAL:** Bids to receive consideration shall be made in accordance with the following instructions:

(a) Before submitting a bid, bidders shall carefully examine the plans and specifications and contract documents, visit the site of the work, fully inform themselves as to all existing conditions and limitations.

(b) Bids shall be submitted on the "PROPOSAL" forms provided and delivered to the City of Glendale Engineering Department on or before the day and hour set in the "NOTICE TO CONTRACTORS," as published. Bids shall be enclosed in a sealed envelope marked on the outside lower right-hand corner indicating:

1. The bidder's name and address.
2. The project number.
3. The title of the project.
4. The time and date the bids are to be received.

(c) It is the sole responsibility of the bidder to see that his bid is received in proper time. Any bids received after the scheduled closing time for receipt of bids will be returned to the bidder unopened.

(d) The signatures of all persons shall be in longhand. Any interlineations, alterations, or erasures must be initialed by the signer of the bid.

(e) Bids shall not contain any recapitulations of the work to be done. No oral, telegraphic, telephonic, or modified proposals will be considered.

3. **BID SECURITY:** Each proposal shall be accompanied by a proposal guarantee in the form of a certified or cashier's check or bid bond, with a properly executed Power of Attorney attached, in an amount equal at least to ten percent (10%) of the proposal payable without condition to the City. If a bid bond is submitted with the bid it shall be issued by a company licensed with the Arizona Department of Insurance and authorized to issue such bonds in this state. **NO BONDS ISSUED BY INDIVIDUAL SURETIES WILL BE ACCEPTED. The company issuing the bid bond shall have a rating of not less than A- in the BEST rating available at the time this project was let to bid.** The proposal guarantee shall guarantee that the bidder, if awarded the contract, will, within ten (10) working days after the award, execute such contract in accordance with the proposal and in manner and form required by the contract documents, and will furnish good and sufficient bond for the faithful performance of the same, a payment bond and a certificate of insurance. The bid securities of the three (3) lowest bidders will be retained until the contract is awarded, or other disposition made thereof. The bid securities of all bidders, except the three (3) lowest, will be returned promptly after the canvass of bids. In the event the Contractor fails, within ten (10)

working days after the award, to execute said Contract and deliver the Performance and Labor and Material Payment Bonds and the Certificate of Insurance, the Bid Security shall become the property of the City.

4. WITHDRAWAL OF BID: Any bidder may withdraw his bid, either personally, by telegram or by written request, at any time prior to the scheduled closing time for receipt of bids. No bid may be withdrawn by telephone. Any bid withdrawn will not be opened and will be returned to the bidder. After opening and reading of the bids, no bidder may withdraw his bid for a period of fifty (50) days from the date of opening and reading.

5. LATE BIDS: Bids received after the scheduled closing time for receipt of bids, as contained in the "Notice to Contractors," will not be considered and will be returned to the bidder.

6. AWARD OR REJECTION OF BIDS: The contract will be awarded to the lowest and best qualified responsive bidder complying with these instructions and with the "NOTICE TO CONTRACTORS." The City of Glendale, Arizona, however, reserves the right to accept or reject any or all bids or to waive any or all informalities or irregularities in the bid. Alternates may be accepted depending upon the availability of City funds. Accepted alternates will be considered in determining the lowest responsive and responsible bidder.

7. BIDDERS INTERESTED IN MORE THAN ONE BID: No person, firm or corporation shall be allowed to make, file, or be interested in more than one (1) bid for the same work unless alternate bids are called for in the specifications or any addenda. A person, firm, or corporation who has submitted a sub-proposal to a bidder, or who has quoted prices on materials to a bidder is not thereby disqualified from submitting a sub-proposal or quoting prices to other bidders.

8. CONTRACT AND BONDS: The form of contract, which the successful bidder as Contractor will be required to execute and the forms of bonds which he shall be required to furnish are included in the contract documents and should be carefully examined by the bidder. The successful bidder shall use the forms provided or such other forms as are acceptable by the City. The Contract and Performance and Labor and Material Payment Bonds will be executed in three (3) original counterparts. All bonds shall be issued by companies licensed with the Arizona Department of Insurance and authorized to issue such bonds in this state. **NO BONDS ISSUED BY INDIVIDUAL SURETIES WILL BE ACCEPTED. The company issuing any bond shall have a rating of not less than A- in the BEST rating available at the time this project was let to bid.**

9. INSURANCE REQUIREMENTS: Contractor, and each Sub-contractor performing work or providing materials related to this Agreement must procure and maintain the insurance coverages described (collectively, "Contractor's Policies"), until each Parties' obligations under this Agreement are completed. Contractor must at all times relevant hereto carry a commercial general liability policy with a combined single limit of at least \$1,000,000 per occurrence and \$2,000,000 annual aggregate. **Contracts in excess of \$250,000 shall require \$2,000,000 single occurrence/\$5,000,000 annual aggregate.**

Sub-contractors must at all times relevant hereto carry a general commercial liability policy with a combined single limit of at least \$1,000,000 per occurrence.

This commercial general liability insurance must include independent contractors' liability, contractual liability, broad form property coverage, products and completed operations, XCU

hazards if requested by the City, and a separation of insurance provision.

These limits may be met through a combination of primary and excess liability coverage.

Auto. A business auto policy providing a liability limit of at least \$1,000,000 per accident for Contractor and \$1,000,000 per accident for Sub-contractors and covering owned, non-owned and hired automobiles.

Workers' Compensation and Employer's Liability. A workers' compensation and employer's liability policy providing at least the minimum benefits required by Arizona law.

Equipment Insurance. Contractor must secure, pay for, and maintain all-risk insurance as necessary to protect the City against loss of owned, non-owned, rented or leased capital equipment and tools, equipment and scaffolding, staging, towers and forms owned or rented by Contractor or its Sub-contractors.

10. **SUBCONTRACTORS LISTING AND CERTIFICATION OF CONTRACT COMPLIANCE:** The contractor will be required to furnish the form of subcontractors listing and certification of contract compliance with the executed contract documents. This information is requested for tracking and insurance purposes only.

11. **INTERPRETATION OF PLANS AND DOCUMENTS:** If any person contemplating a bid for proposed contract is in doubt as to the true meaning of any part of the plans, specifications, or other proposed contract documents, or finds discrepancies in or omissions from the plans and specifications, he may submit to the Engineering Department, a written request for an interpretation or correction thereof. The person submitting the request will be responsible for its prompt delivery. Questions received less than ninety-six (96) hours before the bid opening time may not be answered. Any interpretation or correction of the documents will be made only by Addendum, duly issued and a copy of such Addendum will be mailed or delivered to each person receiving a set of such documents. The City of Glendale will not be responsible for any other explanations or interpretations of the proposed documents.

12. **CHANGES TO PLANS AND DOCUMENTS:** Any changes to the plans and documents shall be made only by Addendum. No verbal or other changes to the plans and documents will be valid. A copy of each Addendum will be mailed or delivered as provided in Section 13 below.

13. **ADDENDUM:** Any addenda will be faxed, mailed or delivered to all who are known by the City to have received a complete set of bid documents, and to offices where bid documents have been filed for review purposes. It is the responsibility of each bidder to ascertain that he has received all addenda issued by telephoning the office identified in the NOTICE TO CONTRACTORS as the location where bid documents are available prior to submitting his bid.

Bidders shall acknowledge all addenda in the appropriate location on the "PROPOSAL" form. Failure to acknowledge receipt of Addenda shall render the bid proposal non-responsive and it will be rejected.

14. **ASSIGNMENT OF CONTRACT:** No assignment by the Contractor of any contract to be entered into hereunder, or any part thereof, or of funds to be received thereunder by the Contractor, will be recognized by the Owner by the Owner unless such assignment has had prior approval of the Owner, and the Surety has been given due notice of such assignment in writing and has consented

thereto in writing.

15. PLANS AND SPECIFICATIONS TO SUCCESSFUL BIDDER: The successful bidder may obtain five (5) sets of plans and specifications for this project from the City.

16. TIME OF COMPLETION: The Contractor shall commence work under this project on or before the tenth day following receipt of the Notice to Proceed for that project from the City of Glendale and shall fully complete all work under the project within NINETY (90) consecutive calendar days from and including the date of receipt of such Notice to Proceed. Time is of the essence in the completion of all work required under this contract. The Contractor shall, at all times, during the continuance of the contract, prosecute the work with such force and equipment as is sufficient to complete all work within the time specified.

17. CITY OF GLENDALE TRANSACTION PRIVILEGE TAX: The City of Glendale transaction privilege tax shall **NOT** be waived under the provisions of this contract. The current privilege tax rate can be obtained from the City of Glendale Sales Tax and Licenses Department. The Contractor shall be responsible for reporting and payment of all city, county, state or federal taxes.

18. PRE-BID CONFERENCE: A pre-bid conference will be held on APRIL 17, 2012, at 1:00 P.M., in the Engineering Department Conference Room, 5850 West Glendale Avenue, Glendale, Arizona. Bidders, contractors, and other interested parties are invited to attend this conference which will be conducted by the Owner and Engineer to answer any questions.

19. ALTERNATES: Alternate proposals will not be considered unless called for in the documents or any addenda thereto. When alternates are requested, all requested alternates or alternate bid items, unless otherwise stated, shall be bid. If no change in the base bid will occur with the alternate, enter "No Change."

20. APPROVAL OF SUBSTITUTIONS: The materials, products and equipment described in the Documents and Addenda establish a standard or required function, dimension, appearance and quality to be met by any proposed substitution. No substitute will be considered, before bid opening, unless written request for approval has been received by the City Engineer at least ten (10) working days prior to the scheduled closing time for receipt of bids. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including any drawings, cuts, performance and test data and any other information necessary for evaluation of the substitute. Bidder shall not be entitled to approval of a substitute.

If a substitute is approved, the approval shall be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

21. USE OF "EQUALS": When the specifications for materials, articles, products and equipment state "or equal," contractor may bid upon, and use materials, articles, products and equipment which will perform equally the duties imposed by the general design. The City Engineering Department will have the final approval of all materials, articles, products and equipment proposed to be used as an "equal." It shall not be purchased or installed without the prior written approval from the City Engineering Department.

Approvals for "equals," before bid opening, may be requested in writing to the City Engineering

Department for approval. Requests must be received at least ten (10) days prior to the date set for opening the Bid Proposals. The request shall state the name of the material, article, product or equipment for which the item is sought to be considered an equal and a complete description of the proposed equal including any drawings, cuts, performance and test data and any other information necessary for approval of the equal. All approvals will be issued in the form of an addendum.

22. EXAMINATION OF CONTRACT DOCUMENTS AND VISIT SITE: Before submitting a Bid Proposal, bidders should carefully examine the Contract Documents, visit the site of the work, fully inform themselves as to all existing conditions and limitations. No consideration will be granted for any alleged misunderstanding of the material, articles or piece of equipment to be furnished or work to be done. It is understood that the tender of the Bid Proposal carries with it the agreement to all items and conditions referred to herein or indicated in the Contract Documents.

23. BIDDERS IN DEFAULT: No bid will be awarded to any person, firm or corporation that is not authorized by the Arizona Corporation Commission to do business in the State of Arizona, in arrears or is in default to the City of Glendale upon any debt or contract, or that is a defaulter as surety or otherwise upon any obligation to the City of Glendale, or has failed to faithfully perform any previous contract with the City of Glendale.

END OF INFORMATION FOR BIDDERS

PROPOSAL

Place Gilbert Arizona

Date 4/26/2012

Proposal of Hunter Contracting Co., a Corporation organized and existing under the laws of the State of Arizona. a partnership consisting of -- N / A --; or an individual trading as -- N / A --.

TO THE HONORABLE MAYOR AND COUNCIL
CITY OF GLENDALE
GLENDALE, ARIZONA

Gentlemen:

The undersigned hereby proposes and agrees to furnish any and all required labor, materials, construction equipment, transportation and services for the construction of: **PROJECT 111213 - GLENDALE WEST AREA WATER RECLAMATION FACILITY MISCELLANEOUS IMPROVEMENTS PROJECT - UV VENTILATION IMPROVEMENTS**, in strict conformity with the plans and specifications for the following unit prices:

(Extension of these unit prices on the basis of estimated quantities and the totaling of these extensions are for the purpose of comparing bids only. The mathematics of such extensions and totaling will be checked and corrected by the Engineering Department, before evaluating the bids, and the lowest of such corrected and checked totals will determine the lowest bids.)

BID SCHEDULE PROJECT 111213 - WEST AREA WATER RECLAMATION FACILITY MISCELLANEOUS IMPROVEMENTS PROJECT UV VENTILATION IMPROVEMENTS					
ITEM #	DESCRIPTION	QTY	UNIT	UNIT COST	BID COST
1	General Conditions	1	LS	32,460.00	32,460.00
2	Construction Surveying and Layout	1	LS	2,700.00	2,700.00
3	Allowance for Owner Construction Contingencies	1	LS	\$15,000	\$15,000
4	Mobilization/Demobilization	1	LS	1,260.00	1,260.00
5	Painting	1	LS	10,370.00	10,370.00
6	FRP Ductwork, Dampers and Accessories	1	LS	67,080.00	67,080.00
7	SS Vent Relocation and FRP/SS Flange Connections	1	LS	3,380.00	3,380.00
8	Pipe Supports and Hangers (including Concrete Pads, Misc. Metals, and Anchors)	1	LS	27,870.00	27,870.00
TOTAL BID					160,120.00

The undersigned hereby declares that he has visited the site(s) and has carefully examined the contract documents relating to the work covered by the above bid or bids.

Upon receipt of notice of the acceptance of this bid, we will execute the formal contract attached within ten (10) days, and will deliver a one hundred percent (100%) Performance Bond for the faithful performance of this Contract, together with a one hundred percent (100%) Payment Bond and Certificate of Insurance.

The bid security attached, with endorsement, in the sum of ten percent (10%) of the total bid, is to become the property of the City of Glendale, Arizona, in the event the Contract and Bonds are not executed within the time set forth, as liquidated damages for the delay and additional work caused thereby.

The undersigned has checked carefully all the above figures and understands that the City of Glendale, Arizona, will not be responsible for any errors or omissions on the part of the undersigned in making up this bid.

The undersigned understands that the Mayor and Council of the City of Glendale, Arizona, reserves the right to reject any or all bids or to waive any informalities or irregularities in the bid.

Respectfully submitted,

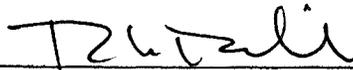
Arizona Contractor's
Classification and
License No.

ROC070961 A

Hunter Contracting Co.

Contractor

By



Rob Padilla, Vice President

701 N. Cooper Rd.

Gilbert AZ 85233

(Complete business address)

Telephone Number: 480-892-0521

Fax Number 480-892-4932

Bidder shall signify receipt of all Addenda here (if any):

Failure to acknowledge receipt of all Addenda shall render the bid proposal non-responsive and will be rejected.

Acknowledged by



Rob Padilla, Vice President

CONSTRUCTION AGREEMENT

This Construction Agreement ("Agreement") is entered into and effective between the CITY OF GLENDALE, an Arizona municipal corporation ("City"), and Hunter Contracting Co., an Arizona corporation ("Contractor") as of the 12th day of June, 2012.

RECITALS

- A. City intends to undertake a project for the benefit of the public and with public funds that is more fully set forth in the **Notice to Contractors** and the attached **Exhibit A** ("Project");
- B. City desires to retain the services of Contractor to perform those specific duties and produce the specific work as set forth in the Project, the plans and specifications, the **Information for Bidders**, and the **Maricopa Association of Governments ("MAG") General and Supplemental Conditions and Provisions**;
- C. City and Contractor desire to memorialize their agreement with this document.

AGREEMENT

In consideration of the Recitals, which are confirmed as true and correct and incorporated by this reference, the mutual promises and covenants contained in this Agreement, and other good and valuable consideration, City and Contractor agree as follows:

1. Project.

- 1.1 **Scope.** Contractor will provide all services and material necessary to assure the Project is completed timely and efficiently consistent with Project requirements, including, but not limited to, working in close interaction and interfacing with City and its designated employees, and working closely with others, including other contractors, providers or consultants retained by City.
- 1.2 **Documents.** The following documents are, by this reference, entirely incorporated into this Agreement and attached Exhibits as though fully set forth herein:

- (A) Notice to Contractors;
- (B) Information for Bidders;
- (C) MAG General Conditions, Supplemental General Conditions, Special and Technical Provisions;
- (D) Proposal;
- (E) Bid Bond;
- (F) Payment Bond;
- (G) Performance Bond;
- (H) Certificate of Insurance;
- (I) Appendix; and
- (J) Plans and Addenda thereto.

Should a conflict exist between this Agreement (and its attachments), and any of the incorporated documents as listed above, the provisions of this Agreement shall govern.

1.3 Project Team.

- (A) **Project Manager.** Contractor will designate an employee as Project Manager with sufficient training, knowledge, and experience to, in the City's opinion, to complete the project and handle all aspects of the Project such that the work produced by Contractor is consistent with applicable standards as detailed in this Agreement.

(B) Project Team.

- (1) The Project manager and all other employees assigned to the project by Contractor will comprise the "Project Team."
- (2) Project Manager will have responsibility for and will supervise all other employees assigned to the project by Contractor.

(C) Sub-contractors.

- (1) Contractor may engage specific technical contractor (each a "Sub-contractor") to furnish certain service functions.
- (2) Contractor will remain fully responsible for Sub-contractor's services.
- (3) Sub-contractors must be approved by the City, unless the Sub-contractor was previously mentioned in the response to the solicitation.
- (4) Contractor shall certify by letter that contracts with Sub-contractors have been executed incorporating requirements and standards as set forth in this Agreement.

2. **Schedule.** The Project will be undertaken in a manner that ensures it is completed in a timely and efficient manner. If not otherwise stated in **Exhibit A**, the Project shall be completed by no later than within ninety (90) consecutive calendar days from and including the date of receipt of the Notice to Proceed.

3. **Contractor's Work.**

3.1 **Standard.** Contractor must perform services in accordance with the standards of due diligence, care, and quality prevailing among contractors having substantial experience with the successful furnishing of services and materials for projects that are equivalent in size, scope, quality, and other criteria under the Project and identified in this Agreement.

3.2 **Licensing.** Contractor warrants that:

- (A) Contractor and Sub-contractors will hold all appropriate and required licenses, registrations and other approvals necessary for the lawful furnishing of services ("Approvals"); and
- (B) Neither Contractor nor any Sub-contractor has been debarred or otherwise legally excluded from contracting with any federal, state, or local governmental entity ("Debarment").
 - (1) City is under no obligation to ascertain or confirm the existence or issuance of any Approvals or Debarments or to examine Contractor's contracting ability.
 - (2) Contractor must notify City immediately if any Approvals or Debarment changes during the Agreement's duration and the failure of the Contractor to notify City as required will constitute a material default of this Agreement.

3.3 **Compliance.** Services and materials will be furnished in compliance with applicable federal, state, county and local statutes, rules, regulations, ordinances, building codes, life safety codes, or other standards and criteria designated by City.

3.4 **Coordination; Interaction.**

- (A) If the City determines that the Project requires the coordination of professional services or other providers, Contractor will work in close consultation with City to proactively interact with any other contractors retained by City on the Project ("Coordinating Entities").
- (B) Subject to any limitations expressly stated in the budget, Contractor will meet to review the Project, schedules, budget, and in-progress work with Coordinating Entities and the City as often and for durations as City reasonably considers necessary in order to ensure the timely work delivery and Project completion.

- (C) If the Project does not involve Coordinating Entities, Contractor will proactively interact with any other contractors when directed by City to obtain or disseminate timely information for the proper execution of the Project.

3.5 Hazardous Substances. Contractor is responsible for the appropriate handling, disposal of, and if necessary, any remediation and all losses and damages to the City, associated with the use or release of hazardous substances by Contractor in connection with completion of the Project.

3.6 Warranties. At any time within two years after completion of the Project, Contractor must, at Contractor's sole expense and within 20 days of written notice from the City, uncover, correct and remedy all defects in Contractor's work. City will accept a manufacturer's warranty on approved equipment as satisfaction of the Contractor's warranty under this subsection.

3.7 Bonds. Upon execution of this Agreement, and if applicable, Contractor must furnish Payment and Performance bonds as required under A.R.S. § 34-608.

4. Compensation for the Project.

4.1 Compensation. Contractor's compensation for the Project, including those furnished by its Sub-contractors will not exceed \$160,120.00, as specifically detailed in the Contractor's bid and set forth in Exhibit B ("Compensation").

4.2 Change in Scope of Project. The Compensation may be equitably adjusted if the originally contemplated scope of services as outlined in the Project is significantly modified by the City.

- (A) Adjustments to the Scope or Compensation require a written amendment to this Agreement and may require City Council approval.
- (B) Additional services which are outside the scope of the Project and not contained in this Agreement may not be performed by the Contractor without prior written authorization from the City.

5. Billings and Payment.

5.1 Applications.

- (A) The Contractor will submit monthly invoices (each, a "Payment Application") to City's Project Manager and City will remit payments based upon the Payment Application as stated below.
- (B) The period covered by each Payment Application will be one calendar month ending on the last day of the month.

5.2 Payment.

- (A) After a full and complete Payment Application is received, City will process and remit payment within 30 days.
- (B) Payment may be subject to or conditioned upon City's receipt of:
 - (1) Completed work generated by Contractor and its Sub-contractors; and
 - (2) Unconditional waivers and releases on final payment from Sub-contractors as City may reasonably request to assure the Project will be free of claims arising from required performances under this Agreement.

5.3 Review and Withholding. City's Project Manager will timely review and certify Payment Applications.

- (A) If the Payment Application is rejected, the Project Manager will issue a written listing of the items not approved for payment.
- (B) City may withhold an amount sufficient to pay expenses that City reasonably expects to incur in correcting the deficiency or deficiencies rejected for payment.

- (C) Contractor will provide, by separate cover, and concurrent with the execution of this Agreement, all required financial information to the City, including City of Glendale Transaction Privilege License and Federal Taxpayer identification numbers.
- (D) City will temporarily withhold Compensation amounts as required by A.R.S. 34-221(C).

6. Termination.

6.1 For Convenience. City may terminate this Agreement for convenience, without cause, by delivering a written termination notice stating the effective termination date, which may not be less than 15 days following the date of delivery.

- (A) Contractor will be equitably compensated any services and materials furnished prior to receipt of the termination notice and for reasonable costs incurred.
- (B) Contractor will also be similarly compensated for any approved effort expended and approved costs incurred that are directly associated with Project closeout and delivery of the required items to the City.

6.2 For Cause. City may terminate this Agreement for cause if Contractor fails to cure any breach of this Agreement within seven days after receipt of written notice specifying the breach.

- (A) Contractor will not be entitled to further payment until after City has determined its damages. If City's damages resulting from the breach, as determined by City, are less than the equitable amount due but not paid Contractor for Service and Repair furnished, City will pay the amount due to Contractor, less City's damages.
- (B) If City's direct damages exceed amounts otherwise due to Contractor, Contractor must pay the difference to City immediately upon demand; however, Contractor will not be subject to consequential damages more than \$1,000,000 or the amount of this Agreement, whichever is greater.

7. Insurance.

7.1 Requirements. Contractor must obtain and maintain the following insurance ("Required Insurance"):

- (A) Contractor and Sub-contractors. Contractor, and each Sub-contractor performing work or providing materials related to this Agreement must procure and maintain the insurance coverages described below (collectively, "Contractor's Policies"), until each Parties' obligations under this Agreement are completed.
- (B) General Liability.
 - (1) Contractor must at all times relevant hereto carry a commercial general liability policy with a combined single limit of at least \$1,000,000 per occurrence and \$2,000,000 annual aggregate.
 - (2) Sub-contactors must at all times relevant hereto carry a general commercial liability policy with a combined single limit of at least \$1,000,000 per occurrence.
 - (3) This commercial general liability insurance must include independent contractors' liability, contractual liability, broad form property coverage, products and completed operations, XCU hazards if requested by the City, and a separation of insurance provision.
 - (4) These limits may be met through a combination of primary and excess liability coverage.
- (C) Auto. A business auto policy providing a liability limit of at least \$1,000,000 per accident for Contractor and 1,000,000 per accident for Sub-contractors and covering owned, non-owned and hired automobiles.

- (D) Workers' Compensation and Employer's Liability. A workers' compensation and employer's liability policy providing at least the minimum benefits required by Arizona law.
- (E) Equipment Insurance. Contractor must secure, pay for, and maintain all-risk insurance as necessary to protect the City against loss of owned, non-owned, rented or leased capital equipment and tools, equipment and scaffolding, staging, towers and forms owned or rented by Contractor or its Sub-contractors.
- (F) Notice of Changes. Contractor's Policies must provide for not less than 30 days' advance written notice to City Representative of:
 - (1) Cancellation or termination of Contractor or Sub-contractor's Policies;
 - (2) Reduction of the coverage limits of any of Contractor or and Sub-contractor's Policies; and
 - (3) Any other material modification of Contractor or Sub-contractor's Policies related to this Agreement.
- (G) Certificates of Insurance.
 - (1) Within 10 business days after the execution of the Agreement, Contractor must deliver to City Representative certificates of insurance for each of Contractor and Sub-contractor's Policies, which will confirm the existence or issuance of Contractor and Sub-contractor's Policies in accordance with the provisions of this section, and copies of the endorsements of Contractor and Sub-contractor's Policies in accordance with the provisions of this section.
 - (2) City is and will be under no obligation either to ascertain or confirm the existence or issuance of Contractor and Sub-contractor's Policies, or to examine Contractor and Sub-contractor's Policies, or to inform Contractor or Sub-contractor in the event that any coverage does not comply with the requirements of this section.
 - (3) Contractor's failure to secure and maintain Contractor Policies and to assure Sub-contractor policies as required will constitute a material default under this Agreement.
- (H) Other Contractors or Vendors.
 - (1) Other contractors or vendors that may be contracted by Contractor with in connection with the Project must procure and maintain insurance coverage as is appropriate to their particular agreement.
 - (2) This insurance coverage must comply with the requirements set forth above for Contractor's Policies (e.g., the requirements pertaining to endorsements to name the parties as additional insured parties and certificates of insurance).
- (I) Policies. Except with respect to workers' compensation and employer's liability coverages, the City must be named and properly endorsed as additional insureds on all liability policies required by this section.
 - (1) The coverage extended to additional insureds must be primary and must not contribute with any insurance or self insurance policies or programs maintained by the additional insureds.
 - (2) All insurance policies obtained pursuant to this section must be with companies legally authorized to do business in the State of Arizona and acceptable to all parties.

7.2 Sub-contractors.

- (A) Contractor must also cause its Sub-contractors to obtain and maintain the Required Insurance.
- (B) City may consider waiving these insurance requirements for a specific Sub-contractor if City is satisfied the amounts required are not commercially available to the Sub-contractor and the

insurance the Sub-contractor does have is appropriate for the Sub-contractor's work under this Agreement.

- (C) Contractor and Sub-contractors must provide to the City proof of Required Insurance whenever requested.

7.3 Indemnification.

- (A) To the fullest extent permitted by law, Contractor must defend, indemnify, and hold harmless City and its elected officials, officers, employees and agents (each, an "Indemnified Party," collectively, the "Indemnified Parties"), for, from, and against any and all claims, demands, actions, damages, judgments, settlements, personal injury (including sickness, disease, death, and bodily harm), property damage (including loss of use), infringement, governmental action and all other losses and expenses, including attorneys' fees and litigation expenses (each, a "Demand or Expense"; collectively, "Demands or Expenses") asserted by a third-party (i.e. a person or entity other than City or Contractor) and that arises out of or results from the breach of this Agreement by the Contractor or the Contractor's negligent actions, errors or omissions (including any Sub-contractor or other person or firm employed by Contractor), whether sustained before or after completion of the Project.
- (B) This indemnity and hold harmless policy applies even if a Demand or Expense is in part due to the Indemnified Party's negligence or breach of a responsibility under this Agreement, but in that event, Contractor shall be liable only to the extent the Demand or Expense results from the negligence or breach of a responsibility of Contractor or of any person or entity for whom Contractor is responsible.
- (C) Contractor is not required to indemnify any Indemnified Parties for, from, or against any Demand or Expense resulting from the Indemnified Party's sole negligence or other fault solely attributable to the Indemnified Party.

7.4 Waiver of Subrogation. Contractor waives, and will require any Subcontractor to waive, all rights of subrogation against the City to the extent of all losses or damages covered by any policy of insurance.

8. Immigration Law Compliance.

- 8.1 Contractor, and on behalf any subcontractor, warrants, to the extent applicable under A.R.S. § 41-4401, compliance with all federal immigration laws and regulations that relate to their employees as well as compliance with A.R.S. § 23-214(A) which requires registration and participation with the E-Verify Program.
- 8.2 Any breach of warranty under subsection 8.1 above is considered a material breach of this Agreement and is subject to penalties up to and including termination of this Agreement.
- 8.3 City retains the legal right to inspect the papers of any Contractor or subcontractor employee who performs work under this Agreement to ensure that the Contractor or any subcontractor is compliant with the warranty under subsection 8.1 above.
- 8.4 City may conduct random inspections, and upon request of City, Contractor shall provide copies of papers and records of Contractor demonstrating continued compliance with the warranty under subsection 8.1 above. Contractor agrees to keep papers and records available for inspection by the City during normal business hours and will cooperate with City in exercise of its statutory duties and not deny access to its business premises or applicable papers or records for the purposes of enforcement of this section 8.
- 8.5 Contractor agrees to incorporate into any subcontracts under this Agreement the same obligations imposed upon Contractor and expressly accrue those obligations directly to the benefit of the City. Contractor also agrees to require any subcontractor to incorporate into each of its own subcontracts under this Agreement the same obligations above and expressly accrue those obligations to the benefit of the City.
- 8.6 Contractor's warranty and obligations under this section to the City is continuing throughout the term of this Agreement or until such time as the City determines, in its sole discretion, that Arizona law has been modified in that compliance with this section is no longer a requirement.

8.7 The "E-Verify Program" above means the employment verification program administered by the United States Department of Homeland Security, the Social Security Administration, or any successor program.

9. **Conflict.** Contractor acknowledges this Agreement is subject to A.R.S. § 38-511, which allows for cancellation of this Agreement in the event any person who is significantly involved in initiating, negotiating, securing, drafting, or creating the Agreement on City's behalf is also an employee, agent, or consultant of any other party to this Agreement.

10. **Prohibitions.** Contractor certifies under A.R.S. §§ 35-391 *et seq.* and 35-393 *et seq.*, that it does not have, and during the term of this Agreement will not have "scrutinized" business operations, as defined in the preceding statutes, in the countries of Sudan or Iran.

11. **Non-Discrimination Policies.** Contractor must not discriminate against any employee or applicant for employment on the basis of race, religion, color sex or national origin. Contractor must develop, implement and maintain non-discrimination policies and post the policies in conspicuous places visible to employees and applicants for employment. Contractor will require any Sub-contractor to be bound to the same requirements as stated within this section.

12. **Notices.**

12.1 A notice, request or other communication that is required or permitted under this Agreement (each a "Notice") will be effective only if:

- (A) The Notice is in writing, and
- (B) Delivered in person or by private express overnight delivery service (delivery charges prepaid), certified or registered mail (return receipt requested).
- (C) Notice will be deemed to have been delivered to the person to whom it is addressed as of the date of receipt, if:
 - (1) Received on a business day, or before 5:00 p.m., at the address for Notices identified for the Party in this Agreement by U.S. Mail, hand delivery, or overnight courier on or before 5:00 p.m.; or
 - (2) As of the next business day after receipt, if received after 5:00 p.m.
- (D) The burden of proof of the place and time of delivery is upon the Party giving the Notice.
- (E) Digitalized signatures and copies of signatures will have the same effect as original signatures.

12.2 **Representatives.**

(A) Contractor. Contractor's representative ("Contractor's Representative") authorized to act on Contractor's behalf with respect to the Project, and his or her address for Notice delivery is:

Hunter Contracting Co.
Attn: Rob Padilla
701 N. Cooper Road
Gilbert, AZ 85233

(B) City. City's representative ("City's Representative") authorized to act on City's behalf, and his or her address for Notice delivery is:

City of Glendale
Attn: Tom Kaczmarowski
5850 West Glendale Avenue
Glendale, Arizona 85301

With required copies to:

City of Glendale
City Manager
5850 West Glendale Avenue
Glendale, Arizona 85301

City of Glendale
City Attorney
5850 West Glendale Avenue
Glendale, Arizona 85301

(C) Concurrent Notices.

- (1) All notices to City's representative must be given concurrently to City Manager and City Attorney.
- (2) A notice will not be considered to have been received by City's representative until the time that it has also been received by City Manager and City Attorney.
- (3) City may appoint one or more designees for the purpose of receiving notice by delivery of a written notice to Contractor identifying the designee(s) and their respective addresses for notices.

(D) **Changes.** Contractor or City may change its representative or information on Notice, by giving Notice of the change in accordance with this section at least ten days prior to the change.

13. **Financing Assignment.** City may assign this Agreement to any City-affiliated entity, including a non-profit corporation or other entity whose primary purpose is to own or manage the Project.

14. **Entire Agreement; Survival; Counterparts; Signatures.**

14.1 **Integration.** This Agreement contains, except as stated below, the entire agreement between City and Contractor and supersedes all prior conversations and negotiations between the parties regarding the Project or this Agreement.

- (A) Neither Party has made any representations, warranties or agreements as to any matters concerning the Agreement's subject matter.
- (B) Representations, statements, conditions, or warranties not contained in this Agreement will not be binding on the parties.
- (C) Any solicitation, addendums and responses submitted by the Contractor are incorporated fully into this Agreement as Exhibit A. Any inconsistency between Exhibit A and this Agreement will be resolved by the terms and conditions stated in this Agreement.

14.2 **Interpretation.**

- (A) The parties fairly negotiated the Agreement's provisions to the extent they believed necessary and with the legal representation they deemed appropriate.
- (B) The parties are of equal bargaining position and this Agreement must be construed equally between the parties without consideration of which of the parties may have drafted this Agreement.
- (C) The Agreement will be interpreted in accordance with the laws of the State of Arizona.

14.3 **Survival.** Except as specifically provided otherwise in this Agreement each warranty, representation, indemnification and hold harmless provision, insurance requirement, and every other right, remedy and responsibility of a Party, will survive completion of the Project, or the earlier termination of this Agreement.

14.4 **Amendment.** No amendment to this Agreement will be binding unless in writing and executed by the parties. Any amendment may be subject to City Council approval.

14.5 **Remedies.** All rights and remedies provided in this Agreement are cumulative and the exercise of any one or more right or remedy will not affect any other rights or remedies under this Agreement or applicable law.

14.6 Severability. If any provision of this Agreement is voided or found unenforceable, that determination will not affect the validity of the other provisions, and the voided or unenforceable provision will be reformed to conform to applicable law.

14.7 Counterparts. This Agreement may be executed in counterparts, and all counterparts will together comprise one instrument.

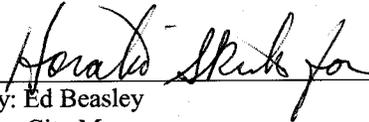
15. Dispute Resolution. Each claim, controversy and dispute ("Dispute") between Contractor and City will be resolved in accordance with Exhibit C. The final determination will be made by the City.

16. Exhibits. The following exhibits, with reference to the term in which they are first referenced, are incorporated by this reference.

Exhibit A	Project
Exhibit B	Compensation
Exhibit C	Dispute Resolution

The parties enter into this Agreement as of the date shown above.

City of Glendale,
an Arizona municipal corporation


By: Ed Beasley
Its: City Manager

ATTEST:


City Clerk (SEAL)

APPROVED AS TO FORM:


City Attorney

Hunter Contracting Co.
an Arizona corporation


By: Rob Padilla
Its: Vice President

WOMEN-OWNED/MINORITY BUSINESS [] YES [] NO
CITY OF GLENDALE TRANSACTION PRIVILEGE TAX NO. _____
FEDERAL TAXPAYER IDENTIFICATION NO. _____

**EXHIBIT A
CONSTRUCTION AGREEMENT**

PROJECT

This project is located at the West Area Water Reclamation Facility (WARF) and includes installation of fiberglass reinforced plastic (FRP) foul air ductwork, dampers, and accessories for ventilation improvements at the existing UV Effluent Channel and Backwash Supply/NPW Pump Station.

**EXHIBIT B
CONSTRUCTION AGREEMENT**

COMPENSATION

METHOD AND AMOUNT OF COMPENSATION

By bid, including all services, materials and costs.

NOT-TO-EXCEED AMOUNT

The total amount of compensation paid to Contractor for full completion of all work required by the Project during the entire term of the Project must not exceed \$160,120.

DETAILED PROJECT COMPENSATION

Per Page 8 of the Bid Schedule.

**EXHIBIT C
CONSTRUCTION AGREEMENT**

DISPUTE RESOLUTION

1. Disputes.

- 1.1 Commitment. The parties commit to resolving all disputes promptly, equitably, and in a good-faith, cost-effective manner.
- 1.2 Application. The provisions of this Exhibit will be used by the parties to resolve all controversies, claims, or disputes ("Dispute") arising out of or related to this Agreement-including Disputes regarding any alleged breaches of this Agreement.
- 1.3 Initiation. A party may initiate a Dispute by delivery of written notice of the Dispute, including the specifics of the Dispute, to the Representative of the other party as required in this Agreement.
- 1.4 Informal Resolution. When a Dispute notice is given, the parties will designate a member of their senior management who will be authorized to expeditiously resolve the Dispute.
 - (A) The parties will provide each other with reasonable access during normal business hours to any and all non-privileged records, information and data pertaining to any Dispute in order to assist in resolving the Dispute as expeditiously and cost effectively as possible;
 - (B) The parties' senior managers will meet within 10 business days to discuss and attempt to resolve the Dispute promptly, equitably, and in a good faith manner, and
 - (C) The Senior Managers will agree to subsequent meetings if both parties agree that further meetings are necessary to reach a resolution of the Dispute.

2. Arbitration.

- 2.1 Rules. If the parties are unable to resolve the Dispute by negotiation within 30 days from the Dispute notice, and unless otherwise informal discussions are extended by the mutual agreement, the Dispute will be decided by binding arbitration in accordance with Construction Industry Rules of the AAA, as amended herein. Although the arbitration will be conducted in accordance with AAA Rules, it will not be administered by the AAA, but will be heard independently.
 - (A) The parties will exercise best efforts to select an arbitrator within 5 business days after agreement for arbitration. If the parties have not agreed upon an arbitrator within this period, the parties will submit the selection of the arbitrator to one of the principals of the mediation firm of Scott & Skelly, LLC, who will then select the arbitrator. The parties will equally share the fees and costs incurred in the selection of the arbitrator.
 - (B) The arbitrator selected must be an attorney with at least 15 years experience with commercial construction legal matters in Maricopa County, Arizona, be independent, impartial, and not have engaged in any business for or adverse to either Party for at least 10 years.
- 2.2 Discovery. The extent and the time set for discovery will be as determined by the arbitrator. Each Party must, however, within ten (10) days of selection of an arbitrator deliver to the other Party copies of all documents in the delivering party's possession that are relevant to the dispute.
- 2.3 Hearing. The arbitration hearing will be held within 90 days of the appointment of the arbitrator. The arbitration hearing, all proceedings, and all discovery will be conducted in Glendale, Arizona unless otherwise agreed by the parties or required as a result of witness location. Telephonic hearings and other reasonable arrangements may be used to minimize costs.
- 2.4 Award. At the arbitration hearing, each Party will submit its position to the arbitrator, evidence to support that position, and the exact award sought in this matter with specificity. The arbitrator must select the award sought by one of the parties as the final judgment and may not independently alter or modify the awards sought by the parties, fashion any remedy, or make any equitable order. The arbitrator has no authority to consider or award punitive damages.

- 2.5 Final Decision. The Arbitrator's decision should be rendered within 15 days after the arbitration hearing is concluded. This decision will be final and binding on the Parties.
- 2.6 Costs. The prevailing party may enter the arbitration in any court having jurisdiction in order to convert it to a judgment. The non-prevailing party shall pay all of the prevailing party's arbitration costs and expenses, including reasonable attorney's fees and costs.
3. **Services to Continue Pending Dispute.** Unless otherwise agreed to in writing, Contractor must continue to perform and maintain progress of required services during any Dispute resolution or arbitration proceedings, and City will continue to make payment to Contractor in accordance with this Agreement.
4. **Exceptions.**
 - 4.1 Third Party Claims. City and Contractor are not required to arbitrate any third-party claim, cross-claim, counter claim, or other claim or defense of a third-party who is not obligated by contract to arbitrate disputes with City and Contractor.
 - 4.2 Liens. City or Contractor may commence and prosecute a civil action to contest a lien or stop notice, or enforce any lien or stop notice, but only to the extent the lien or stop notice the Party seeks to enforce is enforceable under Arizona Law, including, without limitation, an action under A.R.S. § 33-420, without the necessity of initiating or exhausting the procedures of this Exhibit.
 - 4.3 Governmental Actions. This Exhibit does not apply to, and must not be construed to require arbitration of, any claims, actions or other process filed or issued by City of Glendale Building Safety Department or any other agency of City acting in its governmental permitting or other regulatory capacity.

INDIVIDUAL SURETIES WILL NOT BE ACCEPTED
STATUTORY PERFORMANCE BOND PURSUANT TO TITLE 34,
CHAPTER 2, ARTICLE 2, OF THE ARIZONA REVISED STATUTES
(Penalty of this bond must be 100% of the Contract Amount)

BOND #105 749 468
ISSUED IN TRIPLICATE
3 of 3 originals

KNOW ALL MEN BY THESE PRESENTS:

That HUNTER CONTRACTING CO. (hereinafter called the Principal), as Principal, and **, a corporation organized and existing under the laws of the State of CONNECTICUT with its principal office in the City of HARTFORD, (hereinafter called the Surety), as Surety, are held and firmly bound unto the City of Glendale, a municipal corporation, (hereinafter called the Obligee), in the amount of ONE HUNDRED-SIXTY THOUSAND, ONE HUNDRED-TWENTY & NO/100 Dollars (\$160,120.00--), for the payment whereof; the said Principal and Surety bind themselves, and their heirs, administrators, successors and assigns, jointly and severally, firmly by these presents.
**TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA

WHEREAS, The Principal has entered into a certain written contract with the Obligee, dated the ___ day of , 20___, to construct **PROJECT 111213 - GLENDALE WEST AREA WATER RECLAMATION FACILITY MISCELLANEOUS IMPROVEMENTS PROJECT - UV VENTILATION IMPROVEMENTS**, 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 THIS OBLIGATION IS SUCH, that if the said Principal shall faithfully perform and fulfill all undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract any extension thereof, with or without notice to the Surety, and during the life of any guaranty required under the contract and shall also perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the Surety being hereby waived; then the above obligation shall be void, otherwise to remain in full force and effect.

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

The prevailing party or any party which recovers judgment on this bond shall be entitled to such reasonable attorney's fees as may be fixed by the court or a judge thereof.

Witness our hands this 25TH day of JUNE, 2012.

HUNTER CONTRACTING CO.
Principal Seal

By *Rh Delli*

TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA
Surety Seal
By: *[Signature]*
WILLIAM J. PASSEY, ATTORNEY-IN-FACT
PASSEY-BOND CO., INC.
Agency of Record

P.O. BOX 819, MESA, AZ 85211
Agency Address

Telephone Number: 480-969-2291



POWER OF ATTORNEY

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company

St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company

Attorney-In Fact No. 222894

Certificate No. 004863662

KNOW ALL MEN BY THESE PRESENTS: That St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company and St. Paul Mercury Insurance Company are corporations duly organized under the laws of the State of Minnesota, that Farmington Casualty Company, Travelers Casualty and Surety Company, and Travelers Casualty and Surety Company of America are corporations duly organized under the laws of the State of Connecticut, that United States Fidelity and Guaranty Company is a corporation duly organized under the laws of the State of Maryland, that Fidelity and Guaranty Insurance Company is a corporation duly organized under the laws of the State of Iowa, and that Fidelity and Guaranty Insurance Underwriters, Inc., is a corporation duly organized under the laws of the State of Wisconsin (herein collectively called the "Companies"), and that the Companies do hereby make, constitute and appoint

William J. Passey, Deborah G. Lavo, and Ilona Avnukov

of the City of Mesa, State of Arizona, their true and lawful Attorney(s)-in-Fact, each in their separate capacity if more than one is named above, to sign, execute, seal and acknowledge any and all bonds, recognizances, conditional undertakings and other writings obligatory in the nature thereof on behalf of the Companies in their business of guaranteeing the fidelity of persons, guaranteeing the performance of contracts and executing or guaranteeing bonds and undertakings required or permitted in any actions or proceedings allowed by law.

IN WITNESS WHEREOF, the Companies have caused this instrument to be signed and their corporate seals to be hereto affixed, this 17th day of May, 2012.

Farmington Casualty Company
Fidelity and Guaranty Insurance Company
Fidelity and Guaranty Insurance Underwriters, Inc.
St. Paul Fire and Marine Insurance Company
St. Paul Guardian Insurance Company

St. Paul Mercury Insurance Company
Travelers Casualty and Surety Company
Travelers Casualty and Surety Company of America
United States Fidelity and Guaranty Company



State of Connecticut
City of Hartford ss.

By: [Signature]
George W. Thompson, Senior Vice President

On this the 17th day of May, 2012, before me personally appeared George W. Thompson, who acknowledged himself to be the Senior Vice President of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, and that he, as such, being authorized so to do, executed the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

In Witness Whereof, I hereunto set my hand and official seal.
My Commission expires the 30th day of June, 2016.



[Signature]
Marie C. Tetreault, Notary Public

This Power of Attorney is granted under and by the authority of the following resolutions adopted by the Boards of Directors of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company, which resolutions are now in full force and effect, reading as follows:

RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President, any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary may appoint Attorneys-in-Fact and Agents to act for and on behalf of the Company and may give such appointee such authority as his or her certificate of authority may prescribe to sign with the Company's name and seal with the Company's seal bonds, recognizances, contracts of indemnity, and other writings obligatory in the nature of a bond, recognizance, or conditional undertaking, and any of said officers or the Board of Directors at any time may remove any such appointee and revoke the power given him or her; and it is

FURTHER RESOLVED, that the Chairman, the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President may delegate all or any part of the foregoing authority to one or more officers or employees of this Company, provided that each such delegation is in writing and a copy thereof is filed in the office of the Secretary; and it is

FURTHER RESOLVED, that any bond, recognizance, contract of indemnity, or writing obligatory in the nature of a bond, recognizance, or conditional undertaking shall be valid and binding upon the Company when (a) signed by the President, any Vice Chairman, any Executive Vice President, any Senior Vice President or any Vice President, any Second Vice President, the Treasurer, any Assistant Treasurer, the Corporate Secretary or any Assistant Secretary and duly attested and sealed with the Company's seal by a Secretary or Assistant Secretary; or (b) duly executed (under seal, if required) by one or more Attorneys-in-Fact and Agents pursuant to the power prescribed in his or her certificate or their certificates of authority or by one or more Company officers pursuant to a written delegation of authority; and it is

FURTHER RESOLVED, that the signature of each of the following officers: President, any Executive Vice President, any Senior Vice President, any Vice President, any Assistant Vice President, any Secretary, any Assistant Secretary, and the seal of the Company may be affixed by facsimile to any Power of Attorney or to any certificate relating thereto appointing Resident Vice Presidents, Resident Assistant Secretaries or Attorneys-in-Fact for purposes only of executing and attesting bonds and undertakings and other writings obligatory in the nature thereof, and any such Power of Attorney or certificate bearing such facsimile signature or facsimile seal shall be valid and binding upon the Company and any such power so executed and certified by such facsimile signature and facsimile seal shall be valid and binding on the Company in the future with respect to any bond or understanding to which it is attached.

I, Kevin E. Hughes, the undersigned, Assistant Secretary, of Farmington Casualty Company, Fidelity and Guaranty Insurance Company, Fidelity and Guaranty Insurance Underwriters, Inc., St. Paul Fire and Marine Insurance Company, St. Paul Guardian Insurance Company, St. Paul Mercury Insurance Company, Travelers Casualty and Surety Company, Travelers Casualty and Surety Company of America, and United States Fidelity and Guaranty Company do hereby certify that the above and foregoing is a true and correct copy of the Power of Attorney executed by said Companies, which is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 25TH day of JUNE, 20 12.

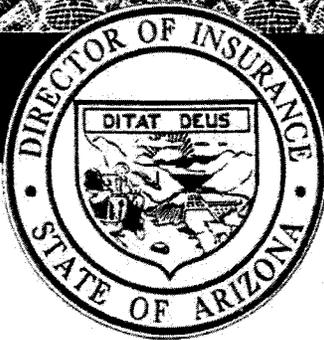
WARNING: THIS POWER OF ATTORNEY IS INVALID WITHOUT THE RED BORDER

Kevin E. Hughes
Kevin E. Hughes, Assistant Secretary



To verify the authenticity of this Power of Attorney, call 1-800-421-3880 or contact us at www.travelersbond.com. Please refer to the Attorney-In-Fact number, the above-named individuals and the details of the bond to which the power is attached.

STATE OF



ARIZONA

DEPARTMENT OF INSURANCE
CERTIFICATE OF AUTHORITY

I, JOHN A. GREENE, Director of Insurance of the State of Arizona, do hereby certify that

TRAVELERS CASUALTY AND SURETY COMPANY OF AMERICA
Domiciled in Connecticut
NAIC NO. 31194

is hereby authorized, subject to the provisions thereof and the Charter Powers of said Company, to transact the business of:

CASUALTY WITH WORKERS' COMPENSATION
DISABILITY
MARINE AND TRANSPORTATION
PROPERTY
SURETY
VEHICLE

insurance within the State of Arizona until terminated at the request of the insurer or suspended or revoked by the Director of Insurance.

Arizona Revised Statute § 20-217 (C) states:

A Certificate of Authority remains the property of the State of Arizona. Upon termination at the request of the insurer or revocation by the Director of Insurance, the insurer shall immediately deliver the Certificate of Authority to the Director of Insurance.

In TESTIMONY WHEREOF, I have hereunto set my hand and affixed the official seal of the Director of Insurance at the City of Phoenix. The effective date of this Certificate is July 1, 1997.



John A. Greene

John A. Greene
Director of Insurance

E146 (01/97)

274258

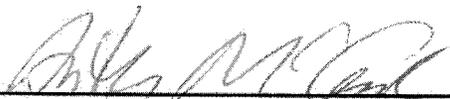
000843

**STATE
OF
ARIZONA**

DEPARTMENT OF INSURANCE

*THIS IS TO CERTIFY, THAT THIS
INSTRUMENT IS A FULL, TRUE AND
CORRECT COPY OF THE ORIGINAL ON
FILE WITH THE DEPARTMENT OF
INSURANCE OF THE STATE OF ARIZONA
AND CONSISTS OF 1PAGE(S)*

HEREUNTO SET MY HAND AND THE OFFICIAL SEAL OF THIS DEPARTMENT
FOR THE DIRECTOR OF INSURANCE THIS 11 JANUARY 2011.



AUTHORIZED REPRESENTATIVE

CERTIFICATE No.:

274258





CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)
6/25/2012

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Passey-Bond Co., Inc. 28 North Center Street P. O. Box 819 Mesa AZ 85211-0819	CONTACT NAME: Kori L. Moseley, CISR, CPIW PHONE (A/C, No, Ext): (480) 969-2291 E-MAIL ADDRESS: korim@passeybond.com	FAX (A/C, No): (480) 833-4833
	INSURER(S) AFFORDING COVERAGE	
INSURED Hunter Contracting Company 701 N. Cooper Road Gilbert AZ 85233	INSURER A: Cincinnati Insurance Co. NAIC # 10677	
	INSURER B: Great American Insurance Group 16691	
	INSURER C: SCF American Insurance Co.	
	INSURER D: Columbia Casualty Company	
	INSURER E:	
	INSURER F:	

COVERAGES**CERTIFICATE NUMBER:****REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	GENERAL LIABILITY						EACH OCCURRENCE \$ 1,000,000
	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 500,000
	<input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR	X	X	CPP1061979	5/1/2012	5/1/2013	MED EXP (Any one person) \$ 10,000
	<input checked="" type="checkbox"/> GA233AZ/GA4316AZ						PERSONAL & ADV INJURY \$ 1,000,000
	<input checked="" type="checkbox"/> GA4094/CG2404/GA4088						GENERAL AGGREGATE \$ 2,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						PRODUCTS - COMP/OP AGG \$ 2,000,000
	<input type="checkbox"/> POLICY <input checked="" type="checkbox"/> PROJECT <input type="checkbox"/> LOC						\$
A	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000
	<input checked="" type="checkbox"/> ANY AUTO						BODILY INJURY (Per person) \$
	<input type="checkbox"/> ALL OWNED AUTOS		X	CPA1061979	5/1/2012	5/1/2013	BODILY INJURY (Per accident) \$
	<input checked="" type="checkbox"/> HIRED AUTOS		X				PROPERTY DAMAGE (Per accident) \$
	<input checked="" type="checkbox"/> AA4004		X				\$
	<input checked="" type="checkbox"/> AA4174						\$
B	<input checked="" type="checkbox"/> UMBRELLA LIAB			Umbrella extends over GL			EACH OCCURRENCE \$ 10,000,000
	<input type="checkbox"/> EXCESS LIAB			Auto and Employers Liab			AGGREGATE \$ 10,000,000
	<input type="checkbox"/> DED <input checked="" type="checkbox"/> RETENTION \$ 10,000			TUU405724706	5/1/2012	5/1/2013	\$
C	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY						<input checked="" type="checkbox"/> WC STATUTORY LIMITS <input type="checkbox"/> OTHER
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH)						E.L. EACH ACCIDENT \$ 500,000
	If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N	N/A	WC000313			E.L. DISEASE - EA EMPLOYEE \$ 500,000
				A60219	5/1/2012	5/1/2013	E.L. DISEASE - POLICY LIMIT \$ 500,000
D	Professional Liability			CZB288363995	11/28/2011	11/28/2012	Aggregate/Per Claim \$4mil/\$2mil
	A Course of Construction			CPP1061979	5/1/2012	5/1/2013	Limit/Deductible \$10mil/10,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)
 Project #111213 West Area Water Reclamation Facility (WARF).

CERTIFICATE HOLDER**CANCELLATION**

City of Glendale, Arizona
 Attn: Engineering DEpt
 5850 W. Glendale Avenue
 Glendale, AZ 85301

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Bill Passey/KORI

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

CONTRACTORS' COMMERCIAL GENERAL LIABILITY BROADENED ENDORSEMENT

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

A. Endorsement - Table of Contents:

<u>Coverage:</u>	<u>Begins on Page:</u>
1. Employee Benefit Liability Coverage	2
2. Unintentional Failure to Disclose Hazards	7
3. Damage to Premises Rented to You	8
4. Supplementary Payments	9
5. Medical Payments	9
6. Voluntary Property Damage (Coverage a.) and Care, Custody or Control Liability Coverage (Coverage b.)	9
7. 180 Day Coverage for Newly Formed or Acquired Organizations	10
8. Waiver of Subrogation	10
9. Automatic Additional Insured - Specified Relationships:	10
Managers or Lessors of Premises; Lessor of Leased Equipment; Vendors; State or Political Subdivisions - Permits Relating to Premises; State or Political Subdivisions - Permits; and Contractors' Operations	
10. Broadened Contractual Liability - Work Within 50' of Railroad Property	13
11. Property Damage to Borrowed Equipment	13
12. Employees as Insureds - Specified Health Care Services:	14
Nurses; Emergency Medical Technicians; and Paramedics	
13. Broadened Notice of Occurrence	14

B. Limits of Insurance:

The Commercial General Liability Limits of Insurance apply to the insurance provided by this endorsement, except as provided below:

1. Employee Benefit Liability Coverage

Each Employee Limit: \$ 1,000,000

Aggregate Limit: \$ 3,000,000

Deductible: \$ 1,000

3. Damage to Premises Rented to You

The lesser of:

a. The Each Occurrence Limit shown in the Declarations; or

b. \$500,000 unless otherwise stated \$ _____

4. Supplementary Payments

a. Bail bonds: \$ 1,000

b. Loss of earnings: \$ 350

5. Medical Payments

Medical Expense Limit: \$ 10,000

6. Voluntary Property Damage (Coverage a.) and Care, Custody or Control Liability Coverage (Coverage b.)

Limits of Insurance (Each Occurrence)

Coverage a. \$1,000

Coverage b. \$5,000 unless otherwise stated \$ _____

Deductibles (Each Occurrence)

Coverage a. \$250

Coverage b. \$250 unless otherwise stated \$ _____

COVERAGE	PREMIUM BASIS (a) Area (b) Payroll (c) Gross Sales (d) Units (e) Other	RATE (For Limits in Excess of \$5,000)	ADVANCE PREMIUM (For Limits in Excess of \$5,000)
b. Care, Custody or Control			\$
TOTAL ANNUAL PREMIUM			\$

11. Property Damage to Borrowed Equipment

Each Occurrence Limit: \$ 10,000

Deductible: \$ 250

C. Coverages:

1. Employee Benefit Liability Coverage

a. The following is added to SECTION I - COVERAGES: Employee Benefit Liability Coverage.

(1) Insuring Agreement

(a) We will pay those sums that the insured becomes legally obligated to pay as damages caused by any act, error or omission of the insured, or of any other person for whose acts the insured is legally liable, to which this insurance applies. We will have the right and duty to defend the insured against any "suit" seeking those damages. However, we will have no duty to defend against any "suit" seeking damages to which this insurance does not apply. We may, at our discretion, investigate any report of an act, error or omission and settle any claim or "suit" that may result. But:

1) The amount we will pay for damages is limited as described in SECTION III - LIMITS OF INSURANCE; and

2) Our right and duty to defend ends when we have used up the applicable limit of insurance in the payment of judgments or settlements.

No other obligation or liability to pay sums or perform acts or services is covered unless explicitly provided for under Supplementary Payments.

(b) This insurance applies to damages only if the act, error or omission, is negligently committed in the "administration" of your "employee benefit program"; and

1) Occurs during the policy period; or

2) Occurred prior to the effective date of this endorsement provided:

a) You did not have knowledge of a claim or "suit" on or before the effective date of this endorsement.

You will be deemed to have

knowledge of a claim or "suit" when any "authorized representative";

i) Reports all, or any part, of the act, error or omission to us or any other insurer;

ii) Receives a written or verbal demand or claim for damages because of the act, error or omission; and

b) There is no other applicable insurance.

(2) Exclusions

This insurance does not apply to:

(a) Bodily Injury, Property Damage or Personal and Advertising Injury

"Bodily injury", "property damage" or "personal and advertising injury".

(b) Dishonest, Fraudulent, Criminal or Malicious Act

Damages arising out of any intentional, dishonest, fraudulent, criminal or malicious act, error or omission, committed by any insured, including the willful or reckless violation of any statute.

(c) Failure to Perform a Contract

Damages arising out of failure of performance of contract by any insurer.

(d) Insufficiency of Funds

Damages arising out of an insufficiency of funds to meet any obligations under any plan included in the "employee benefit program".

(e) Inadequacy of Performance of Investment / Advice Given With Respect to Participation

Any claim based upon:

- 1) Failure of any investment to perform;
- 2) Errors in providing information on past performance of investment vehicles; or
- 3) Advice given to any person with respect to that person's decision to participate or not to participate in any plan included in the "employee benefit program".

(f) Workers' Compensation and Similar Laws

Any claim arising out of your failure to comply with the mandatory provisions of any workers' compensation, unemployment compensation insurance, social security or disability benefits law or any similar law.

(g) ERISA

Damages for which any insured is liable because of liability imposed on a fiduciary by the Employee Retirement Income Security Act of 1974, as now or hereafter amended, or by any similar federal, state or local laws.

(h) Available Benefits

Any claim for benefits to the extent that such benefits are available, with reasonable effort and cooperation of the insured, from the applicable funds accrued or other collectible insurance.

(i) Taxes, Fines or Penalties

Taxes, fines or penalties, including those imposed under the Internal Revenue Code or any similar state or local law.

(j) Employment-Related Practices

Any liability arising out of any:

- (1) Refusal to employ;
- (2) Termination of employment;
- (3) Coercion, demotion, evaluation, reassign-

ment, discipline, defamation, harassment, humiliation, discrimination or other employment-related practices, acts or omissions; or

- (4) Consequential liability as a result of (1), (2) or (3) above.

This exclusion applies whether the insured may be held liable as an employer or in any other capacity and to any obligation to share damages with or repay someone else who must pay damages because of the injury.

(3) Supplementary Payments

SECTION I - COVERAGES, SUPPLEMENTARY PAYMENTS - COVERAGES A AND B also apply to this Coverage.

b. Who is an Insured

As respects Employee Benefit Liability Coverage, **SECTION II - WHO IS AN INSURED** is deleted in its entirety and replaced by the following:

- (1) If you are designated in the Declarations as:
- (a) An individual, you and your spouse are insureds, but only with respect to the conduct of a business of which you are the sole owner.
 - (b) A partnership or joint venture, you are an insured. Your members, your partners, and their spouses are also insureds but only with respect to the conduct of your business.
 - (c) A limited liability company, you are an insured. Your members are also insureds, but only with respect to the conduct of your business. Your managers are insureds, but only with respect to their duties as your managers.
 - (d) An organization other than a partnership, joint venture or limited liability company, you are an insured. Your "executive officers" and directors are insureds, but only with respect to their duties as your officers or di-

rectors. Your stockholders are also insureds, but only with respect to their liability as stockholders.

- (e) A trust, you are an insured. Your trustees are also insureds, but only with respect to their duties as trustees.

- (2) Each of the following is also an insured:

(a) Each of your "employees" who is or was authorized to administer your "employee benefit program".

(b) Any persons, organizations or "employees" having proper temporary authorization to administer your "employee benefit program" if you die, but only until your legal representative is appointed.

(c) Your legal representative if you die, but only with respect to duties as such. That representative will have all your rights and duties under this Coverage Part.

- (3) Any organization you newly acquire or form, other than a partnership, joint venture or limited liability company, and over which you maintain ownership or majority interest, will qualify as a Named Insured if no other similar insurance applies to that organization. However, coverage under this provision:

(a) Is afforded only until the 180th day after you acquire or form the organization or the end of the policy period, whichever is earlier; and

(b) Does not apply to any act, error or omission that was committed before you acquired or formed the organization.

c. Limits of Insurance

As respects Employee Benefit Liability Coverage, **SECTION III - LIMITS OF INSURANCE** is deleted in its entirety and replaced by the following:

- (1) The Limits of Insurance shown in Section B. **Limits of Insurance, 1. Employee Benefit Liability Coverage** and the rules

below fix the most we will pay regardless of the number of:

- (a) Insureds;
 - (b) Claims made or "suits" brought;
 - (c) Persons or organizations making claims or bringing "suits";
 - (d) Acts, errors or omissions; or
 - (e) Benefits included in your "employee benefit program".
- (2) The Aggregate Limit shown in Section B. **Limits of Insurance, 1. Employee Benefit Liability Coverage** of this endorsement is the most we will pay for all damages because of acts, errors or omissions negligently committed in the "administration" of your "employee benefit program".
- (3) Subject to the limit described in (2) above, the Each Employee Limit shown in Section B. **Limits of Insurance, 1. Employee Benefit Liability Coverage** of this endorsement is the most we will pay for all damages sustained by any one "employee", including damages sustained by such "employee's" dependents and beneficiaries, as a result of:
- (a) An act, error or omission; or
 - (b) A series of related acts, errors or omissions, regardless of the amount of time that lapses between such acts, errors or omissions,

negligently committed in the "administration" of your "employee benefit program".

However, the amount paid under this endorsement shall not exceed, and will be subject to the limits and restrictions that apply to the payment of benefits in any plan included in the "employee benefit program".

(4) **Deductible Amount**

- (a) Our obligation to pay damages on behalf of the insured applies only to the amount of damages in excess of the deductible amount stated in the Declarations as applicable to Each Employee. The limits of insurance shall not be

reduced by the amount of this deductible.

- (b) The deductible amount stated in the Declarations applies to all damages sustained by any one "employee", including such "employee's" dependents and beneficiaries, because of all acts, errors or omissions to which this insurance applies.
- (c) The terms of this insurance, including those with respect to:
 - 1) Our right and duty to defend the insured against any "suits" seeking those damages; and
 - 2) Your duties, and the duties of any other involved insured, in the event of an act, error or omission, or claim,

apply irrespective of the application of the deductible amount.

- (d) We may pay any part or all of the deductible amount to effect settlement of any claim or "suit" and, upon notification of the action taken, you shall promptly reimburse us for such part of the deductible amount as we have paid.

d. **Additional Conditions**

As respects **Employee Benefit Liability Coverage, SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS** is amended as follows:

- (1) Item 2. **Duties in the Event of Occurrence, Offense, Claim or Suit** is deleted in its entirety and replaced by the following:

2. **Duties in the Event of an Act, Error or Omission, or Claim or Suit**

- a. You must see to it that we are notified as soon as practicable of an act, error or omission which may result in a claim. To the extent possible, notice should include:
 - (1) What the act, error or omission was and when it occurred; and
 - (2) The names and addresses of anyone who may suffer dam-

ages as a result of the act, error or omission.

- b. If a claim is made or "suit" is brought against any insured, you must:

- (1) Immediately record the specifics of the claim or "suit" and the date received; and
- (2) Notify us as soon as practicable.

You must see to it that we receive written notice of the claim or "suit" as soon as practicable.

- c. You and any other involved insured must:

- (1) Immediately send us copies of any demands, notices, summonses or legal papers received in connection with the claim or "suit";
- (2) Authorize us to obtain records and other information;
- (3) Cooperate with us in the investigation or settlement of the claim or defense against the "suit"; and
- (4) Assist us, upon our request, in the enforcement of any right against any person or organization which may be liable to the insured because of an act, error or omission to which this insurance may also apply.

- d. No insured will, except at that insured's own cost, voluntarily make a payment, assume any obligation, or incur any expense without our consent.

- (2) Item 5. **Other Insurance** is deleted in its entirety and replaced by the following:

5. Other Insurance

If other valid and collectible insurance is available to the insured for a loss we cover under this Coverage Part, our obligations are limited as follows:

a. Primary Insurance

This insurance is primary except when c. below applies. If this insurance is primary, our obligations are not affected unless any of the other insurance is also primary. Then, we will share with all that other insurance by the

method described in b. below.

b. Method of Sharing

If all of the other insurance permits contribution by equal shares, we will follow this method also. Under this approach each insurer contributes equal amounts until it has paid its applicable limit of insurance or none of the loss remains, whichever comes first.

If any of the other insurance does not permit contribution by equal shares, we will contribute by limits. Under this method, each insurer's share is based on the ratio of its applicable limit of insurance to the total applicable limits of insurance of all insurers.

c. No Coverage

This insurance shall not cover any loss for which the insured is entitled to recovery under any other insurance in force previous to the effective date of this Coverage Part.

e. Additional Definitions

As respects **Employee Benefit Liability Coverage, SECTION V - DEFINITIONS** is amended as follows:

- (1) The following definitions are added:

1. "Administration" means:

- a. Providing information to "employees", including their dependents and beneficiaries, with respect to eligibility for or scope of "employee benefit programs";
- b. Interpreting the "employee benefit programs";
- c. Handling records in connection with the "employee benefit programs"; or

- d. Effecting, continuing or terminating any "employee's" participation in any benefit included in the "employee benefit program".

However, "administration" does not include:

- a. Handling payroll deductions; or
 - b. The failure to effect or maintain any insurance or adequate limits of coverage of insurance, including but not limited to unemployment insurance, social security benefits, workers' compensation and disability benefits.
2. "Cafeteria plans" means plan authorized by applicable law to allow "employees" to elect to pay for certain benefits with pre-tax dollars.
3. "Employee benefit programs" means a program providing some or all of the following benefits to "employees", whether provided through a "cafeteria plan" or otherwise:
- a. Group life insurance; group accident or health insurance; dental, vision and hearing plans; and flexible spending accounts; provided that no one other than an "employee" may subscribe to such benefits and such benefits are made generally available to those "employees" who satisfy the plan's eligibility requirements;
 - b. Profit sharing plans, employee savings plans, employee stock ownership plans, pension plans and stock subscription plans, provided that no one other than an "employee" may subscribe to such benefits and such benefits are made generally available to all "employees" who are eligible under the plan for such benefits;

- c. Unemployment insurance, social security benefits, workers' compensation and disability benefits; and

- d. Vacation plans, including buy and sell programs; leave of absence programs, including military, maternity, family, and civil leave; tuition assistance plans; transportation and health club subsidies.

(2) The following definitions are deleted in their entirety and replaced by the following:

21. "Suit" means a civil proceeding in which money damages because of an act, error or omission to which this insurance applies are alleged. "Suit" includes:

- a. An arbitration proceeding in which such damages are claimed and to which the insured must submit or does submit with our consent;
- b. Any other alternative dispute resolution proceeding in which such damages are claimed and to which the insured submits with our consent; or
- c. An appeal of a civil proceeding.

8. "Employee" means a person actively employed, formerly employed, on leave of absence or disabled, or retired. "Employee" includes a "leased worker". "Employee" does not include a "temporary worker".

2. Unintentional Failure to Disclose Hazards

SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS, 7. Representations is hereby amended by the addition of the following:

Based on our dependence upon your representations as to existing hazards, if unintentionally you should fail to disclose all such hazards at the inception date of your policy, we will not reject coverage under this Coverage Part based solely on such failure.

3. **Damage to Premises Rented to You**

- a. The last Subparagraph of Paragraph 2. **SECTION I - COVERAGES, COVERAGE A. - BODILY INJURY AND PROPERTY DAMAGE, 2. LIABILITY Exclusions** is hereby deleted and replaced by the following:

Exclusions c. through q. do not apply to damage by fire, explosion, lightning, smoke or soot to premises while rented to you or temporarily occupied by you with permission of the owner.

- b. The insurance provided under **SECTION I - COVERAGES, COVERAGE A. BODILY INJURY AND PROPERTY DAMAGE LIABILITY** applies to "property damage" arising out of water damage to premises that are both rented to and occupied by you.

- (1) As respects Water Damage Legal Liability, as provided in Paragraph 3.b. above:

The exclusions under **SECTION I - COVERAGES, COVERAGE A. BODILY INJURY AND PROPERTY DAMAGE LIABILITY, 2. Exclusions**, other than i. **War** and the **Nuclear Energy Liability Exclusion**, are deleted and the following are added:

This insurance does not apply to:

- (a) "Property damage":
- 1) Assumed in any contract; or
 - 2) Loss caused by or resulting from any of the following:
 - a) Wear and tear;
 - b) Rust, corrosion, fungus, decay, deterioration, hidden or latent defect or any quality in property that causes it to damage or destroy itself;
 - c) Smog;
 - d) Mechanical breakdown including rupture or bursting caused by centrifugal force;

e) Settling, cracking, shrinking or expansion; or

f) Nesting or infestation, or discharge or release of waste products or secretions, by insects, birds, rodents or other animals.

- (b) Loss caused directly or indirectly by any of the following:

1) Earthquake, volcanic eruption, landslide or any other earth movement;

2) Water that backs up or overflows from a sewer, drain or sump;

3) Water under the ground surface pressing on, or flowing or seeping through:

a) Foundations, walls, floors or paved surfaces;

b) Basements, whether paved or not; or

c) Doors, windows or other openings.

- (c) Loss caused by or resulting from water that leaks or flows from plumbing, heating, air conditioning, or fire protection systems caused by or resulting from freezing, unless:

1) You did your best to maintain heat in the building or structure; or

2) You drained the equipment and shut off the water supply if the heat was not maintained.

- (d) Loss to or damage to:

1) Plumbing, heating, air conditioning, fire protection systems, or other equipment or appliances; or

2) The interior of any building or structure, or to personal property in the building or structure

caused by or resulting from rain, snow, sleet or ice, whether driven by wind or not.

c. Limit of Insurance

The Damage to Premises Rented to You Limit as shown in the Declarations is amended as follows:

(2) Paragraph 6. of SECTION III - LIMITS OF INSURANCE is hereby deleted and replaced by the following:

6. Subject to 5. above, the Damage to Premises Rented to You Limit is the most we will pay under **COVERAGE A. BODILY INJURY AND PROPERTY DAMAGE LIABILITY**, for damages because of "property damage" to premises while rented to you or temporarily occupied by you with permission of the owner, arising out of any one "occurrence" to which this insurance applies.

(3) The amount we will pay is limited as described in Section B. **Limits of Insurance, 3. Damage to Premises Rented to You** of this endorsement.

4. Supplementary Payments

Under SECTION I - COVERAGE, SUPPLEMENTARY PAYMENTS - COVERAGES A AND B:

a. Paragraph 2. is replaced by the following:

Up to the limit shown in Section B. **Limits of Insurance, 4.a. Bail Bonds** of this endorsement for cost of bail bonds required because of accidents or traffic law violations arising out of the use of any vehicle to which the Bodily Injury Liability Coverage applies. We do not have to furnish these bonds.

b. Paragraph 4. is replaced by the following:

All reasonable expenses incurred by the insured at our request to assist us in the investigation or defense of the claim or "suit", including actual loss of earnings up to the limit shown in Section B. **Limits of Insurance, 4.b. Loss of Earnings** of this endorsement per day because of time off from work.

5. Medical Payments

The Medical Expense Limit of Any One Person as stated in the Declarations is amended to the limit shown in Section B. **Limits of Insurance, 5. Medical Payments** of this endorsement.

6. Voluntary Property Damage and Care, Custody or Control Liability Coverage

a. Voluntary Property Damage Coverage

We will pay for "property damage" to property of others arising out of operations incidental to the insured's business when:

- (1) Damage is caused by the insured; or
- (2) Damage occurs while in the insured's possession.

With your consent, we will make these payments regardless of fault.

b. Care, Custody or Control Liability Coverage

SECTION I - COVERAGES, COVERAGE A. BODILY INJURY AND PROPERTY DAMAGE LIABILITY, 2. Exclusions, j. Damage to Property, Subparagraphs (3), (4) and (5) do not apply to "property damage" to the property of others described therein.

With respect to the insurance provided by this section of the endorsement, the following additional provisions apply:

a. The Limits of Insurance shown in the Declarations are replaced by the limits designated in Section B. **Limits of Insurance, 6. Voluntary Property Damage and Care, Custody or Control Liability Coverage** of this endorsement with respect to coverage provided by this endorsement. These limits are inclusive of and not in addition to the limits being replaced. The Limits of Insurance shown in Section B. **Limits of Insurance, 6. Voluntary Property Damage and Care, Custody or Control Liability Coverage** of this endorsement fix the most we will pay in any one "occurrence" regardless of the number of:

- (1) Insureds;
- (2) Claims made or "suits" brought; or
- (3) Persons or organizations making claims or bringing "suits".

b. Deductible Clause

- (1) Our obligation to pay damages on your behalf applies only to the amount of damages for each "occurrence" which are in excess of the deductible amount stated in Section B. **Limits of Insurance, 6. Voluntary Property Damage and Care, Custody or Control Liability Coverage** of this endorsement. The limits of insurance will not be reduced by the application of such deductible amount.
- (2) **Condition 2. Duties in the Event of Occurrence, Offense, Claim or Suit**, applies to each claim or "suit" irrespective of the amount.
- (3) We may pay any part or all of the deductible amount to effect settlement of any claim or "suit" and, upon notification of the action taken, you shall promptly reimburse us for such part of the deductible amount as has been paid by us.

7. 180 Day Coverage for Newly Formed or Acquired Organizations

SECTION II - WHO IS AN INSURED is amended as follows:

Subparagraph a. of Paragraph 4. is hereby deleted and replaced by the following:

- a. Insurance under this provision is afforded only until the 180th day after you acquire or form the organization or the end of the policy period, whichever is earlier;

8. Waiver of Subrogation

SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS, 9. Transfer of Rights of Recovery Against Others to Us is hereby amended by the addition of the following:

We waive any right of recovery we may have because of payments we make for injury or damage arising out of your ongoing operations or "your work" done under a written contract requiring such waiver with that person or organization and included in the "products-completed operations hazard". However, our rights may only be waived prior to the "occurrence" giving rise to the injury or damage for which we make payment under this Coverage Part. The insured must do nothing after a loss to impair our rights. At our request, the insured will bring "suit" or transfer those rights to us and help us enforce those rights.

9. Automatic Additional Insured - Specified Relationships

a. The following is hereby added to **SECTION II - WHO IS AN INSURED**:

- (1) Any person or organization described in Paragraph 9.a.(2) below (hereinafter referred to as additional insured) whom you are required to add as an additional insured under this Coverage Part by reason of:

- (a) A written contract or agreement; or
- (b) An oral agreement or contract where a certificate of insurance showing that person or organization as an additional insured has been issued,

is an insured, provided:

- (a) The written or oral contract or agreement is:

- 1) Currently in effect or becomes effective during the policy period; and
- 2) Executed prior to an "occurrence" or offense to which this insurance would apply; and

- (b) They are not specifically named as an additional insured under any other provision of, or endorsement added to, this Coverage Part.

- (2) Only the following persons or organizations are additional insureds under this endorsement, and insurance coverage provided to such additional insureds is limited as provided herein:

- (a) The manager or lessor of a premises leased to you with whom you have agreed per Paragraph 9.a.(1) above to provide insurance, but only with respect to liability arising out of the ownership, maintenance or use of that part of a premises leased to you, subject to the following additional exclusions:

This insurance does not apply to:

- 1) Any "occurrence" which takes place after

you cease to be a tenant in that premises.

- 2) Structural alterations, new construction or demolition operations performed by or on behalf of such additional insured.
- (b) Any person or organization from which you lease equipment with whom you have agreed per Paragraph 9.a.(1) above to provide insurance. Such person(s) or organization(s) are insureds solely with respect to their liability arising out of the maintenance, operation or use by you of equipment leased to you by such person(s) or organization(s). However, this insurance does not apply to any "occurrence" which takes place after the equipment lease expires.
- (c) Any person or organization (referred to below as vendor) with whom you have agreed per Paragraph 9.a.(1) above to provide insurance, but only with respect to "bodily injury" or "property damage" arising out of "your products" which are distributed or sold in the regular course of the vendor's business, subject to the following additional exclusions:
- 1) The insurance afforded the vendor does not apply to:
 - a) "Bodily injury" or "property damage" for which the vendor is obligated to pay damages by reason of the assumption of liability in a contract or agreement. This exclusion does not apply to liability for damages that the vendor would have in the absence of the contract or agreement;
 - b) Any express warranty unauthorized by you;
 - 2) This insurance does not apply to any insured person or organization:
 - a) From whom you have acquired such products, or any ingredient, part or container, entering into, ac-
- c) Any physical or chemical change in the product made intentionally by the vendor;
 - d) Repackaging, unless unpacked solely for the purpose of inspection, demonstration, testing, or the substitution of parts under instructions from the manufacturer, and then repackaged in the original container;
 - e) Any failure to make such inspections, adjustments, tests or servicing as the vendor has agreed to make or normally undertakes to make in the usual course of business, in connection with the distribution or sale of the products;
 - f) Demonstration, installation, servicing or repair operations, except such operations performed at the vendor's premises in connection with the sale of the product;
 - g) Products which, after distribution or sale by you, have been labeled or relabeled or used as a container, part or ingredient of any other thing or substance by or for the vendor.
- 2) This insurance does not apply to any insured person or organization:
 - a) From whom you have acquired such products, or any ingredient, part or container, entering into, ac-

companying or containing such products; or

- b) When liability included within the "products-completed operations hazard" has been excluded under this Coverage Part with respect to such products.
- (d) Any state or political subdivision with which you have agreed per Paragraph 9.a.(1) above to provide insurance, subject to the following additional provision:

This insurance applies only with respect to the following hazards for which the state or political subdivision has issued a permit in connection with premises you own, rent or control and to which this insurance applies:

- 1) The existence, maintenance, repair, construction, erection, or removal of advertising signs, awnings, canopies, cellar entrances, coal holes, driveways, manholes, marquees, hoist away openings, sidewalk vaults, street banners, or decorations and similar exposures; or
 - 2) The construction, erection, or removal of elevators; or
 - 3) The ownership, maintenance, or use of any elevators covered by this insurance.
- (e) Any state or political subdivision with which you have agreed per Paragraph 9.a.(1) above to provide insurance, subject to the following provisions:
- 1) This insurance applies only with respect to operations performed by you or on your behalf for which the state or political subdivision has issued a permit.

2) This insurance does not apply to "bodily injury", "property damage" or "personal and advertising injury" arising out of operations performed for the state or political subdivision.

- (f) Any person or organization with which you have agreed per Paragraph 9.a.(1) above to provide insurance, but only with respect to liability caused, in whole or in part, by your ongoing operations performed for that additional insured by you or on your behalf. A person or organization's status as an insured under this provision of this endorsement ends when your operations for that insured are completed.
- (3) Any insurance provided to an additional insured designated under Paragraph 9.a.(2):
- (a) Subparagraphs (e) and (f) does not apply to "bodily injury" or "property damage" included within the "products-completed operations hazard";
 - (b) Subparagraphs (a), (b), (d) and (e) does not apply to "bodily injury", "property damage" or "personal and advertising injury" arising out of the sole negligence or willful misconduct of the additional insured or their agents, "employees" or any other representative of the additional insured; or
 - (c) Subparagraph (f) does not apply to "bodily injury", "property damage" or "personal and advertising injury" arising out of:
 - 1) The rendering of or failure to render any professional services by you or on your behalf, but only with respect to either or both of the following operations:
 - a) Providing engineering, architectural or surveying services to others; and

- b) Providing or hiring independent professionals to provide engineering, architectural or surveying services in connection with the construction work you perform.

Subject to the final paragraph of this exclusion below, professional services include:

- a) Preparing, approving or failing to prepare or approve, maps, shop drawings, opinions, reports, surveys, field orders, change orders or drawings and specifications; and
- b) Supervisory or inspection activities performed as a part of any architectural or engineering activities.

Professional services do not include services within construction means, methods, techniques, sequences and procedures employed by you in connection with construction work you perform.

- 2) "Your work" for which a consolidated (wrap-up) insurance program has been provided by the prime contractor-project manager or owner of the construction project in which you are involved.
- b. Only with regard to insurance provided to an additional insured designated under Paragraph 9.a.(2) Subparagraph (f) above, **SECTION III - LIMITS OF INSURANCE** is amended to include:

The limits applicable to the additional insured are those specified in the written contract or agreement or in the Declarations of this Coverage Part, whichever are less. If no limits are specified in the written contract or agreement, or if there is no written contract or agreement, the limits ap-

plicable to the additional insured are those specified in the Declarations of this Coverage Part. The limits of insurance are inclusive of and not in addition to the limits of insurance shown in the Declarations.

- c. **SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS, 5. Other Insurance** is hereby amended as follows:

Any insurance provided by this endorsement shall be primary to other insurance available to the additional insured except:

- (1) As otherwise provided in **SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS, 5. Other Insurance, b. Excess Insurance**; or
- (2) For any other valid and collectible insurance available to the additional insured as an additional insured by attachment of an endorsement to another insurance policy that is written on an excess basis. In such case, the coverage provided under this endorsement shall also be excess.

10. Broadened Contractual Liability - Work Within 50' of Railroad Property

It is hereby agreed that Paragraph f.(1) of Definition 12. "Insured contract" (**SECTION V - DEFINITIONS**) is deleted.

11. Property Damage to Borrowed Equipment

- a. The following is hereby added to Exclusion j. **Damage to Property of Paragraph 2., Exclusions of SECTION I - COVERAGES, COVERAGE A. BODILY INJURY AND PROPERTY DAMAGE LIABILITY:**

Paragraphs (3) and (4) of this exclusion do not apply to tools or equipment loaned to you, provided they are not being used to perform operations at the time of loss.

- b. With respect to the insurance provided by this section of the endorsement, the following additional provisions apply:

- (1) The Limits of insurance shown in the Declarations are replaced by the limits designated in **Section B. Limits of Insurance, 11.** of this endorsement with respect to coverage provided by this endorsement. These limits are inclusive of and not in addition to the limits being replaced. The

Limits of Insurance shown in Section B. **Limits of Insurance**, 11. of this endorsement fix the most we will pay in any one "occurrence" regardless of the number of:

- (a) Insureds;
- (b) Claims made or "suits" brought; or
- (c) Persons or organizations making claims or bring "suits".

(2) Deductible Clause

- (a) Our obligation to pay damages on your behalf applies only to the amount of damages for each "occurrence" which are in excess of the Deductible amount stated in Section B. **Limits of Insurance**, 11. of this endorsement. The limits of insurance will not be reduced by the application of such Deductible amount.
- (b) Condition 2. **Duties in the Event of Occurrence, Offense, Claim or Suit**, applies to each claim or "suit" irrespective of the amount.
- (c) We may pay any part or all of the deductible amount to effect settlement of any claim or "suit" and, upon notification of the action taken, you shall promptly reimburse us for such part of the deductible amount as has been paid by us.

12. Employees as Insureds - Specified Health Care Services

It is hereby agreed that Paragraph 2.a.(1)(d) of **SECTION II - WHO IS AN INSURED**, does not apply to your "employees" who provide professional health care services on your behalf as duly licensed:

- a. Nurses;
- b. Emergency Medical Technicians; or
- c. Paramedics,

in the jurisdiction where an "occurrence" or offense to which this insurance applies takes place.

13. Broadened Notice of Occurrence

Paragraph a. of Condition 2. **Duties in the Event of Occurrence, Offense, Claim or Suit (SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS)** is hereby deleted and replaced by the following:

- a. You must see to it that we are notified as soon as practicable of an "occurrence" or an offense which may result in a claim. To the extent possible, notice should include:
 - (1) How, when and where the "occurrence" or offense took place;
 - (2) The names and addresses of any injured persons and witnesses; and
 - (3) The nature and location of any injury or damage arising out of the "occurrence" or offense.

This requirement applies only when the "occurrence" or offense is known to an "authorized representative".

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

**WAIVER OF TRANSFER OF RIGHTS OF RECOVERY
AGAINST OTHERS TO US**

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART.

SCHEDULE

Name of Person or Organization:

**ANY PERSON OR ORGANIZATION FOR WHOM YOU ARE REQUIRED TO NAME
UNDER THIS ENDORSEMENT IN A WRITTEN CONTRACT OR AGREEMENT.**

(If no entry appears above, information required to complete this endorsement will be shown in the Declarations as applicable to this endorsement.)

The TRANSFER OF RIGHTS OF RECOVERY AGAINST OTHERS TO US Condition (Section IV -- COMMERCIAL GENERAL LIABILITY CONDITIONS) is amended by the addition of the following:

We waive any right of recovery we may have against the person or organization shown in the Schedule above because of payments we make for injury or damage arising out of your ongoing operations or "your work" done under a contract with that person or organization and included in the "products-completed operations hazard". This waiver applies only to the person or organization shown in the Schedule above.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

**PRIMARY / NONCONTRIBUTORY AMENDMENT OF
CONDITIONS FOR DESIGNATED ADDITIONAL
INSUREDS**

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name of Person or Organization (Additional Insured):

Any entity for which the insured is required in a written contract to cover on a primary and noncontributory basis

With respect to insurance provided the additional insured shown in the Schedule, **SECTION IV - COMMERCIAL GENERAL LIABILITY CONDITIONS, 5. Other Insurance** is deleted in its entirety and replaced by the following:

5. Other Insurance

If other valid and collectible insurance is available to the additional insured for a loss we cover under Coverages A or B of this Coverage Part, our obligations are limited as follows:

a. Primary Insurance

Where required by a written contract, this insurance is primary and noncontributory as respects any other insurance policy issued to the additional insured. Otherwise, b, below applies.

b. Excess Insurance

This insurance is excess over any of the other insurance available to the additional insured whether primary, excess, contingent or on any other basis.

When this insurance is excess, we will have no duty under Coverages A or B to defend any claim or "suit" that any other insurer has a duty to defend. If no other insurer defends, we will undertake to do so, but we will be entitled to the insured's rights against all those other insurers.

When this insurance is excess over any other insurance, we will pay only our share of the amount of the loss, if any, that exceeds the sum of:

- (1) The total amount that all such other insurance would pay for the loss in the absence of this insurance; and
- (2) The total of all deductible and self-insured amounts under all that other insurance.

We will share the remaining loss, if any, with any other insurance that was not bought specifically to apply in excess of the Limits of Insurance shown in the Declarations of this Coverage Part.

c. Method of Sharing

If all of the other insurance permits contribution by equal shares, we will follow this method also. Under this approach each insurer contributes equal amounts until it has paid its applicable limit of insurance or none of the loss remains, whichever comes first.

If any of the other insurance does not permit contribution by equal shares, we will contribute by limits. Under this method, each insurer's share is based on the ratio of its applicable limit of insurance to the total applicable limits of insurance of all insurers.

Hunter Contracting Co
CPP1061979

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CITY OF GLENDALE, ARIZONA
PUBLIC WORKS/ENGINEERING DEPARTMENT

CONTRACTOR'S AFFIDAVIT
REGARDING
SETTLEMENT OF CLAIMS

**PROJECT 111213 - GLENDALE WEST AREA WATER RECLAMATION FACILITY
MISCELLANEOUS IMPROVEMENTS PROJECT - UV VENTILATION IMPROVEMENTS**

To the City of Glendale, Arizona

Gentlemen:

This is to certify that all lawful claims for materials, rental of equipment and labor used in connection with the construction of the above project, whether by subcontractor or claimant in person, have been duly discharged.

The undersigned, for the consideration of \$ _____, as set out in the final pay estimate, as full and complete payment under the terms of the contract, hereby waives and relinquishes any and all further claims or right of lien under, in connection with, or as a result of the above described project. The undersigned further agrees to indemnify and save harmless the City of Glendale against any and all liens, claims of liens, suits, actions, damages, charges, costs, litigation expenses, attorneys' fees and any other and expenses whatsoever, which said City may suffer arising out of the failure of the undersigned to pay for all labor performance and materials furnished for the performance of said installation.

Signed and dated at _____, this ____ day of _____, 20__.

Contractor

By _____

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

The foregoing instrument was subscribed and sworn to before me this ____ day of _____, 20__

Notary Public

My Commission Expires: _____

SUPPLEMENTAL GENERAL CONDITIONS

1. GENERAL: By Ordinance No. 1110 New Series, the City of Glendale adopted the "Uniform Standard Specifications for Public Works Construction," which are sponsored and distributed by the Maricopa Association of Governments. Copies of these documents, with revisions, are on file in the office of the City Engineer of the City of Glendale, and are hereby made a part of these Contract Documents.

Whenever in the Uniform Standard Specifications, the words "The Contracting Agency" are used, the meaning shall be the City of Glendale.

In all cases where ASTM, AASHTO, AWWA, USAG, Federal, City of Phoenix, MAG Specifications, Maricopa County, Arizona State Highway, City of Glendale or other standard specifications are referred to, unless otherwise stated, revisions, supplements or addenda issued on or before the date of this contract, shall prevail. In the event of any conflict between these project specifications and the requirements of the plans, detail drawings, MAG Standard Details and Specifications, these project specifications shall prevail.

2. DEFINITIONS: The following terms, as used in or pertaining to the Contract Documents, are defined as follows:

CITY: The word "City" refers to the City of Glendale, Arizona. The official representative of said City in these proceedings shall be the City Engineer.

CONTRACTOR: The word "Contractor" means the person, firm, or corporation with whom the Contract is made by the City.

MATERIALS: The term "Materials" includes, in addition to materials incorporated in the project, equipment and other material used and/or consumed in the performance of the work.

SUBCONTRACTOR: The word "Subcontractor" includes those having a direct contract with the Contractor and those who furnish material worked to a special design according to the plans and/or specifications for this work, but does not include those who merely furnish materials not so worked.

ENGINEER: The word "Engineer" means a person, firm or corporation duly authorized by the City, to act for the City in staking out the work, inspecting materials and construction, and interpreting plans and specifications.

CONTRACT DOCUMENTS: The words "Contract Documents" mean the Notice to Contractors, Information for Bidders, "Uniform Standard Specifications for Public Works Construction," MAG General Conditions, Supplemental General Conditions, Special Provisions, Supplemental Specifications, Proposal, Contract, Payment Bond, Performance Bond, Certificates of Insurance, Plans and Addenda thereto.

3. PROPOSAL QUANTITIES: It is expressly understood and agreed by the parties hereto that the quantities of the various classes of work to be done and material to be furnished under this Contract, which have been estimated as stated in the Proposal, are only approximate and are to be used SOLELY for the purpose of comparing, on a consistent basis, the proposals offered for the work under this Contract; and the Contractor further agrees that the City will not be held responsible if any of the quantities shall be found incorrect; and the Contractor will not make any claim for damages or for loss of profits because of a difference between the quantities of the various classes of work as estimated and the work actually done. If any error, omission, or mis-statement is found to occur in the estimated quantities, the same shall not invalidate this Contract or release the Contractor from the execution and completion of the whole or any part of the work in accordance with the specifications and the plans herein mentioned, or for the prices herein agreed upon and fixed therefore, or excuse him from any of the obligations or liabilities hereunder, or entitle him to any damages or compensation except as may be provided for in this Contract.

4. WITHDRAWAL OF PROPOSALS: No proposal shall be withdrawn following the opening and reading of the bids for a period of 50 days from the date of opening without the consent of the contracting agency through the body or agent duly authorized to accept or reject the proposal.

5. LOSSES AND DAMAGES: All loss or damage arising out of the nature of the work to be done or from the action of the elements, or from any unforeseen circumstances in the prosecution of the same, or from any unusual obstructions or difficulties which may be encountered in and/or during the prosecution of the work, or from any casualty whatsoever of every description, shall be sustained and borne by the Contractor at his own cost and expense except as otherwise provided by the contract documents or the laws of the State of Arizona.

6. DUST PREVENTION: The Contractor shall take whatever steps, procedures or means required to prevent abnormal dust conditions due to his construction operations in connection with this contract. The dust control measures shall be maintained at all times during construction of the project, to the satisfaction of the Engineer, in accordance with the requirements of the "Maricopa County Health Department Air Pollution Control Regulations" which have been adopted pursuant to A.R.S. § 36-779.

The Contractor shall be required to obtain the necessary permit from the Maricopa County Air Pollution Control Bureau, 1001 N. Central Ave., Phoenix, Arizona 85004 - telephone (602) 506-6727.

7. EXCESS MATERIAL: Excess material shall be removed from the work site and wasted at a location approved by the Engineer. Broken concrete and asphalt may be delivered to the Glendale Sanitary Landfill located at 115th Avenue and Glendale Avenue. The prevailing regulations and fee schedule will not be waived for work under this project. All materials, to be disposed of at the landfill, shall be weighed and disposed of at the prevailing rate.

8. STOCKPILE OF MATERIALS: The Contractor may place or stockpile materials in the public right-of-way, if approved by the Engineer, provided they do not prevent access to adjacent properties or prevent compliance with traffic regulations.

Traffic shall not be required to travel over stockpiled materials, and proper dust control shall be maintained.

9. REFUSE COLLECTION ACCESS: At any time the project construction shall require the closure or disruption of traffic in any roadway, alley, or refuse collection easement such that normal refuse collection will be interfered with, the Contractor shall, at least 48 hours prior to causing such closure or disruption, make arrangements with the Field Operations Department in order that refuse collection service can be maintained.

10. CLEAN-UP: After all work under this contract is completed, the Contractor shall remove all loose concrete, lumber, wire, reinforcing, debris, and other materials not incorporated in the work, from the site of the work. Clean-up shall include the removal of all excess pointing mortar materials within pipes and removal of over-size rocks and boulders left after finish grading. The contractor shall provide for the legal disposal of all waste products, debris, etc., and shall make necessary arrangements for such disposal.

11. SHOP DRAWINGS: The Contractor shall provide shop drawings as may be necessary for the prosecution of the work as required by the contract documents. The Engineer shall promptly review all shop drawings. The Engineer's approval of any shop drawing shall not release the Contractor from responsibility for deviations from the contract documents. The approval of any shop drawing which substantially deviates from the requirements of the contract documents shall be evidenced by a change order.

When submitted for the Engineer's review, shop drawings shall bear the contractor's certification that he has reviewed, checked, and approved the shop drawings and that they are in conformance with the requirements of the contract documents.

Portions of the work requiring a shop drawing or sample submission shall not begin until the shop drawing or sample 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.

12. PROTECTION OF FINISHED OR PARTIALLY FINISHED WORK: The Contractor shall properly guard and protect all finished or partially finished work, and shall be responsible for the same until the entire contract is completed and accepted, in writing, by the City. The Contractor shall turn over the entire work in full accordance with the specifications before final settlement shall be made.

13. STATUS OF EMPLOYEES: Contractor shall be responsible for assuring the legal working status of its employees and its subcontractor's employees.

14. LAWS AND REGULATIONS: This Contract shall be governed by and constructed in accordance with the laws of the State of Arizona. The Contractor shall keep himself fully informed of all existing and future City and County Ordinances and Regulations and State and Federal Laws and Occupational Safety and Health Standards (OSHA) in any manner affecting the work herein specified. He shall at all times observe and comply with said Ordinances, Regulations, or Laws.

15. PERMITS: The City has obtained certain required permits which are included in the project specifications, but it will be the duty of the Contractor to determine that all the necessary permits have been obtained. The Contractor shall, at his own expense, obtain all required permits which have not been furnished by the City. A no-fee permit will be issued for work in the City of Glendale right-of-way and easement. (Also see Paragraph 7. Dust Prevention.)

16. ELECTRIC POWER AND WATER: The Contractor shall make his own arrangements for electric power and water. Subject to the convenience of the City, he may be permitted to connect to existing facilities where available, but he shall meter and bear the cost of such power or water. Fire hydrant meters may be obtained from the City of Glendale. Installation and removal of meters should be scheduled at least forty-eight (48) hours in advance through the Public Works/Utilities Division at 930-2700. A \$1,555.50 deposit is required for each meter. The cost of the water is at the prevailing rate.

17. SURVEY CONTROL POINTS AND MONUMENTS: Existing survey monuments indicated on the plans or found during construction shall be protected by the Contractor, and in the event removal is necessary, removal and replacement shall be performed by permission of the Engineer, under direct supervision of the Engineer or his authorized representative. Survey monuments shall be constructed to conform to the requirements of MAG Specifications, Section 405, and Standard Details.

18. EXISTING UTILITIES: The Contractor is hereby advised that the location of all utilities, as shown on the plans, may not be complete nor exact and the Contractor shall satisfy himself as to the exact location of the utilities by contacting Blue Stake or the utility companies before proceeding with the work. After the underground utilities are located by Blue Stake or the utility company, the contractor shall excavate in a careful and prudent manner to prevent unwillful damage to the underground utilities.

In the event the Contractor or its Subcontractor damages an existing, properly identified underground City of Glendale water or sewer line, the Contractor shall be responsible for the repairs at its expense.

The exact location of all existing underground service utilities, whether or not indicated on the plans, shall be determined by the Contractor at no expense to the City, and he shall conduct his work so as to prevent interruption of service or damage to them.

The Contractor shall protect existing utility services and be responsible for their replacement if damaged by him, or to make necessary adjustment in their location, if required, in order to complete the work for his Contract.

Utility companies and other interested parties have been provided with construction plans and the construction schedule for this project. The Contractor shall comply with MAG Specifications 105.6 to cooperate with the utility companies.

19. MAINTENANCE OF IRRIGATION FACILITIES: Where irrigation facilities interfere with construction, the Contractor shall remove and replace the affected irrigation facilities to its original condition. Final acceptance of replaced facilities will depend upon final approval of the Engineer.

20. OVERHEAD UTILITY LINES AND POLES: Contractor is advised that when work around overhead lines and poles is required on a project the Contractor is required to coordinate with Utility Companies who own and operate overhead lines and poles. The coordination may include, but not be limited to the following activities: pole bracing, de-energizing of lines, and temporary relocations. Contractor is responsible to contact the applicable Utility Company representative and discuss his proposed construction methods; in order to determine what actions the Utility Company must take and the costs related to those actions. The Contractor shall include these costs in the applicable bid items for this project.

The primary and the backup representatives for this review and cost determinations are as follows:

Arizona Public Service:	Mr. Bobby Garza	602-371-7989
Qwest:	Mr. Ron Floyd	602-630-1932
Salt River Project:	Mr. Tim Rinn	602-236-8694
Salt River Project:	Ms. Mariann Ward	602-236-6389
Cox Communications:	Mr. Ron Pint	623-328-3529
Cox Communications:	Ms. Linda Facio	623-328-3500

21. SOUTHWEST GAS FACILITIES EXPOSED DURING CONSTRUCTION: The Contractor, upon exposing a gas line during construction, shall call SOUTHWEST GAS at 602-271-4277. The Southwest Gas patrolman will respond, usually within an hour, to inspect the line. Minor cuts or abrasions to the pipe coating will be rewrapped and tracer wire will be reconnected at no cost to the City.

22. UNDERGROUND UTILITIES' BEDDING: All water, sewer, storm drain, irrigation and other conduits installed within the City of Glendale shall be bedded from bottom of excavation to one foot above the pipe with granular bedding material meeting the requirements of Section 601.4.6 of MAG Uniform Standard Specifications. The initial bedding under the pipe shall follow City of Glendale Detail G-690.

23. SEWER SERVICE LINES: The Contractor shall be responsible for locating, and protecting from damage during construction, all sewer service lines within the project which are not owned by the City. Contractor will be permitted to review the "as-builts" to assist Contractor in locating the non-City owned sewer service lines. These "as-builts" were prepared, and supplied to the City, by private developers or contractors who installed the non-City owned sewer service lines. Therefore, the City does not guarantee or warranty the accuracy of such "as-builts" and the contractor, as a condition for being allowed to review such "as-builts", hereby agrees to hold the City harmless for any and all damages or other expenses contractor may incur as a result of any inaccuracies or incorrect information in these "as-builts".

24. RIGHTS-OF-WAY: The City will provide rights-of-way and easements for all work specified in this Contract, and the Contractor shall not enter or occupy with man, tools, equipment or materials any private ground outside the property of the City of Glendale, Maricopa County, Arizona, without the consent of the property owner.

25. SUBCONTRACTS: Subcontracts shall be in accordance with, and the Contractor shall be bound by, the following provisions:

All subcontracts shall be subject to the approval of the City.

All subcontracts shall be in writing and shall provide that all work to be performed

thereunder shall be performed in accordance with the terms of the Contract.

Certified copies of any and all subcontracts shall be furnished to the City Engineering Department; however, prices may be omitted.

Subcontracts shall conform to the regulations governing employment of labor.

The subcontracting of any part of the work will in no way relieve the Contractor of his responsibility under the Contract.

26. **PRE-CONSTRUCTION CONFERENCE:** After completion of the Contract Documents, to include bonds, insurance and signatures, and prior to the commencement of any work on the project, the Engineer will schedule a Pre-Construction Conference. This will be held at the City of Glendale, 5850 West Glendale Avenue, Glendale, Arizona.

The purpose of this Conference is to establish a working relationship between the Contractor, Utility Companies, and the Engineer. The agenda will include critical elements of the construction schedule, procedures for handling shop drawings and other submittals, cost breakdown of major lump sum items, payment application and processing, coordination with the involved utility companies, emergency telephone numbers for all representatives involved in the course of construction, and establishment of the Notice to Proceed date.

Minimum attendance by the Contractor shall be a responsible official of the company/corporation, who is authorized to execute and sign documents on behalf of the company/corporation.

27. **OVERTIME:**

Regular Work Hours: The work required to be performed by the Plans and Specifications for the Project shall be performed only during regular working hours, unless the City has authorized overtime work in accordance with the procedures set forth below. Regular working hours shall be defined as one 8-1/2 hour shift per day, Monday through Friday, or, upon prior approval of the City, one 10-1/2 hour shift per day on a compressed four day work week during Monday through Friday. Regular working hours shall not include Saturdays, Sundays or City recognized legal holidays.

Authorization and Costs: If the Contractor desires to schedule work for times other than regular work hours (overtime), the Contractor shall make a written request to the City at least two business days prior to the scheduled overtime. The City reserves the right to deny the request to work overtime based on the best interest and needs of the City. If an overtime request is denied, the City may, at its sole discretion, extend the contract time at no additional costs to the City.

In the event the Contractor does perform work overtime, with or without the prior approval of the City, the Contractor shall be responsible to the City for all additional costs that may be incurred by the City as a result of the Contractor's overtime work, including costs for engineering, inspections, testing, surveying and construction administration, all in accordance with MAG Section 108.5. However, the Contractor shall not be responsible for City's costs incurred as a result of overtime work requested by the City or overtime work resulting from an emergency which is not the responsibility of the Contractor or its employees, subcontractors or suppliers. The City's cost will be billed directly to the Contractor or may, at the City's option, be deducted from monies due the Contractor.

28. **CONTRACTOR'S CONSTRUCTION SCHEDULE:** Concurrently, with the execution of the contract and prior to the pre construction conference, the Contractor shall submit a preliminary schedule for the Engineer's review and acceptance. The schedule shall be in sufficient detail to allow the Engineer to determine if the proposed schedule will conform to an acceptable program of construction operations, as determined by the contracting agency. Within ten calendar days after the preliminary schedule, described above, has been accepted by the Engineer, the Contractor shall submit a progress schedule, utilizing the critical path method scheduling technique, showing the order in which he proposes to carry out the work, the dates on which he will start each phase of the work, and the contemplated date for completion of each phase. The Contractor shall not be permitted to

commence construction until the schedule complying with this paragraph has been submitted to the City. The Contractor will not be granted any extension to the contract time or compensation for any damages as a result of the City's refusal to allow Contractor to commence construction until the critical path method progress schedule has been submitted and accepted by the Engineer.

The critical path method (CPM) scheduling technique requires a breakdown of the entire work into individual tasks and an analysis of the number of days required to perform each task. The schedule submitted to the City should highlight and identify the critical path for the project. After the work is in progress, the Contractor shall submit supplementary progress schedules, using the critical path method technique, of the progress to date and projection for completion. The supplementary progress schedules shall be submitted with each pay request in accordance with the paragraph, "Payments to Contractors," of these Supplemental General Conditions. The progress schedules shall be subject to the acceptance of the Engineer. In the event the Contractor fails to submit a supplementary progress schedule acceptable to the Engineer, the City may withhold further progress payments to the Contractor until the Contractor submits an acceptable supplementary progress schedule, which is accepted by the Engineer, to the City. Schedule changes requiring an increase in the City's engineering personnel on the project shall not be put into effect until the Engineer has approved such increase and made arrangements for the required additional personnel.

29. CHARACTER OF WORKMEN: None but skilled foremen and workmen shall be employed on work requiring special qualifications. When required by the Engineer, the Contractor shall discharge any person who is, in the opinion of the Engineer, disorderly, dangerous, insubordinate, incompetent, or otherwise objectionable. The Contractor shall keep the City harmless from damages or claims for compensation that may occur in the enforcement of this section of the specifications.

30. HINDRANCES AND DELAYS: Except as otherwise provided herein, no charge shall be made by the Contractor for hindrances or delays from any cause during the progress of the work embraced in this Contract; but such delays, if due to no fault or neglect of the Contractor, shall entitle the Contractor to an extension of time allowed for completing the work, sufficient to compensate for the delay, the amount of the delay to be determined by the Engineer, provided the Contractor shall give said Engineer immediate notice in writing of the cause of such delay.

30.1 Delay: In the event of a delay for which the City is solely responsible, which is unreasonable under the circumstances and which was not within the contemplation of City and Contractor at the time this Contract is executed, City and Contractor shall negotiate, in good faith, a payment by the City to Contractor for the expenses incurred by Contractor as a result of such delay, in accordance with the City of Glendale Engineering Department's POLICY STATEMENT FOR CALCULATING DELAYS AND DAMAGES. This provision shall not be construed to void any provision in the contract which requires notice of delay or provides for liquidated damages. However, if the delay is the result of any act or neglect of a third party, including the architect, engineer or other contractor employed by the City, or by labor disputes, fire, unusual delay in transportation, adverse weather conditions not reasonably foreseeable, unavoidable casualties, or any causes beyond the Contractor's control, the Contractor shall not be entitled to any payments or compensation for expenses incurred as a result of such delay, but the Contract Time shall be extended by Change Order for such reasonable time as the Engineer may determine. No extension or compensation will be granted for any delay which is the result, wholly or partially, of any act or neglect of Contractor or any Subcontractor hired by Contractor.

31. LIQUIDATED DAMAGES:

31.1 Should the contractor fail to substantially complete the work under this contract within the time for completion stated in the paragraph "Time of Completion," in the Information for Bidders, then the contractor shall pay the City of Glendale, Arizona, liquidated damages, pursuant to the provisions of Section 108.9, Standard Specifications for Public Works Construction, Maricopa Association of Governments, until the work is substantially complete.

31.2 Should the contractor fail to fully and finally complete the work under this contract within the time for completion set forth in the paragraph "Time of Completion," in the Information for Bidders,

even though the contractor has achieved substantial completion of the work within such time, then the contractor shall pay the City of Glendale, liquidated damages (pursuant to the provisions of Section 108.9, Standard Specifications for Public Works Construction, Maricopa Association of Governments), in an amount equal to 100% of the applicable liquidated damage rate set forth in MAG Section 108.9 for each and every calendar day of delay until the work is fully and finally complete and accepted.

31.3 The date of substantial completion shall be the date when the work is sufficiently complete, in accordance with the contract documents, so the owner can fully occupy and utilize the work or designated portion thereof for the use for which it is intended, with all the project's parts and systems operable as required by the contract documents and all the work is complete, accessible, operable, and usable by the owner for its intended purpose(s), and all parts, systems and sitework are 100% complete and cleaned for the owner's use. Only incidental corrective work and final cleaning (if required), beyond cleaning needed for the owner's full use, may remain for final completion.

31.4 Full and final completion shall be that date when all work under the project, including incidental corrective work under punch list and final cleaning, has been completed and the entire project is accepted by the owner.

32. PAYMENTS TO CONTRACTOR: The measurements of quantities and the payments to the Contractor shall be in accordance with MAG Uniform Standard Specifications for Public Works Construction, Part 100 - General Conditions, Section 109 - Measurements and Payments.

Payments will be made on the basis of itemized, monthly statements prepared by the City and signed by the Contractor. The Contractor shall submit an itemized, duly certified and approved estimate for work completed through the last day of the preceding month in accordance with MAG Specifications, as amended by these Supplemental General Conditions. Upon approval of the pay estimate, the City will mail the check directly to the Contractor.

The pay estimate shall be accompanied by an updated progress schedule as required by these Supplemental General Conditions and a cash flow report when required by the Special Provisions. Approval of progress payments shall be conditional upon submittal of progress schedules and cash flow reports, when required, which are acceptable to the Engineer.

Upon 100% completion and acceptance of the project, and with the request for final payment, the Contractor shall complete and submit the "Contractor's Affidavit Regarding Settlement of Claims" form which is included in these specifications. Before final payment and release of retention, Contractor must arrange for its Surety to provide the City with a fully executed AIA Consent of Surety form. To avoid delays in the final payment, the Surety may send the Consent of Surety directly to the City via fax at (623) 915-2861, and mail the original to the City of Glendale Engineering Department, 5850 West Glendale Avenue, Glendale, Arizona 85301. Should any ambiguity arise between the Contract and these Conditions, the provisions of the Contract shall prevail.

END OF SUPPLEMENTAL GENERAL CONDITIONS

SPECIAL PROVISIONS

1. **SCOPE OF WORK:** The project is located at the Glendale West Area Water Reclamation Facility, 5901 N. Glen Harbor Boulevard. The project includes installation of fiberglass reinforced plastic (FRP) foul air duct-work, damper and accessories for ventilation improvements at the existing ultraviolet (UV) effluent channel and backwash supply (NPW Pump Station). The ductwork will terminate with an existing 30" foul air duct at the backwash equalization basin. Also included, but not limited to is removal/relocation of stainless steel vent, new flanged insect screen, installation of a flanged checkered plate vent connection, installation of a flanged aluminum plank grating duct connection, and installation of pipe supports, hangers, concrete support pads, and painting of the work. This is only a general description of the work and project plans and specifications govern.

2. **DEFINITIONS:**

A. **Section:** Reference to a Section on the plans or in these Specifications shall mean a Section of the Uniform Standard Specifications for Public Works Construction, sponsored and distributed by Maricopa Association of Governments (MAG), latest revision. The provisions of MAG Uniform Standard Specifications and Details for Public Works Construction, which are not altered or modified by the drawings or by these Special Provisions or by any subsequently issued Addendum, shall apply to the contract even though the Contractor's attention is not specifically drawn to such provisions.

B. **Standard Detail:** Reference to a MAG Standard Detail (MAG S.D.) on the plans or in these specifications shall mean a standard detail drawing in the latest revision of the Uniform Standard Specifications for Public Works Construction, sponsored and distributed by Maricopa Association of Governments. City of Glendale Standard Detail (C.O.G. S.D.) shall mean a standard detail drawing in the City of Glendale's Engineering Design and Construction Standards, latest revision. City of Phoenix Standard Detail (C.O.P. S.D.) shall mean a standard detail drawing in the Phoenix Supplemental Standard Details for Public Works Construction, latest revision.

3. **CONSTRUCTION SURVEYING AND LAYOUT:** The work under this item shall consist of furnishing all materials, personnel, equipment, and traffic control necessary to perform all surveying, staking, and verification of the accuracy of all control points per the plans and as directed by the Engineer. Included in this work shall be all calculations required for the satisfactory completion of the project in conformance with the plans and these Special Provisions. The work shall be done under the direction of a registered professional engineer or a registered land surveyor employed by the Contractor. The crew chief shall be NICET Certified Level III or a registered land surveyor. The Contractor shall furnish all equipment, materials and other devices necessary for establishing, checking, marking and maintaining points, lines, grades and layouts.

Throughout the work, the Contractor shall set all stakes including, but not limited to; centerline stakes; offset stakes; reference point stakes; slope stakes; pavement lines, curb lines and grade stakes at intervals not greater than 25 feet; stakes for sewers, roadway drainage, pipe, under drains, clearing, paved gutter, fence, right of way markers, and survey monuments; blue tops of subgrade, subbase and base courses at intervals not greater than 50 feet; permanent as-built elevation marks; and all other horizontal or vertical controls necessary for complete and accurate layout and construction of the work. Stakes for horizontal and vertical curves shall be set at intervals appropriate for the length of curve. The coordinates of any new control points established by the Contractor during the course of the work shall be given to the Engineer within five working days of control point establishment.

Field notes shall be kept in standard field notebooks furnished by the Contractor. Field notes shall be kept in a clear, orderly and neat manner consistent with standard surveying practices. The standard field notebooks or copies of, shall be made available to the Engineer upon request at any time during the prosecution of the work.

When utility adjustments are a part of the contract, the Contractor shall perform all layout work and set all control points, stakes and references necessary for carrying out all such adjustments.

The Contractor shall cross-section all fill areas for monthly, quantity estimates and as directed by the Engineer. The Engineer may verify the accuracy of same. The Engineer shall check all measurements that involve determination of final quantities.

Any errors, omissions or discrepancies in the project plans shall be immediately brought to the attention of the Engineer. The Contractor shall promptly notify the Engineer in writing, explaining the problem in detail. The Engineer will advise the Contractor within three working days of any corrective actions deemed necessary. No changes in the project plans will be allowed without the approval of the Engineer.

The Contractor shall be compensated for additional work associated with survey and layout when:

- A. The project plans do not provide sufficient information and new calculations must be performed.
- B. The Contractor performs survey work based on erroneous plan information, which results in the duplication of work.
- C. Changes by the Engineer to the plan information for which the Contractor has already performed the work and results in the duplication of such work.

The Contractor shall not be due compensation for any survey work when:

- A. Information provided on the plans is sufficiently complete to allow any additional information necessary for the complete layout of the work to be routinely calculated.
- B. The Contractor fails to inform the Engineer of discovered plan errors before the performance of any extra survey work.
- C. Work is included in any other pay item.

The Contractor shall inform the Engineer in a timely manner of any omissions, ambiguities, or errors which the Contractor feels may result in extra calculations or survey work, so as not to delay the project or create any unnecessary calculations.

All additional survey work shall be documented by the Contractor and verified by the Engineer before compensation may be granted. Documentation shall consist of a detailed diary specifically addressing the work involved in the alleged problem area. The Contractor may be required to provide calculations, charts, graphs, drawings, or any other physical evidence, which will verify additional work.

The Contractor shall be responsible for verifying curb and gutter grades before placement of concrete using a steel straightedge, string line or other method approved by the Engineer. The field verification shall be performed in the presence of the Engineer or designated representative.

The Engineer reserves the right to make inspections and random checks of the staking and layout. Inspection or acceptance of all or any part of the Contractor's staking and layout by the Engineer does not relieve the Contractor of full responsibility to secure the proper dimensions, grades and elevations of the work.

If, in the Engineer's opinion, the work is not being performed in a manner that will assure proper controls and accuracy, the Engineer will order any or all of the staking and layout work redone at no additional cost to the City. If any portion of the Contractor's staking and layout work is ordered redone and requires additional rechecking by the Engineer, the City shall be reimbursed for all costs for such additional

checking. The amount of such costs will be deducted from the Contractor's monthly estimate.

The Contractor shall provide final "as-constructed" field surveying, including both vertical and horizontal data based on the finished work. The Contractor shall also furnish final Record Drawings for all improvements. The Record Drawings shall be prepared by a Registered Land Surveyor and submitted to the Owner for approval prior to final acceptance of the project. The Record Drawings shall be prepared on a set of reproducible copies of the construction plans. The completed drawings shall be signed and sealed by the Registered Land Surveyor responsible for obtaining the As-built information and preparing the Record Drawings.

All survey field books and documentation shall be available for inspection by the Engineer.

Payment for this item will be made at the contract lump sum price fully complete for **CONSTRUCTION SURVEYING AND LAYOUT.**

4. **SUSPENSION OF WORK:** The Engineer reserves the right to suspend the work wholly or in part if deemed necessary for the best interest of the City. This suspension will be without compensation to the Contractor, other than to adjust the contract time in accordance with MAG Section 108.

5. **COMPLIANCE WITH MANUFACTURER'S INSTRUCTIONS:** In all instances wherein the item and/or specifications require installation or construction in accordance with either manufacturer's or supplier's recommendations and/or instructions, said recommendations and/or instructions shall be submitted with the applicable portions clearly marked for approval prior to the commencement of work on that item or portion of the contract.

6. **CASH FLOW REPORT:** The Contractor shall prepare a Cash Flow Report for projected monthly project cash flow on a City provided form and submit it for approval prior to issuance of the Notice to Proceed. The accumulation of monthly pay estimate costs shall be plotted versus time in accordance with the proposed construction schedule. After approval, the Contractor shall submit an updated Cash Flow Report prior to the receipt of each Progress Payment. Each updated Cash Flow Report shall reflect the Contractor's actual monthly payment versus the actual elapsed contract time.

At the City's request, if the projected quarterly project cash flow varies by more than ten percent of the total contract price, the Contractor shall prepare a revised Cash Flow Report. Each revised Cash Flow Report is subject to approval by the City prior to issuance of the progress payment.

Revisions to the report resulting from Contractor initiated delays or work schedule changes shall be at no cost to the City. Any revisions required by City initiated delays or changes to the work shall be paid as an integral part of the approved Change Order.

7. **ALLOWANCE FOR CONSTRUCTION CONTINGENCIES:** Bid schedule includes a lump sum contingency allowance. This allowance is at all times the property of the City and is for the sole purpose of reimbursing Contractor for any unforeseen work not apparent at the time of bidding or additional work requested by the CITY OF GLENDALE.

No work anticipated for reimbursement under this Bid Item shall be initiated by Contractor until Contractor, City of Glendale Representative and City of Glendale agree on the scope and cost to perform the additional work. The Contractor shall prepare and submit to City of Glendale Representative a cost itemization and summary for the additional work. City of Glendale Representative and City of Glendale shall review and approve prior to Contractor proceeding with any additional work. Any portion of the stated sum not expended remains the property of the City of Glendale.

Work under this section shall consist of any additional work identified by the owner and contractor due to construction activity. All work under this item shall be itemized as per MAG requirements and deducted from the set amount of \$15,000. All work under this section shall include but is not limited to all necessary materials, tools, layout, survey and labor required to complete each task.

Measurement and payment for this item shall be made on an individual basis per task and as described above. Limit for this item is set at \$15,000 on the bid form, under line item ALLOWANCE FOR CONSTRUCTION CONTINGENCY.

END OF SPECIAL PROVISIONS

Project Life Cycle Cash Flow Schedule



Project No.: _____ Date: _____

Project Name: _____

Company Name: _____

Project Start Date: _____ Project Completion Date: _____

Original Updated Revised

Qtr.	Fiscal Yr.	Estimated		Actual	
		Amount	Accum.	Amount	Accum.
1st	07/11 - 09/11				
2nd	10/11 - 12/11				
3rd	01/12 - 03-12				
4th	04/12 - 06/12				
1st	07/12 - 09/12				
2nd	10/12 - 12/12				
3rd	01/13 - 03/13				
4th	04/13 - 06/13				
1st	07/13 - 09/13				
2nd	10/13 - 12/13				
3rd	01/14 - 03/14				
4th	04/14 - 06/14				
1st	07/14 - 09/14				
2nd	10/14 - 12/14				
3rd	01/15 - 03/15				
4th	04/15 - 06/15				
1st	07/15 - 09/15				
2nd	10/15 - 12/15				
3rd	01/16 - 03/16				
4th	04/16 - 06/16				
Totals		\$ -	\$ -	\$ -	\$ -

* COG's fiscal year is July 1, (current year) through June 30, (following year)

For Engineering Use Only:
 Account No: _____ PO No. _____

**CITY OF GLENDALE
WEST AREA WATER RECLAMATION FACILITY
MISCELLANEOUS IMPROVEMENTS PROJECT
PROJECT NO. 111213**

TECHNICAL SPECIFICATIONS

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SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope:
1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install cast-in-place concrete.
 2. The Work includes providing concrete consisting of portland cement, fine and coarse aggregate, water, and approved admixtures; combined, mixed, transported, placed, finished and cured. The Work also includes:
 - a. Providing openings in concrete to accommodate the Work under this and other Sections and building into the concrete all items such as sleeves, frames, anchor bolts, inserts and all other items to be embedded.
- B. Coordination:
1. Review installation procedures under other Sections and coordinate the installation of items that must be installed in the concrete.
- C. Classes of Concrete:
1. Class "A" concrete shall be steel reinforced and includes the following:
 - a. Foundations.
 - b. Walls.
 - c. Slabs.
 - d. Beams.
 - e. Girders.
 - f. Columns.
 - g. Equipment bases.
 - h. Pipe supports.
 2. Class "B" concrete shall be placed without forms or with simple forms, with little or no reinforcing, and includes the following:
 - a. Concrete fill.
 - b. Thrust blocks.
 - c. Encasements.
- D. Related Sections:
1. Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.

1.2 QUALITY ASSURANCE

- A. Standard Specifications and Details:
1. CONTRACTOR shall conform to all applicable requirements of Sections Nos. 505, 725 and 726 of the Uniform Standard Specifications for Public Works Construction by the Maricopa Association of Governments (MAG) as supplemented by the City of Glendale. Where there is a conflict between MAG Standard Specifications as supplemented by the City of Glendale and this Specification, provisions of this Specification shall govern.
- B. Reference Standards: Comply with the applicable provisions and recommendations of the following, except as otherwise shown or specified.
1. ACI 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
 2. ACI 214, Recommended Practice for Evaluation of Strength Test Results of Concrete.
 3. ACI 301, Specifications for Structural Concrete for Buildings, (includes ASTM Standards referred to herein).
 4. ACI 304, Guide for Measuring, Mixing, Transporting and Placing Concrete.
 5. ACI 305, Hot Weather Concreting.
 6. ACI 306, Cold Weather Concreting.
 7. ACI 309, Guide for Consolidation of Concrete.
 8. ACI 311, Guide for Concrete Inspection.
 9. ACI 318, Building Code Requirements for Reinforced Concrete.
 10. ACI 350R, Environmental Engineering Concrete Structures.
 11. AASHTO M 182, Burlap Cloth Made From Jute or Kenaf.

1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:
1. List of concrete materials and concrete mix designs proposed for use. Include the results of all tests performed to qualify the materials and to establish the mix designs.
 3. The following information, if ready-mixed concrete is used.
 - a. Physical capacity of mixing plant.
 - b. Trucking facilities available.
 - c. Estimated average amount which can be produced and delivered to the site during a normal 8 hour day, excluding the output to other customers.
- B. Laboratory Test Reports: Submit copies of laboratory test reports for concrete cylinders, materials and mix design tests. ENGINEER'S review will be for general information only. Production of concrete to comply with specified requirements is the responsibility of CONTRACTOR.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All materials used for concrete must be kept clean and free from all foreign matter during transportation and handling and kept separate until measured and placed in the mixer. Bins or platforms having hard clean surfaces shall be provided for storage. Suitable means shall be taken during hauling, piling and handling to ensure that segregation of the coarse and fine aggregate particles does not occur and the grading is not affected.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement:
1. Portland cement, ASTM C 150, Type II; or blended hydraulic cement, ASTM C 595, Type 1P (MS).
 2. Use portland cement made by a well-known acceptable manufacturer and produced by not more than one plant.
 3. Do not use cement which has deteriorated because of improper storage or handling.
- B. Aggregates: ASTM C 33 and as herein specified.
1. Do not use aggregates containing soluble salts or other substances such as iron sulfides, pyrite, marcasite, ochre, or other materials that can cause stains on exposed concrete surfaces.
 2. Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances.
 - a. Dune sand, bank run sand and manufactured sand are not acceptable.
 3. Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:
 - a. Crushed stone, processed from natural rock or stone.
 - b. Coarse Aggregate Size: Size to be ASTM C 33, Nos. 57 or 67, except that No. 467 may be used for footings, foundation mats and walls 16-inches or greater in thickness.
- C. Water: Clean, free from injurious amounts of oils, acids, alkalis, organic materials or other substances that may be deleterious to concrete or steel.

2.2 CONCRETE ADMIXTURES

- A. Provide admixtures produced by established reputable manufacturers, and use in compliance with the manufacturer's printed instruction. Do not use admixtures which have not been incorporated and tested in the accepted mixes, unless otherwise authorized in writing by ENGINEER.

- B. Air-Entraining Admixtures: ASTM C 260.
1. Product and Manufacturer: Provide one of the following:
 - a. SIKA AER, as manufactured by Sika Corporation.
 - b. MB-VR, as manufactured by Master Builders Inc.
 - c. Daravair, as manufactured by W.R. Grace & Conn.
 - d. Or equal.
- C. Water-Reducing High Range Admixture: ASTM C 494, Type F/G.
1. High range water-reducer shall be used in all Class "A" concrete. The admixture shall not contain more chloride ions than are contained in municipal drinking water. It shall be added only at the job site to concrete in compliance with the manufacturer's printed instruction. Provide one of the following:
 - a. Sikament 320, as manufactured by Sika Corporation.
 - b. Rheobuild 1000 or 716, as manufactured by Master Builders Inc.
 - c. Daracem-100, as manufactured by W.R. Grace & Conn.
 - d. Or equal.
- D. Water-Reducing Admixture: ASTM C 494, Type A.
1. Proportion all Class "B" concrete with non-air entraining, normal setting, water-reducing, aqueous solution of a modification of the salt of polyhydroxylated organic acids. The admixture shall not contain any lignin, nitrates or chlorides added during manufacture.
 2. Product and Manufacturer: Provide one of the following:
 - a. Eucon WR-75, as manufactured by The Euclid Chemical Company.
 - b. Pozzolith, as manufactured by Master Builders Inc.
 - c. WRDA-15, as manufactured by W.R. Grace & Conn.
 - d. Or equal.
- E. Pozzolanic Admixtures:
1. Mineral admixtures, when used, shall meet the requirements of ASTM C 618 Class F, except as follows:
 - a. The loss on ignition shall be a maximum of 4 percent.
 - b. The maximum percent of sulfur trioxide (SO₃) shall be 4.0.
 2. A substitution by weight, of the portland cement by pozzolan, so that the total tricalcium aluminate content of the resulting cement plus pozzolan is not greater than 8 percent, will be considered. However, the pozzolan shall not exceed 15 percent by weight of the cement plus pozzolan.
- F. Set-Control Admixtures: ASTM C 494, as follows:
1. Type B, Retarding.
 2. Type C, Accelerating.
 3. Type D, Water-reducing and Retarding.
 4. Type E, Water-reducing and Accelerating.
 5. Type F, Water-reducing, high range admixtures.
 6. Type G, Water-reducing, high range, and retarding admixtures.

- G. Calcium Chloride: Do not use calcium chloride in concrete, unless otherwise authorized in writing by ENGINEER. Do not use admixtures containing calcium chloride where concrete is placed against galvanized steel.

2.3 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes of concrete. Mixes subject to the following limitations:

1. Class A Concrete:

- a. Specified 28-day Compressive Strength: 4,000 psi.
 b. Maximum Water-Cement Ratio by Weight: 0.45.
 c. Coarse Aggregate Minimum Cement Content-Pounds Per Cubic Yard Percent Air Content
- | <u>Number</u> | <u>Per Cubic Yard</u> | <u>Content</u> |
|---------------|-----------------------|----------------|
| 57, 67 | 564 | 6 ± 1% |
| 467 | 517 | 5 ± 1% |

2. Class B Concrete:

- a. Specified 28-day Compressive Strength: 2,500 psi.
 b. Maximum Water-Cement Ratio by Weight: 0.48.
 c. Coarse Aggregate Minimum Cement Content-Pounds Per Cubic Yard Percent Air Content
- | <u>Number</u> | <u>Per Cubic Yard</u> | <u>Content</u> |
|---------------|-----------------------|----------------|
| 57, 67 | 470 | 5 ± 1% |

- B. Proportion mixes by either laboratory trial batch or field experience methods, using materials to be employed on the Project for concrete required. Comply with ACI 211.1 and report to ENGINEER the following data:

1. Complete identification of aggregate source of supply.
2. Tests of aggregates for compliance with specified requirements.
3. Scale weight of each aggregate.
4. Absorbed water in each aggregate.
5. Brand, type and composition of cement.
6. Brand, type and amount of each admixture.
7. Amounts of water used in trial mixes.
8. Proportions of each material per cubic yard.
9. Gross weight and yield per cubic yard of trial mixtures.
10. Measured slump.
11. Measured air content.
12. Compressive strength developed at 7 days and 28 days, from not less than 3 test cylinders cast for each 7 day and 28 day test, and for each design mix.

- C. Submit written reports to ENGINEER of proposed mix of concrete at least 15 days prior to start of Work. Do not begin concrete production until mixes have been approved by ENGINEER. Sources of materials shall not be changed without ENGINEERS prior approval.
- D. Laboratory Trial Batches: When laboratory trial batches are used to select concrete proportions, prepare test specimens and conduct strength tests as specified in ACI 301, Chapter 3 - Proportioning. However, 4,000 psi concrete mixes need not be designed for greater than 4,600 psi regardless of the production facilities standard deviation.
- E. Field Experience Method: When field experience methods are used to select concrete proportions, establish proportions as specified in ACI 301, Chapter 3.
- F. Adjustment to Concrete Mixes: Mix design adjustments may be requested by CONTRACTOR when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to the OWNER and as accepted by ENGINEER. Laboratory test data for revised mix designs and strength results must be submitted to and accepted by ENGINEER before using the revised mixes. Sources of materials shall not be changed without ENGINEERS prior approval.
- G. Admixtures:
 - 1. Use air-entraining admixture in all concrete, except interior slabs subject to abrasion, unless otherwise shown or specified. Add air-entraining admixture at the manufacturer's prescribed rate to result in concrete at the point of placement having air content within the prescribed limits.
 - 2. Use amounts of admixtures as recommended by the manufacturer for climatic conditions prevailing at the time of placing. Adjust quantities and types of admixtures as required to maintain quality control.
- H. Slump Limits:
 - 1. Proportion and design mixes to result in concrete slump at the point of placement of not less than 1-inch and not more than 4-inches.
 - 2. Class "A" Concrete: Proportion and design mixes to result in concrete slump:
 - a. Not more than 3-inches prior to adding high range water-reducer.
 - b. Not more than 8-inches at point of placement after adding high range water-reducer. If superplasticizer or water-reducing admixtures are used, the mix shall be slumped at jobsite prior to the addition of the admixture.
 - 3. Class "B" Concrete: Proportion and design mixes to result in concrete slump at point of placement of not less than 1-inch and not more than 4-inches.

2.4 EPOXY BONDING AGENT

- A. Provide an epoxy-resin bonding agent, two component, polysulfide type.

- B. Product and Manufacturer: Provide one of the following:
1. Sikadur 32, Hi-Mod LPL, as manufactured by Sika Corporation.
 2. Eucopoxy LPL, as manufactured by the Euclid Chemical Company.
 3. Or equal.
 4. Five Star Bonding Adhesive, Five Star Products.

2.5 CONCRETE CURING MATERIALS

- A. (NOT USED).
- B. (NOT USED).
- C. Curing Compound: ASTM C 309 Type 1-D (water retention requirements):
1. Product and Manufacturer: Provide one of the following:
 - a. Super Aqua Cure VOX, as manufactured by The Euclid Chemical Company.
 - b. Sealtight 1100, as manufactured by W.R. Meadows, Incorporated.
 - c. MasterKure, as manufactured by Master Builders, Inc.
 - d. Or equal.
 2. Provide red fugitive dye.

2.6 EMBEDDED ITEMS

- A. Items such as plates, angles, inserts, bolts and similar items not specified elsewhere shall be provided and installed under this Section. Galvanizing of embedded items shall not be permitted.

2.7 FORM MATERIALS

- A. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection. CONTRACTOR shall be responsible for designing the formwork system to resist all applied loads including pressures from fluid concrete and construction loads.
- B. Smooth Form Surfaces: Acceptable panel-type to provide continuous, straight, smooth, as-cast surfaces in accordance with ACI 301.
- C. Unexposed Concrete Surfaces: Material to suit project conditions.
- D. Provide 3/4-inch chamfer at all external corners. Chamfer is not required at re-entrant corners unless otherwise shown or indicated.
- E. Form Ties:
1. Provide factory-fabricated, removable, or snap-off metal form ties, that prevent form deflection and prevent spalling of concrete surfaces upon removal. Materials used for tying forms are subject to approval of ENGINEER.
 2. Unless otherwise shown or indicated, provide ties so that portion remaining within concrete after removal of exterior parts is at least 1.5 inches from outer

surface of concrete. Unless otherwise shown or indicated, provide form ties that, upon removal, will leave a uniform, circular hole not larger than one-inch diameter in the concrete surface.

3. Ties for exterior walls, below-grade walls, and walls subject to hydrostatic pressure shall be provided with waterstops.
4. Wire ties are unacceptable.

2.8 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60 deformed bars.
- B. Welded Wire Fabric: ASTM A185/A185M.
- C. Steel Wire: ASTM A82/A82M.
- D. Provide supports for reinforcing including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing in place.
 1. Use wire bar-type supports complying with CRSI MSP1 recommendations, except as specified in this Section. Do not use wood, brick, or other unacceptable materials.
 2. For slabs on grade, use precast concrete blocks, four inches square minimum with compressive strength equal to or greater than the surrounding concrete, or supports with sand plates or horizontal runners where base materials will not support chair legs.
 3. For all concrete surfaces where legs of supports are in contact with forms, provide supports having either hot-dip galvanized, plastic-protected, or stainless steel legs in accordance with CRSI MSP1.
 4. Provide precast concrete supports over waterproof membranes.
- E. Adhesive Dowels:
 1. Dowels:
 - a. Dowel reinforcing bars shall comply with ASTM A615, Grade 60.
 2. Adhesive:
 - a. For requirements for adhesive, refer to Section 05051, Anchor Bolts, Toggle Bolts and Concrete Inserts.

2.9 GROUT

- A. Non-shrink Grout:
 1. Pre-packaged, non-metallic, cementitious grout requiring only the addition of water at the Site.
 2. Minimum 28-day Compressive Strength: 7,000 psi.
 3. Products and Manufacturers: Provide one of the following:
 - a. NS Grout by Euclid Chemical Company.
 - b. Set Grout by Master Builders, Inc.
 - c. NBEC Grout by Five Star Products, Inc.
 - d. Or equal.

- B. Epoxy Grout:
1. Pre-packaged, non-shrink, non-metallic, 100 percent solids, solvent-free, moisture-insensitive, three-component epoxy grouting system.
 2. Minimum Seven-day Compressive Strength: 14,000 psi, when tested in accordance with ASTM C579.
 3. Products and Manufacturers: Provide one of the following:
 - a. Euco High Strength Grout, by Euclid Chemical Company.
 - b. Sikadur 42, Grout Pak, by Sika Corporation.
 - c. Five Star Epoxy Grout, by Five Star Products, Inc.
 - d. Or equal.
- C. Grout Fill:
1. Grout mix shall consist of cement, fine and coarse aggregates, water, and admixtures complying with requirements specified in this Section for similar materials in concrete.
 2. Proportion and mix grout fill as follows:
 - a. Minimum Cement Content: 564 pounds per cubic yard.
 - b. Maximum Water-Cement Ratio: 0.45.
 - c. Maximum Coarse Aggregate size: 1/2-inch, unless otherwise indicated.
 - d. Minimum 28-day Compressive Strength: 4,000 psi.

PART 3 - EXECUTION

3.1 INSPECTION

- A. CONTRACTOR shall examine the substrate and the conditions under which the Work will be performed and notify ENGINEER in writing of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 FORMWORK

- A. Construct formwork in accordance with ACI 347 such that concrete members and structures are of correct size, shape, alignment, elevation, and position.
- B. Provide openings in formwork to accommodate the Work of other trades. Accurately place and securely support items required to be built into formwork.
- C. Clean and adjust forms prior to placing concrete. Apply form release agents or wet forms as required. Re-tighten forms during and after concrete placing, when required, to eliminate cement paste leaks.
- D. Removing Formwork:
1. Comply with ACI 301 and ACI 347, except as otherwise indicated in the Contract Documents.
 2. Do not remove formwork and shoring until supported concrete members have acquired minimum of 90 percent of specified compressive strength. Results of

suitable quality control tests of field-cured specimens may be submitted to ENGINEER for review as evidence that concrete has attained sufficient strength for removal of supporting formwork and shoring prior to removal times indicated in the Contract Documents.

3. Removal time for formwork is subject to ENGINEER's acceptance.
4. Repair form tie-holes following in accordance with ACI 301.

3.3 REINFORCING, JOINTS, AND EMBEDDED ITEMS

- A. Comply with the applicable recommendations of Laws and Regulations and standards referenced in this Section, including CRSI MSP1, for details and methods of placing and supporting reinforcing.
- B. Clean reinforcing to remove loose rust and mill scale, earth, ice, and other materials which act to reduce or destroy bond between reinforcing material and concrete.
- C. Position, support, and secure reinforcing against displacement during formwork construction and concrete placing. Locate and support reinforcing by means of metal chairs, runners, bolsters, spacers, and hangers, as required.
 1. Place reinforcing to obtain minimum concrete coverages as shown on the Drawings and as required in ACI 318. Arrange, space, and securely tie bars and bar supports together with 16-gage wire to hold reinforcing accurately in position during concrete placing. Set with ties so that twisted ends are directed away from exposed concrete surfaces.
 2. Do not secure reinforcing to formwork using wire, nails or other ferrous metal. Metal supports subject to corrosion shall not be in contact with formed or exposed concrete surfaces.
- D. Provide sufficient quantity of supports of strength required to carry reinforcing. Do not place reinforcing more than two inches beyond the last leg of continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.
- E. Splices: Provide standard reinforcing splices by lapping ends, placing bars in contact, and tying tightly with wire. Comply with requirements shown or indicated for minimum lap of spliced bars, in accordance with the requirements of ACI.
- F. Install welded wire fabric in lengths as long as practical, lapping adjoining sections a minimum of one full mesh.
- G. Do not place concrete until reinforcing is inspected and ENGINEER indicates that conditions are acceptable for placing concrete. Concrete placed in violation of this paragraph will be rejected. Notify ENGINEER in writing at least two working days prior to proposed concrete placement.
- H. (NOT USED).
- I. (NOT USED)

J. Adhesive Dowels:

1. Adhesive dowels shall be reinforcing bar dowels set in an adhesive in hole drilled into hardened concrete. Comply with adhesive system manufacturer's installation instructions regarding hole diameter, drilling method, embedment depth required to fully develop required tensile strength, and hole cleaning and preparation instructions. Unless more-stringent standards are required by adhesive system manufacturer, comply with the following.
2. Drill holes to adhesive system manufacturer's recommended diameter and depth to develop required tensile strength. Holes shall not be more than 1/4-inch greater than nominal bar diameter, and hole depth shall not be less than twelve times nominal bar diameter. Hammer-drill holes. Cored holes are not allowed.
3. Embedment depths shall be based on concrete compressive strength of 2,000 psi when embedded in existing concrete, and 4,000 psi when embedded in new concrete.
4. Determine location of existing reinforcing steel in vicinity of proposed holes prior to drilling. Adjust location of holes to be drilled to avoid drilling through or damaging existing reinforcing bars only when approved by ENGINEER.
5. Before setting adhesive dowel, hole shall be free of dust and debris using method recommended by adhesive system manufacturer. Hole shall be brushed, with manufacturer-approved brush and blown clean with clean, dry, oil-free compressed air to remove dust and loose particles. Hole shall be dry as defined by adhesive system manufacturer.
6. Inject adhesive into hole through injection system mixing nozzle and necessary extension tubes, placed to bottom of hole. Withdraw discharge end as adhesive is placed, but keep end of tube immersed to prevent forming air pockets. Fill hole to depth that ensures that excess material is expelled from hole during dowel placement.
7. Twist dowels during insertion into partially-filled hole to guarantee full wetting of bar surface with adhesive. Insert bar slowly to avoid developing air pockets.

3.4 CONCRETE PLACING

- A. Site Mixing: Use drum-type batch machine mixer, mixing not less than 1.5 minutes for one cubic yard or smaller capacity. Increase required mixing time by minimum of 15 seconds for each additional cubic yard or fraction thereof.
- B. Ready-Mixed Concrete: Comply with ASTM C94/C94M.
- C. Concrete Placing:
 1. Place concrete in a continuous operation within planned joints or sections in accordance with ACI 304R.
 2. Do not begin placing concrete until work of other trades affecting concrete is completed.
 3. Wet concrete and subgrade surfaces to saturated surface dry condition immediately prior to placing concrete.

4. Deposit concrete as near its final location as practical to avoid segregation due to re-handling or flowing.
 5. Avoid separation of the concrete mixture during transportation and placing. Concrete shall not free-fall for distance greater than four feet during placing.
 6. Complete concrete placing within 90 minutes of addition of water to the dry ingredients.
- D. Consolidate placed concrete in accordance with ACI 309R using mechanical vibrating equipment supplemented with hand rodding and tamping, such that concrete is worked around placing and other embedded items and into all parts of formwork. Insert and withdraw vibrators vertically at uniformly-spaced locations. Do not use vibrators to transport concrete within the formwork. Vibration of formwork or placing is not allowed.
- E. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing.
1. In hot weather comply with ACI 305R.
 2. In cold weather comply with ACI 306R.

3.5 QUALITY OF CONCRETE WORK

- A. Make concrete solid, compact, smooth, and free of laitance, cracks, and cold joints.
- B. Concrete for liquid-retaining structures and concrete in contact with earth, water, or exposed directly to the elements shall be watertight.
- C. Cut out and properly replace to extent directed by ENGINEER, or repair to satisfaction of ENGINEER, surfaces that contain cracks or voids, are unduly rough, or are in defective in any way. Patches or plastering are unacceptable.
- D. Repair, removal and replacement of defective concrete directed by ENGINEER shall be at no additional cost to OWNER.

3.6 CURING

- A. Begin initial curing as soon as free water has disappeared from exposed surfaces. Where possible, keep continuously moist for not less than 72 hours. Continue curing by using moisture-retaining cover or membrane-forming curing compound. Cure formed surfaces by moist curing until formwork is removed. Provide protection, as required, to prevent damage to exposed concrete surfaces. Total curing period shall not be less than seven days. Curing methods and materials shall be compatible with scheduled finishes.

3.7 FINISHING

- A. Formed Finish:
 1. Provide smooth form concrete finish at exposed surfaces. Use largest practical form panel sizes to minimize form joints. Exposed surfaces include interior

water-contacting surfaces of tanks, whether or not directly visible. All surfaces shall be considered as exposed, unless buried or covered with permanent structural or architectural material. After removing forms, patch form tie holes and defects in accordance with ACI 301. Remove fins exceeding 1/8-inch in height. Where surface will be coated or will receive further treatment, remove all fins flush with concrete surface.

2. Provide rough form finish at all unexposed surfaces. After removing forms, patch form tie holes and defects in accordance with ACI 301. Remove fins exceeding 1/2-inch in height.

3.8 GROUT PLACING

- A. Place grout as shown and indicated, and in accordance with grout manufacturer's instructions and recommendations. If grout manufacturer's instructions conflict with the Contract Documents, notify ENGINEER and not proceed until obtaining ENGINEER's clarification.
- B. Dry-packing is not allowed, unless otherwise indicated.
- C. Manufacturers of proprietary grout materials shall make available upon 72 hours notice the services of qualified, full-time, factory-trained employee to aid in ensuring proper use of grout materials at the Site.
- D. Placing grout shall comply with temperature and weather limitations described in Article 3.4 of this Section.

++ END OF SECTION ++

SECTION 05051

ANCHOR BOLTS, TOGGLE BOLTS AND CONCRETE INSERTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope:
 - 1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified, and required to furnish and install anchor bolts, toggle bolts and concrete inserts.
- B. This Section includes all bolts, anchors, toggles and inserts required for the Work, but not specified under other Sections.
- C. The types of Work using the bolts, anchors, toggles and inserts include, but are not limited to the following:
 - 1. Hangers and brackets.
 - 2. Piping and supports.
 - 3. Grating and floor plate.
- D. Related Sections:
 - 1. Section 05504, Miscellaneous Metal Fabrications.
 - 2. Section 15220, Pipe Hangers and Supports.

1.2 QUALITY ASSURANCE

- A. Standard Specifications and Details:
 - 1. CONTRACTOR shall conform to all applicable requirements of Section 770 of the Uniform Standard Specifications for Public Works Construction by the Maricopa Association of Governments. Where there is a conflict between the MAG Specifications and this Specification, the provisions of this Specification will apply.
- B. Reference Standards: Comply with the applicable provisions and recommendations of the following, except as otherwise shown and specified.
 - 1. ASTM A 36, Standard Specification for Structural Steel.
 - 2. ASTM A 123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - 3. ASTM A 153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 4. ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.

5. ASTM A 320, Standard Specification for Alloys - Steel Bolting Materials for Low-Temperature Service.
6. ASTM A 484, Standard Specification for General Requirements for Stainless and Heat-Resisting Steel Bars, Billets and Forgings.
7. ASTM A 525, Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.

C. Toggle Bolts: Federal Specification FF-B-588C, Type I, Class A, Style 1.

1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:
1. Setting drawings and templates for location and installation of anchorage devices.
 2. Copies of manufacturer's specifications, load tables, dimension diagrams and installation instructions for the devices.
- B. Samples: Submit for approval the following:
1. Representative samples of bolts, anchors and inserts as may be requested by ENGINEER. Review will be for type and finish only. Compliance with all other requirements is exclusive responsibility of CONTRACTOR.

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

- A. When the size, length or load carrying capacity of an anchor bolt, expansion anchor, toggle bolt, or concrete insert is not shown, provide the size, length and capacity required to carry the design load times a minimum safety factor of 4.
- B. Determine design loads as follows:
1. For equipment anchors, use the design load recommended by the manufacturer and approved by ENGINEER.
 2. For pipe hangers and supports, use one half the total weight of pipe, fittings, valves, accessories and water contained in pipe, between the hanger or support in question and adjacent hangers and supports on both sides.
 3. Allowances for vibration are included in the safety factor specified above.
 4. Anchors shall develop ultimate shear and pull-out loads of not less than the following values in concrete:

<u>Bolt Diameter</u> <u>(Inches)</u>	<u>Min. Shear</u> <u>(Pounds)</u>	<u>Min. Pull-Out Load</u> <u>(Pounds)</u>
1/2	8,300	6,500
5/8	12,500	9,000
3/4	17,400	12,200

2.2 MATERIALS

A. Anchor Bolts:

1. Provide carbon steel bolts complying with ASTM A 307, non-headed type, unless otherwise indicated.
2. In buried or submerged locations, provide AISI Type 316 stainless steel bolts complete with nuts and washers complying with ASTM A 320. Other AISI types may be used, subject to ENGINEER'S approval.
3. For equipment, provide anchor bolts which meet the equipment manufacturer's recommendations for size, material, and strength.
4. Provide anchor bolts as shown 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 necessary.
6. Protect threads and shank from damage during installation of equipment and structural steel.
7. Comply with required embedment length and necessary anchor bolt projection.

B. Adhesive Anchors:

1. Provide AISI Type 316 stainless steel anchors complying with ASTM A 320.
2. Anchors shall be of the size required for the concrete strength specified.
3. Anchors shall utilize epoxy resin or vinylester resin.
 - a. Provide system utilizing a screen tube with a cartridge dispenser which contains two parallel tubes of resin and hardener. The installed system shall achieve minimum strength requirements recommended by the manufacturer.
4. Product and Manufacturer: Provide anchors by one of the following:
 - a. HY-150 Adhesive Anchors, as manufactured by Hilti, Incorporated.
 - b. Set XP, as manufactured by Simpson Strong-Tie.
 - c. Or equal.

C. 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 of one of the following:
 - a. The Rawlplug Company, Incorporated.
 - b. Haydon Bolts, Incorporated.
 - c. Or equal.

D. Concrete Inserts:

1. For piping, grating, floor plate and masonry lintels, 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 of 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.
- E. Powder actuated fasteners and other types of bolts and fasteners not specified herein shall not be used, unless approved by ENGINEER.

PART 3 - EXECUTION

3.1 INSPECTION

- A. CONTRACTOR shall examine areas and conditions under which anchor bolts, toggle bolts and concrete insert Work is to be installed, and notify ENGINEER, in writing, of conditions detrimental to proper and timely completion of Work. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.

3.2 INSTALLATION

- A. Drilling equipment used and installation of anchors shall be in accordance with manufacturer's instructions.
- B. Assure that embedded items are protected from damage and are not filled in with concrete.
- C. Use concrete inserts for pipe hangers and supports for the pipe size and loading recommended by the insert manufacturer.
- D. Use toggle bolts for fastening brackets and other elements onto masonry units.
- E. For the 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 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.
- F. Adhesive anchor manufacturer's representative shall observe and demonstrate the proper installation procedures for the adhesive anchors and adhesive material at no additional expense to OWNER. Each installer shall be certified, in writing, by the manufacturer to be qualified to install the adhesive anchors.

3.3 CLEANING

- A. After embedding concrete is placed, remove protection and clean bolts and inserts.

3.4 FIELD QUALITY CONTROL

- A. CONTRACTOR shall employ a testing laboratory to perform field quality testing of installed anchors. ENGINEER is to determine the level of testing which is required for the various types of expansion anchors and bolts. A minimum of 10 percent of the adhesive anchors and reinforcing bars are to be tested to 50 percent of the ultimate tensile capacity of the anchor or reinforcing bar.
- B. If failure of any of the adhesive anchors or reinforcing bars occurs, CONTRACTOR will be required to pay for the costs involved in testing the remaining 90 percent.
- C. CONTRACTOR shall correct improper workmanship, remove and replace, or correct as instructed by the ENGINEER, all anchors or bars found unacceptable or deficient, at no additional cost to the OWNER.
- D. CONTRACTOR shall pay for all corrections and subsequent tests required to confirm the integrity of the anchor or bar.
- E. The independent testing and inspection agency shall complete a report on each area. The report should summarize the observations made by the inspector and be submitted to ENGINEER.
- F. Provide access for the testing agency to places where Work is being produced so that required inspection and testing can be accomplished.

++ END OF SECTION ++

SECTION 05504

MISCELLANEOUS METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install all miscellaneous metal fabrications Work, including surface preparation and shop priming.
2. Extent of miscellaneous metal fabrications is shown or scheduled and includes items fabricated from iron, steel and aluminum shapes, plates, bars, castings and extrusions, which are not a part of other metal systems covered by other Sections of these Specifications.
3. Types of products required include the following:
 - a. Miscellaneous accessories and fasteners.

B. Related Sections:

1. Section 09900, Painting.

1.2 QUALITY ASSURANCE

A. (NOT USED)

B. Reference Standards: Comply with the applicable provisions and recommendations of the following, except as otherwise shown or specified:

1. ASTM A 36, Standard Specification for Carbon Structural Steel.
2. ASTM A 123, Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A 153, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM A 240, Standard Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels.
5. ASTM A 320, Standard Specification for Alloy Steel Bolting Material for Low-Temperature Service.
6. ASTM B 209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
7. ASTM B 211, Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire.
8. ASTM B 221, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes.
9. ANSI A14.3, Safety Requirements for Fixed Ladders.
10. AWS D1.1, Structural Welding Code.
11. AISI Standards for Stainless Steel.

C. Performance Criteria:

1. Size and spacing of anchor bolts, inserts, supports and similar items shown or specified shall be considered minimum acceptable size. Final selection of these items shall be based upon the actual design load times a minimum safety factor of four.
2. Where the size and spacing of anchor bolts, inserts, supports and similar items are not shown or are not specified CONTRACTOR shall provide such items of sufficient size, length, load carrying capacity and spacing required to carry the design load times a minimum safety factor of four. Provide non-corrodible materials for all such items.

D. Field Measurements: Take field measurements where required prior to preparation of Shop Drawings and fabrication to ensure proper fitting of the Work.

E. Shop Assembly: Preassemble items in the shop to the greatest extent possible, so as to minimize field splicing and assembly of units at the project site. Disassemble units only to the extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

F. Source Quality Control:

1. Material and fabrication procedures shall be subject to inspection and tests in the mill, shop, and field, conducted by a qualified inspection agency. Such inspections and tests shall not relieve CONTRACTOR of responsibility for providing materials and fabrication procedures in compliance with specified requirements.
2. (NOT USED).
3. Qualifications for Welding Work:
 - a. Qualified welding processes and welding operators in accordance with AWS "Structural Welding Code" D1.1, Section 5, Qualifications.
 - b. Provide certifications that all welders employed on or to be employed for the Work have satisfactorily passed AWS qualification tests within the previous 12 months. CONTRACTOR shall ensure that all certifications are kept current.

1.3 SUBMITTALS

A. (NOT USED).

B. Shop Drawings: Submit for approval the following:

1. Shop Drawings for the fabrication and erection of all assemblies of miscellaneous metal fabrications Work. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items. Include setting drawings and templates for location and installation of miscellaneous metal fabrications items and anchorage devices.

2. Copies of manufacturer's specifications, load tables, dimension diagrams, anchor details, and installation instructions for products to be used in miscellaneous metal fabrications Work.
3. Submit required structural calculations prepared, signed and stamped with the seal of a Licensed Professional Engineer, licensed to practice in the State of Arizona and recognized as an expert in the specialty involved.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel Sheet and Plate: ASTM A 240, Type 304L and Type 316:
 1. Submerged or Intermittently Submerged: Type 316.
 2. Non-Submerged: Type 304L.
- B. Steel Plates, Shapes and Bars: ASTM A 36.
- C. Aluminum:
 1. Alloy and Temper: Provide alloy and temper as shown or specified, or as otherwise recommended by the aluminum producer or finisher.
 2. Extruded Shapes and Tubes: ASTM B 221.
 3. Plate and Sheet: ASTM B 209.
 4. Bars, Rods and Wire: ASTM B 211.
 5. Finish: Provide Architectural Class I anodized finish AA-M32C22A41 Clear as specified in the NAAMM Manual.
- D. Stainless Steel Fasteners and Fittings: ASTM A 320.
- E. Zinc Coated Items: ASTM A 153.

2.2 MISCELLANEOUS METAL ITEMS

- A. Miscellaneous Framing and Supports:
 1. Provide miscellaneous metal framing, supports and other metal items required which are not a part of the structural steel framework and are required to complete the Work.
 2. Fabricate miscellaneous units to the sizes, shapes and profiles shown or, if not shown, of the required dimensions to receive adjacent grating, plates, tanks, doors, or other work to be retained by the framing. Except as otherwise shown, fabricate from structural shapes, plates, and bars, of all welded construction using mitered corners, welded brackets and splice plates and a minimum number of joints for field connection. Cut, drill and tap units to receive hardware and similar items to be anchored to the Work.
- B. Primer Paint: Unless otherwise shown or specified, prepare surfaces and prime steel items as required under Section 09900, Painting.

- C. Galvanizing: All galvanizing of fabricated steel items shall comply with the requirements of ASTM A 123 or ASTM A 525.

2.3 SURFACE PREPARATION AND SHOP PAINTING

- A. Surface preparation and shop painting is required for all ferrous metals, equipment and accessories. Stainless steel shall not be painted.
- B. All ferrous metal surfaces shall be cleaned and provided with surface preparation and two coats of priming paint in accordance with the applicable requirements of Section 09900, Painting. All prime coat materials shall be compatible with the finish coat materials to be furnished under Section 09900, Painting.

PART 3 - EXECUTION

3.1 FABRICATION, GENERAL

- A. Use materials of the size and thicknesses shown or if not shown, of the required size and thickness to produce adequate strength and durability in the finished product for the intended use. Work to the dimensions shown or accepted on Shop Drawings using proven details of fabrication and support. Use the type of materials shown or specified for the various components of Work.
- B. Form exposed Work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32-inch unless otherwise shown or specified. Form bent metal corners to the smallest radius possible without causing grain separation or otherwise impairing the Work.
- C. Weld corners and seams continuously and in accordance with the recommendation of AWS. Provide 45 degree mitered corners. Grind exposed welds smooth and flush to match and blend with adjoining surfaces. Discoloration of finished surfaces of materials not to be painted will not be acceptable.
- D. Form exposed connections with hairline joints which are flush and smooth using concealed fasteners wherever possible. Use exposed fasteners of the type shown or if not shown, use flathead (countersunk) screws or bolts.
- E. Cut, reinforce, drill, and tap miscellaneous metal fabrications Work as may be required to receive finish hardware and similar items of Work.
- F. Use hot-rolled steel bars for Work fabricated from bar stock, unless Work is otherwise shown or specified to be fabricated from coldfinished or cold-rolled stock.

3.2 INSTALLATION

- A. Set miscellaneous metal fabrications accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels.
- B. Anchor securely as shown or as required for the intended use, using concealed anchors wherever possible. Comply with the following:
 - 1. Drilling equipment used and installation of expansion anchors shall be in accordance with manufacturer's instructions.
 - 2. Assure that embedded items are protected from damage and are not filled in with concrete.
 - 3. Expansion anchors may be used for hanging or supporting 2-inch diameter pipes and smaller. Expansion anchors shall not be used for larger pipe unless otherwise shown or approved by ENGINEER.
 - 4. Use concrete inserts for pipe hangers and supports for the pipe size and loading recommended by the insert manufacturer.
 - a. Minimum embedment depth in concrete: 5 diameters.
 - b. Minimum anchor spacing on centers: 10 diameters
 - c. Minimum distance to edge of concrete: 5 diameters.
 - d. Increase dimensions above if required to develop the required anchor load capacity.
- C. Fit exposed connections accurately together to form tight hairline joints. Weld steel connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind steel joints smooth and touch up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- D. Protection of Aluminum from Dissimilar Materials: Using approved washers, strips or sheets of felt, and coating specified in Section 09900, Painting, protect all surfaces of aluminum from contact with dissimilar materials such as concrete, masonry, steel, nonferrous metals, etc.

++ END OF SECTION ++

SECTION 09900

PAINTING

PART 1 - GENERAL

1.1 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 all painting Work.
 - a. CONTRACTOR shall be responsible for surface preparation and painting Work for all new exterior items and surfaces throughout the Project areas as described in this Section.
2. Extent of painting Work is specified. All surfaces of the generic types specified in Article 2.4, below shall be painted according to their status, intended function and location in the Work, using the painting system for that surface, function and location as specified, whether or not indicated on any Schedule or Drawing.
3. Types of painting Work required include, but are not necessarily limited to, the following:
 - a. Surface preparation and painting of all new items and other surfaces, included in the Work, except as otherwise shown or specified.
 - b. Approved stepped-down job mock-ups for all painting systems showing all components of the surface preparation and paint system application before the start of any Work. Check all dry film thicknesses, demonstrate methods of surface preparation and methods of application in addition to obtaining approval from ENGINEER of colors and textures to be used in the finished Work.
4. The term "paint" in this Section means all coating system materials, which includes pretreatment, primer, emulsion, enamel, organic/inorganic polymer coating, stain sealer and filler, and other applied materials whether used as prime, intermediate or finish coats.
5. Painting systems and required surface preparations, are specified in Article 2.4, below. Paint all new exposed surfaces and items except where the natural finish of the material is specified as a corrosion-resistant surface not requiring paint, or is specifically shown or specified as a surface not to be painted. The term "exposed" in this Section means all items not covered with cement plaster, concrete or fireproofing. Provide items covered with these materials with specified primer only, except where specified as a surface not to be painted. The requirements for "exposed-to-view" surfaces are specified in Article 3.4.A.4.a. Where items or surfaces are not specifically mentioned, paint them the same as adjacent similar materials or areas.
6. Items to be painted include, but are not limited to, the following:
 - a. Piping, pipe hangers, and supports.
 - b. Ductwork.

c. Accessory items.

B. Coordination:

1. Review installation procedures under other Sections and coordinate them with the Work specified herein.
2. Coordinate the painting of areas that will become inaccessible once equipment, laboratory furniture, lockers and similar fixed items, provided under the Contract and by other contractors, has been installed.
3. Coordinate primers with finish paint materials in order to provide primers which are compatible with finish paint materials used. Review other Sections in which primers are to be provided in order to ensure compatibility of the total painting system for the various surfaces. CONTRACTOR shall be responsible for coordinating the compatibility of all shop-primed and field-painted items in other Sections.
4. Furnish information on the characteristics of the finish materials proposed for use, to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and repaint as required. Notify ENGINEER, in writing, of anticipated problems using the specified painting systems with surfaces primed by others. Reprime all factory-primed equipment that is damaged or scratched.

C. Related Sections:

1. Section 15812, Corrosion Resistant Ductwork, Dampers and Accessories.
2. Section 15220, Pipe Hangers and Supports.

D. Work Not Included: The following categories of Work are not included as part of the painting Work, or are included in other Sections.

1. Shop-Priming: Shop-priming of structural metal, miscellaneous metal fabrications, other metal items and fabricated components such as shop-fabricated or factory-built heating and ventilating and electrical equipment or accessories shall conform to applicable requirements of this Section but is included under other Sections of this Specification.
2. Pre-finished Items:
 - a. Items furnished with such finishes as baked-on enamel, porcelain and polyvinylidene fluoride shall only be touched up in the field using Suppliers recommended compatible field-applied touchup paint.
 - b. Items furnished with such finishes as chrome plating, anodizing, or where the natural oxide of the item forms a longterm barrier to corrosion, whether factory or Site formed, such as copper, bronze or muntz metal.
3. Concealed Surfaces:
 - a. Nonmetallic wall or ceiling surfaces in areas concealed from view and generally inaccessible areas such as furred spaces, pipe chases and duct.
 - b. Refer to type of painting Work included for requirements for painting all piping, equipment and similar items within these areas that do not have a galvanized or corrosion-resistant finish.
4. Concrete floors.
5. Glazed structural tile and prefaced, ground-faced or split-faced concrete unit masonry.

6. Exterior face of architectural precast concrete, except for custom medallions shown and specified.
7. Collector bearings, shafts and chains, wood flights, wood stop logs and wood baffles.
8. Corrosion-Resistant Metal Surfaces: Surfaces of zinc, terne metal and stainless steel.
9. Operating Parts and Labels:
 - a. Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sensing devices, interior of motors and fan shafts.
 - b. Do not paint over labels required by building code or other governing authority, such as Factory Mutual, Underwriters' Laboratory, or any equipment identification, performance rating, name or nomenclature plates.
 - c. Cover these labels during the painting Work with protective masking. Remove all protective masking upon completion of Work. Remove all paint, coatings or splatter which comes in contact with such labels.

1.2 QUALITY ASSURANCE

- A. Applicator Qualifications:
 1. Submit the name and experience record of the applicator. Include a list of utility or industrial installations. Provide ENGINEER with names and telephone numbers of owners, architects, or engineers responsible for the project and the approximate contract price.
 2. Applicators whose submittals indicate that they have not had the type of successful experience required to perform the kinds of Work required will not be approved.
- B. Source Quality Control: Obtain materials only from manufacturers who will:
 1. Provide the services of a qualified manufacturer's representative at the Site at the commencement of painting Work to advise on materials, job mock-ups, installation and finishing techniques, at the completion of the Work to advise ENGINEER on the acceptability of completed Work, and during the course of the Work as may be requested by ENGINEER.
 2. Certify long term compatibility of all coatings with surfaces.
- C. Preinstallation Meeting: Before erecting job mock-up, CONTRACTOR, its applicator and representatives of the painting system(s) manufacturer shall meet on-site with ENGINEER to discuss approved products and workmanship in order to ensure proper application of painting systems components and substrate preparation requirements for the Work.
- D. Stepped-Down Job Mock-Ups:
 1. Demonstrate installation of specified painting system(s) on actual wall surfaces and building components at locations selected by ENGINEER.
 2. Provide 4 foot - 0 inch by 8 foot - 0 inch long stepped-down sample panel for each painting system. Prior to the application of a painting system, but after

ENGINEER'S approval of the components of each painting system, apply a 4 foot - 0 inch wide sample of each operation and application step required by the Specification and the specified manufacturer's written application recommendations. Each application step shall be shown as a 2 foot - 0 inch long section which shall remain exposed in order to show ENGINEER the Work performed by that step. Continue application procedures until top coat is provided. Top coat shall be a minimum of 2 foot - 0 inches long. Finished job mock-up for each paint system, when completed, shall reveal each step and each coat of paint required for the paint system with 2 foot - 0 inch wide strips revealing Work performed to prepare the surface and apply each coat. Lengthen overall mock-up as may be required in order to completely demonstrate each painting system. Use tinted shades differing from coat to coat for each component of each painting system.

3. ENGINEER may approve or disapprove each component of each painting system on an individual component basis.
 4. Painting system Work that does not meet the standard approved on the sample areas shall be removed and replaced with new material.
 5. Painting system Work advanced without approved job mock-ups shall be completely removed and re-installed, after job mock-up approval by ENGINEER, at no additional cost to OWNER.
- E. Requirements of Regulatory Agencies:
1. Coatings for surfaces in contact with potable water or water being treated for potable use shall not impart any taste or odor to the water or result in any organic or inorganic content in excess of the maximum allowable contaminant level established by applicable Laws and Regulations. All such coatings shall be approved by the applicable regulatory agency. Revise painting systems specified herein to provide supplier's regulatory agency approved coating system(s) where required.
 2. Comply with governing regulations for air quality and material disposal regulations. Revise painting systems specified herein in order to provide supplier's regulatory agency approved coating systems where required.
- F. Reference Standards: Comply with applicable provisions and recommendations of the following, except where otherwise shown or specified:
1. ANSI A13.1: Scheme for the Identification of Piping Systems.
 2. ANSI Z535.1: Safety Color Code.
 3. ANSI/NSF Standard 60: Drinking Water Chemicals - Health Effects
 4. ANSI/NSF Standard 61: Drinking Water System Components - Health Effects.
 5. Steel Structures Painting Council, SSPC - Volume 2, Systems and Specifications.
 6. Steel Structures Painting Council, SSPC - VIS 1, Visual Standard for Abrasive Blast Cleaned Steel.
 7. Steel Structures Painting Council, SSPC - VIS 2, Visual Standard for Evaluating Degree of Rusting on Painted Steel Surfaces.
 8. Code of Federal Regulations, 29 CFR 1910.144: Safety Color Code for Marking Physical Hazards.

1.3 SUBMITTALS

- A. Samples: Submit for approval the following:
1. Samples for ENGINEER'S review of all color chip options available from specified manufacturer. Include copies of manufacturer's complete color charts for each coating system.
 2. Cards approximately 8-inches by 12-inches accurately representative of colors, selected by ENGINEER for use in the painting Work, shall be provided for ENGINEER'S final review and approval.
- B. Shop Drawings: Submit for approval the following:
1. Copies of manufacturer's technical information, including paint analysis and application instructions for each material proposed for use. Provide Material Safety Data Sheets for each product. Show by copy of transmittal form that a copy of each MSDS has been transmitted to the painting applicator and other employees of CONTRACTOR and all other contractors who may be present near, or who may come in contact with, the painting Work.
 2. Submit proof of acceptability of proposed application techniques by the paint manufacturer selected.
 3. Copies of CONTRACTOR'S proposed protection procedures in each area of Work explaining methods of protecting adjacent surfaces from splatter, for confining application procedures in a manner which allows other work adjacent to surface preparation and painting Work to proceed safely and without interruption, and for maintaining acceptable application, curing and environmental conditions during and after painting system(s) application.
 4. List each material and cross-reference to the specific painting system and application. Identify by manufacturer's catalog number and general classification. State number of gallons of each product being purchased and the square foot area calculated to be covered by each painting system specified. Calculated coverage shall be as specified for each component of each painting system specified. This requirement shall not take precedence over CONTRACTOR'S responsibility to provide dry film thickness required for each component of each painting system.
 5. Identify maximum exposure times allowable for each paint system component before the next coat of paint must be applied. Submit proposed methods for preparing surfaces for subsequent coats if maximum exposure times are exceeded.
 6. Information on curing times and environmental conditions which will affect the curing time of each system component and proposed methods for accommodating variations in curing time. Identify this information for each painting system used in the Work.
 7. Specification for spray equipment with cross-reference to paint manufacturer's recommended equipment requirements.
 8. Maintenance Manual: Upon completion of the painting Work, furnish ENGINEER copies of detailed maintenance manual including the following information:
 - a. Complete and updated product catalog of paint manufacturer's currently available products including complete technical information on each

- product. Identify product names and numbers of each product used in the painting Work.
- b. Name, address and telephone number of manufacturer, local distributor, applicator and technical representative.
 - c. Detailed procedures for routine maintenance and cleaning.
 - d. Detailed procedures for light repairs such as dents, scratches and staining.
- C. Certificates: Submit for approval the following:
1. Certificate stating that materials meet or exceed Specification requirements.
 2. Provide notarized statement verifying that all painting systems are compatible with surfaces specified and that each painting systems' components have been reviewed by an authorized technical representative of the paint manufacturer for use as a compatible system and are acceptable for the exposures specified and that the manufacturer is in agreement that the selected systems are proper, compatible and are not in conflict with the paint manufacturer's recommended specifications. Show by copy of transmittal form that a copy of the letter has been transmitted to the paint manufacturer.
- D. Statement of Application: Upon completion of the painting Work, submit a notarized statement to ENGINEER signed by CONTRACTOR and painting applicator stating that the Work complies with the requirements of these Specifications and that application methods, equipment and temperatures were proper and adequate for the conditions of installation and use.
- E. Test Reports: Submit for approval certified laboratory test reports for required performance and analysis testing.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Delivery of Materials: Deliver all materials to the Site in original, new and unopened packages and containers bearing supplier's name and label, and the following information:
1. Name and title of material.
 2. Manufacturer's stock number and date of manufacture.
 3. Manufacturer's name.
 4. Contents by volume, for major pigment and vehicle constituents.
 5. Thinning instructions where recommended.
 6. Application instructions.
 7. Color name and number.
- B. Storage of Materials:
1. Store only acceptable painting system components at the Site.
 2. Store in an environmentally controlled location as recommended by paint manufacturer's written product information guidelines. Keep area clean and accessible.
 3. Store materials not in actual use in tightly covered containers.
 4. Comply with governing health and fire regulations.

C. Handling of Materials:

1. Handle materials in a manner which precludes the possibility of contamination, or incorrect product catalyzation.
2. Do not open containers or mix components until necessary preparatory Work has been completed and approved by ENGINEER and painting Work will start immediately.
3. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.

1.5 JOB CONDITIONS

A. Site Facilities:

1. Supplemental heat sources, as may be required to maintain both ambient and surface temperatures within the range recommended by the manufacturer for paint system applications, are not available at the Site.
2. The provision of all supplemental heat energy sources and equipment is the responsibility of CONTRACTOR.
3. Heat sources which emit carbon dioxide or carbon monoxide into areas being painted shall not be used in the Work. Provide all such heat sources properly vented to the exterior and located such that paint systems are unaffected by exhaust products.

B. Existing Conditions:

1. Before painting is started in any area, all surfaces to be painted and floors shall be cleaned of all dust using commercial vacuum cleaning equipment equipped with high-efficiency particulate air filters (HEPA filters) and dust containment systems.
2. After painting operations begin in a given area cleaning shall be done only with commercial vacuum cleaning equipment.

C. Environmental Requirements:

1. Apply water-base paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 55°F and 90°F, unless otherwise permitted by the paint manufacturer's printed instructions.
2. Apply other paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 65°F and 95°F, unless otherwise permitted by the paint manufacturer's printed instructions.
3. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; to damp or wet surfaces or when surfaces will reach dew point due to falling or rising temperatures and humidity conditions during the course of the paint application.
4. Do not paint pipelines and other unacceptably hot or cold surfaces until such surfaces can be maintained within temperature and dew point ranges acceptable to manufacturer. CONTRACTOR shall arrange for such surfaces to be brought within acceptable temperature and dew point ranges as part of the painting Work.

5. Moisture content of surfaces shall be verified to ENGINEER as acceptable to permit the commencement of the painting Work using methods recommended by the specified manufacturer.
6. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.
7. Provide adequate illumination and ventilation in all areas where painting operations are in progress.

D. Pre-Painting Conference:

1. Prior to the installation of painting systems and associated Work, CONTRACTOR shall arrange a meeting at the Site with the painting applicator and its foreman, the paint manufacturer's technical representative, the installers of other work in and around the painting system Work which must follow the painting Work, ENGINEER and other representatives directly concerned with performance of the painting Work. Record the discussions of the conference and the decisions and agreements (or disagreements) and furnish a copy of the record to each party attending. Review foreseeable methods and procedures related to the painting Work, including but not necessarily limited to, the following:
 - a. Review project requirements including Contract Documents, approved Shop Drawings, pending and approved Change Orders and requests for information which may have been submitted by CONTRACTOR to ENGINEER.
 - b. Review required samples and submittals, both completed and yet to be completed.
 - c. Review status of substrate including drying, surface preparations and similar considerations.
 - d. Review availability of materials, tradesman, equipment and facilities needed to make progress, avoid delays and protect the Work from damaging conditions.
 - e. Review required inspection, testing, certifying and quality control procedures.
 - f. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.
 - g. Review regulations concerning code compliance, environmental protection, health, safety, fire and similar considerations.
2. Reconvene the meeting at the earliest opportunity if additional information must be developed in order to conclude the subjects under consideration.
3. Record any revisions or changes agreed upon, reasons therefore, and parties agreeing or disagreeing with them.

E. Protection:

1. Cover or otherwise protect finished Work of other trades and surfaces not being painted concurrently or not to be painted.
2. Coordinate and schedule surface preparation and painting Work to avoid exposing employees of CONTRACTOR, OWNER, ENGINEER, contractors and others who are not involved with the surface preparation and painting

Work to the Work of this Section. Provide required personnel safety equipment in compliance with governing authorities.

3. Submit protection procedures to be employed by CONTRACTOR to ENGINEER. Do not begin surface preparation and painting Work in any area until ENGINEER approves protection techniques proposed by CONTRACTOR.
4. Comply with applicable governing code requirements for air quality and material disposal regulations.
5. Provide fire extinguishers and post caution signs warning against smoking and open flame when working with flammable materials.

PART 2 - PRODUCTS

2.1 MATERIAL QUALITY

- A. The use of catalog numbers and the specific requirements set forth in the Specifications, are not intended to preclude the use of any other acceptable manufacturer's products which may be equivalent, but are given for the purpose of establishing a standard of design and quality of materials, application and workmanship. Where catalog numbers are out of date at time of bidding because of catalog revisions, provide products equal in quality to those specified.

2.2 SUBSTITUTIONS

- A. No substitutions shall be considered that decrease the film thickness, the number of coats, percent solids, the surface preparation or the generic type and formulation of coating(s) specified.
- B. All "or equal" products shall be submitted with direct comparison to products specified including information on durability, color and gloss retention, percent solids, VOC's per gallon and recoatability after curing.
- C. Approved manufacturers shall furnish the same color selection as the manufacturer specified, including intense chroma and custom pigmented colors in all painting systems.

2.3 COLORS AND FINISHES

- A. Color Selection:
 1. A maximum of 20 different colors shall be selected for the painting Work, in addition to color coding of all pipelines, valves, equipment, ducts and electrical conduit.
 2. At least one intense chroma or custom pigmented color may be selected by ENGINEER, at time of Shop Drawing review, for one wall in each room where walls are scheduled to receive paint.
 3. ENGINEER reserves the right to select non-standard colors for all paint systems specified within the ability of the manufacturer to produce such non-

standard colors. CONTRACTOR shall supply such colors at no additional expense to OWNER.

B. Color Coding of Pipelines, Valves, Equipment and Ducts:

1. In general, all color coding of pipelines, valves, equipment and ducts shall comply with applicable standards of ANSI A13.1, ANSI Z535.1 and OSHA 1910.144.
2. For equipment located on roofs or where exposed to public view such as on exterior building facades, or in offices or lobbies, the color shall be selected by ENGINEER.
3. Color Coding of Pipelines and Equipment:
 - a. Finish coats of paint for pipelines and equipment shall be coded in basic colors. Colors shall be brilliant, distinctive shades matching the following safety colors In accordance with ANSI Z535.1 color specifications for safety colors and other basic colors:

TABLE OF STANDARD COLORS

<u>Color</u>	<u>Designation</u> *
White	Safety White; WH01
Yellow	Safety Yellow; SC01
Orange	Safety Orange; SC03
Red	Safety Red; SC09
Black	Safety Black; IN06
Blue	Safety Blue; SC06
Green	Safety Green; SC07
Gray	"Gray-ANSI 61"; IN05
Light Gray	"Battleship Gray"; GR13
<u>Color</u>	<u>Designation</u> *
Charcoal	"Graphite"; GR32
Brown	"Chipmunk"; YB23
Light Green	"Misty Jade"; GB38

*Color designations are provided as Tnemec Company, Incorporated paint color numbers and are provided as a standard of quality; equivalent colors matching these colors will be acceptable to ENGINEER. Provide ENGINEER with direct color comparisons of color numbers available from manufacturer submitted at time of Shop Drawing submission.

4. Vents and drains shall be in the same color combination as the contents of tanks and equipment vented and drained.
5. The color of the final coats shall match as closely as possible, without custom blending, the color tabulated under the specific pipeline service.

C. After approval by ENGINEER of colors and Shop Drawing submittals and prior to beginning painting Work, ENGINEER will furnish color schedules for surfaces to be painted listed in Article 2.4, below.

- D. Color Pigments: Provide pure, nonfading, applicable types to suit the surfaces and services indicated. Comply with the following:
1. Lead and Chromate: Lead and chromate content shall not exceed amount permitted by Laws and Regulations.
 2. Manufacturer shall identify colors which meet the requirements of governing standards for use in locations subject to contact with potable water or water being prepared for use as potable water.
 3. Comply with manufacturers' recommendations on preventing coating contact with levels of carbon dioxide and carbon monoxide which could cause yellowing during application and initial stages of curing of paint coatings.

2.4 PAINTING SYSTEMS

- A. (NOT USED).
- B. (NOT USED).
- C. Ferrous Metals, Non-Ferrous Metals, Fiberglass and Galvanized Metals; Non-Submerged, Exterior:
1. Surface Preparation:
 - a. Ferrous Metals: SSPC-SP6 Commercial Blast Cleaning. Prepare as specified in Article 3.2.B.
 - b. Galvanized and Non-Ferrous Metal: Lightly sand as specified in Articles 3.2.C and 3.2.D.
 - c. Fiberglass: Lightly sand as specified in Article 3.2.E.
 2. Product and Manufacturer: Provide one of the following:
 - a. Tnemec Company, Incorporated:
 - 1) Primer:
 - a) Ferrous Metals: Series 66 High-Build Epoxoline - 2 coats, 1.5-2.5 dry mils per coat, 280-475 square feet per gallon per coat.
 - b) Galvanized and Non-Ferrous: Lightly sand as specified in Articles 3.2.D and 3.2.E.
 - 2) Intermediate:
 - a) Provide a high-build, two-component, polyamide-catalyzed epoxy touchup, recommended by the manufacturer's product literature as providing the same adhesion to polyamide epoxy, zinc and similar non-metallic surfaces as the product specified; containing 3.08 pounds per gallon VOC maximum.
 - b) Series 66-1211 High-Build Epoxoline - 1 coat, 3.0-5.0 dry mils, 140-240 square feet per gallon.
 - 3) Finish:
 - a) Provide a high-solids, two-component, aliphatic acrylic polyurethane coating, recommended by the manufacturer's product literature as providing the same high resistance to abrasion as the product specified; containing 3.2 pounds per gallon VOC maximum.

- b) Series 73 Endura-Shield - 1 coat, 2.0-3.0 dry mils, 240-370 square feet per gallon.
- 4) Topcoat:
 - a) Provide a high-solids, three-component, clear aliphatic acrylic polyurethane coating, recommended by the manufacturer's product literature as providing four times the color retention capability than uncoated polyurethane surfaces; containing 2.4 pounds per gallon VOC maximum.
 - b) Series 76 Endura-Clear - 1 coat, 1.5-2.0 dry mils, 430-580 square feet per gallon.

b. Or equal.

D. (NOT USED).

E. (NOT USED).

F. Aluminum in Contact with Dissimilar Materials:

1. Surface Preparation: Remove all foreign matter and lightly sand. Surfaces shall be clean and dry.
2. Product and Manufacturer: Provide one of the following:
 - a. Tnemec Company, Incorporated:
 - 1) Primer:
 - a) Provide a 56 percent volume, minimum, solids, high-build, two-component, polyamide-catalyzed epoxy; containing 3.40 pounds per gallon VOC, maximum.
 - b) Series 69N Hi-Build Epoxoline (TCI) – One coat, 2.0 to 3.0 dry mils, 240 to 360 square feet per gallon.
 - 2) Finish:
 - a) Minimum 80 percent volume, minimum, solids, high-build, two-component, cycloaliphaticamine-catalyzed epoxy coating, recommended by manufacturer's product literature as providing the same maximum long-term chemical and corrosion protection as the product series of manufacturer specified; containing 1.55 pounds per gallon VOC, maximum.
 - b) Series 69N Hi-Build Epoxoline (TCI) – One coat, 2.0 to 3.0 dry mils, 240 to 360 square feet per gallon.

b. Or equal.

G. (NOT USED).

H. (NOT USED).

I. (NOT USED).

J. (NOT USED).

PART 3 - EXECUTION

3.1 INSPECTION

- A. CONTRACTOR and his applicator shall examine the areas and conditions under which painting Work is to be performed and notify ENGINEER, in writing, of conditions detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to ENGINEER.
- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film capable of performing in accordance with claims made in manufacturer's product literature for the surfaces and conditions encountered.
- C. Do not paint over existing paint where there is no assurance that existing paint will provide an acceptable surface for the longterm adherence and durability of painting systems specified or where the supplier requires removal of all existing paint in order to recommend the painting system specified for its intended use.

3.2 SURFACE PREPARATION

- A. General:
 - 1. Test for moisture content of surfaces before commencement of the painting Work. Use test methods recommended by specified manufacturer's authorized representative and report results to ENGINEER before commencing Work.
 - 2. Perform all preparation and cleaning procedures as specified herein and in strict accordance with paint manufacturer's instructions for each particular surface and atmospheric condition.
 - 3. Scarify primers and other painting system components by brush-blasting if coatings have been exposed for lengths of time or under conditions beyond the supplier's written recommendations for the coatings involved, the intended use, or the method of application proposed for subsequent coats of paint.
 - 4. CONTRACTOR shall remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items already in-place and that do not require field-painting, or provide effective surface-applied protection prior to surface preparation and painting operations.
 - 5. CONTRACTOR shall remove, as necessary, items which must be field-painted where adjacent surfaces cannot be completely protected from splatter or overspray. Following completion of painting of each space or area, the removed items shall be reinstalled by workmen skilled in the trades involved.
 - 6. Clean surfaces to be painted before applying any painting system components. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Schedule the cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
 - 7. Prepare all surfaces which were improperly shop-painted, and all abraded or rusted shop-painted surfaces, as specified.

- B. Ferrous Metals:
1. Clean non-submerged ferrous surfaces including structural steel and miscellaneous metal to be shop-primed, of all oil, grease, dirt, mill scale and all other contamination and foreign matter by commercial blast cleaning complying with SSPC-SP6, at the time of paint system application, using SSPC VIS 1 as a standard of comparison.
 2. Clean submerged ferrous surfaces including structural steel and miscellaneous metal to be shop-primed, of all oil, grease, dirt, mill scale and other foreign matter by near-white blasting complying with SSPC-SP10, at the time of painting system application, using SSPC VIS 1 as a standard of comparison.
 3. Clean non-submerged, ferrous surfaces that have not been shop-coated of all oil, grease, dirt, loose mill scale and other foreign substances by commercial blasting complying with SSPC-SP6, at the time of painting system application, using SSPC VIS 1 as a standard of comparison.
 4. Clean submerged ferrous surfaces that have not been shop-coated or that have been improperly shop-coated, of all oil, grease, dirt, mill scale and all other contamination and foreign matter by near-white blasting complying with SSPC-SP10, at the time of painting system application, using SSPC VIS 1 as a standard of comparison.
 5. Touch-up shop-applied prime coats which have damaged or have bare areas, with primer recommended by the coating manufacturer after commercial blasting complying with SSPC-SP6, at the time of painting system application, using SSPC VIS 1 as a standard of comparison, to provide a surface profile of not less than 1 mil.
 6. Power tool clean, complying with SSPC-SP3, in order to remove welding splatter and slag.
- C. Non-Ferrous Metal Surfaces: Lightly whip-blast or sand with 60-80 mesh sandpaper.
- D. Galvanized Surfaces: Prepare all galvanized surfaces for painting by sanding with 60-80 mesh sandpaper. Lightly sand all surfaces.
- E. PVC and CPVC Piping and Fiberglass: Lightly sand and clean all surfaces to be painted.
- F. Covering on Pipe Insulation:
1. Remove all oil and surface contaminants as recommended by the coating supplier for surface and application required.
 2. Do not cut or damage the insulation in any way.
- G. Gypsum Wallboard:
1. Patch, sand and seal all rough spots before apply prime coat. Remove all dust and other contaminants prior to painting.
 2. Touch-up all suction spots and hot spots with primer before application of finish coats.

3.3 MATERIALS PREPARATION

A. General:

1. Mix and prepare painting materials in strict accordance with the supplier's product literature.
2. Do not mix painting materials produced by different manufacturers, unless otherwise permitted by the manufacturer's instructions.
3. Where thinners are required in the Work, they shall be produced by the paint system manufacturer, unless otherwise permitted by the manufacturer's product literature, submitted to ENGINEER at the time of Shop Drawing approval.

B. Tinting:

1. Tint each undercoat a lighter shade to facilitate identification of each coat of paint where multiple coats of the same material are to be applied.
2. Tint undercoats to match the color of the finish coat of paint, but provide sufficient difference in shade of undercoats to distinguish each separate coat. Provide a code number to identify material tinted by the manufacturer.

C. Mixing:

1. Be prepared to maintain those products requiring constant agitation, using methods in compliance with the manufacturer's product literature, in order to prevent settling during paint application.
2. Mix only in containers placed in suitably sized non-ferrous or oxide resistant metal pans to protect concrete floors from slashes or spills which could stain exposed concrete or react with subsequent finish floor material.
3. Mix and apply paint only in containers bearing accurate product name of material being mixed, or applied.
4. Stir all materials before application to produce a mixture of uniform density, and as required during the application of the materials. Do not stir any film which may form on the surface into the material. Remove the film and, if necessary, strain the material before using.
5. Strain products requiring such mixing procedures. After adjusting mixer speed to break up lumps and after components are thoroughly blended, strain through 35 to 50 mesh screen before application.

3.4 APPLICATION

A. General:

1. Apply paint systems by brush, roller, or airless spray in accordance with the manufacturer's directions and recommendations of Paint Application Specifications No. 1 in SSPC Vol. 2, where applicable. Use brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high pile sheeps wool as recommended by the paint manufacturer for material and texture required. Use air spray and airless spray equipment recommended by the paint manufacturer for specific coating system specified. Submit a list of application methods proposed, listing paint systems and location.

2. Paint film thicknesses required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried.
3. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. This is of particular importance regarding intense chroma primary colors. Insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.
4. Surfaces of items not normally exposed-to-view do not require the same color as other components of the system of which they are a part, but require the same coating system specified for exposed surfaces of the system.
 - a. "Exposed-to-view surfaces" is defined as those areas visible when permanent or built-in fixtures, convector covers, ceiling tile, covers for finned tube radiation, grilles, etc. are in-place in areas scheduled to be painted.
5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint before final installation of equipment.
6. Paint the backs of access panels, and removable or hinged covers, to match the exposed surfaces.
7. Paint aluminum parts in contact with dissimilar materials with specified paint system.
8. Paint exterior doors on tops, bottoms, and side edges, the same as exterior surfaces.
9. Omit field-primer on metal surfaces which have been shop-primed. Touch-up paint shop-primed coats and pre-finished items only when approved by ENGINEER using compatible shop primers and manufacturer's recommended compatible field-finishes.
10. Paint the backs of access panels, and removable or hinged covers to match the exposed surfaces.
11. Surfaces to be painted shall be at least 5°F above the dew point temperature.
12. Tanks containing water shall not be painted without specific permission of ENGINEER, and only under conditions where "sweating" of the tank outside surface is not likely to occur within 24 hours of application.
13. Epoxy paints shall not be applied if ambient temperature is expected to go below 50°F within 12 hours of application.
14. Welds shall be stripe-coated with intermediate or finish coat of paint after application of prime coat.

B. Minimum/Maximum Paint Film Thickness:

1. Apply each material at not less than, nor more than, the manufacturer's recommended spreading rate, and provide total dry film thickness as specified.
2. Apply additional coats of paint if required to obtain specified total dry film thickness.
3. Maximum dry film thickness shall not exceed 150 percent of minimum dry film thickness.

C. Scheduling Painting:

1. Apply the first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 2. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
- D. Prime Coats: Recoat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects caused by insufficient sealing.
- E. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage.
- F. Brush Application:
1. Brush-out and work all brush coats onto the surfaces in an even film. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable. Neatly draw all glass and color break lines.
 2. Brush apply all primer or first coats, unless otherwise permitted to use mechanical applicators.
- G. Mechanical Applicators:
1. Use mechanical methods for paint application when permitted by governing ordinances, paint and coating supplier, and approved by ENGINEER. If permitted, limit to only those surfaces impracticable for brush applications.
 2. Limit roller applications, if approved by ENGINEER, to interior wall finishes for second and third coats. Apply each roller coat to provide the equivalent hiding as brush-applied coats.
 3. Wherever spray application is used, apply each coat to provide the equivalent hiding of brush-applied coats. Do not double back with spray equipment for the purpose of building up film thickness of two coats in one pass.
- H. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish, or repaint Work not in compliance with specified requirements as required by ENGINEER.

3.5 FIELD QUALITY CONTROL

- A. The right is reserved by ENGINEER to invoke the following material testing procedure at any time, and any number of times, during the period of field painting:
1. Engage the service of an independent testing laboratory to sample any of the paints being used. Samples of materials delivered to the Site will be taken, identified and sealed, and certified as to being the material actually applied to the surfaces in each area, in the presence of CONTRACTOR.
 2. The testing laboratory will perform appropriate tests for any or all of the following characteristics:

- a. Abrasion resistance.
 - b. Apparent reflectivity.
 - c. Flexibility.
 - d. Washability.
 - e. Absorption.
 - f. Accelerated weathering.
 - g. Dry opacity.
 - h. Accelerated yellowness.
 - i. Recoating.
 - j. Skinning.
 - k. Color retention.
 - l. Alkali resistance.
 - m. Quantitative materials analysis.
3. If the test results show that the material being used does not comply with the specified requirements, CONTRACTOR may be directed to stop painting and remove non-complying paint; pay for testing; and recoat surfaces coated with the rejected paint Work with material complying with the Specifications.
- B. After completion of each coat of paint CONTRACTOR shall notify ENGINEER. After inspection and checking of film thickness, and for other imperfections, and after approval by ENGINEER, proceed with the succeeding coat. CONTRACTOR shall purchase for OWNER two new dry-film thickness gages for checking the film thickness and one set of visual standards to check surface preparation. Dry film thickness gage shall be calibrated at the Site using Bureau of Standards standard shim blocks. CONTRACTOR shall provide one holiday detector for holiday testing. The holiday detector will remain the property of CONTRACTOR.
- 1. Product and Manufacturer: Provide the following:
 - a. Film Thickness Tester: Model FM-III as manufactured by Mikrotest, (Furnish Two).
 - b. Holiday Detector: Model M-1 as manufactured by Tinker & Razor.
 - c. Visual Standards - ASTM D 2200, Swedish Standards, SSPC (VIS 1).
 - 2. ENGINEER shall witness all holiday testing and shall be notified of all scheduled testing 24 hours in advance.
 - 3. Additional coats shall be applied, if required, to produce the specified film thickness.
 - 4. Holiday testing shall be performed by CONTRACTOR.

3.6 PROTECTION

- A. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove all temporary protective wrappings provided for protection of this Work and the work of other contractors after completion of painting operations.

3.7 ADJUSTMENT AND CLEAN-UP

- A. Correct all damages to the work of other trades by cleaning, repairing or replacing, and repainting, as acceptable to ENGINEER.

- B. During the progress of the Work, remove from the Site all discarded paint materials, rubbish, cans and rags at the end of each Work day.
- C. Upon completion of painting, clean all paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- D. At the completion of Work of other trades, touch-up and restore all damaged or defaced painted surfaces as determined by ENGINEER.

++ END OF SECTION ++

SECTION 15052

EXPOSED PIPING INSTALLATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope:

1. CONTRACTOR shall provide all labor, materials, equipment and incidentals as shown, specified and required to furnish and install and test all exposed piping, fittings, and specials. The Work includes, but is not limited to, the following:
 - a. All types and sizes of exposed piping, except those specified under other Sections.
 - b. Piping embedded in concrete within a structure or foundation will be considered as exposed and included herein.
 - c. Supports, restraints, thrust blocks and other anchors.
 - d. Work on or affecting existing piping.
 - e. Testing.
 - f. Cleaning and disinfecting.
 - g. Installation of all jointing and gasketing materials, specials, flexible couplings, mechanical couplings, harnessed and flanged adapters, sleeves, tie rods, and all other Work required to complete the exposed piping installation.
 - h. Incorporation of valves, meters and special items shown or specified into the piping systems as required and as specified in the appropriate Division 15, Mechanical, Sections.
 - i. Unless otherwise specifically shown, specified, or included under other Sections, all exposed piping Work required, beginning at the outside face of structures or structure foundation and extending into the structure.

B. Coordination:

1. Review installation procedures under other Sections and coordinate with the Work that is related to this Section.
2. Section 15052, Exposed Piping Installation, specifies the installation of all exposed piping materials specified in Division 15, Mechanical. Coordinate with these Sections.

C. Related Sections:

1. Section 03300, Cast-In-Place Concrete.
2. Section 09900, Painting.
3. Section 15220, Pipe Hangers and Supports.

4. Section 15812, Corrosion Resistant Ductwork, Dampers and Accessories.

1.2 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies:
 1. Comply with applicable requirements of NFPA Standard No. 13 for "Installation of Sprinkler Systems" and NFPA Standard No. 14 for "Standpipe and Hose Systems" used for fire protection.
 2. Comply with requirements of UL, FM and other jurisdictional authorities, where applicable.
 3. Refer to the General and Supplementary Conditions regarding requirements for this Project.

- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
 1. ANSI B13.1, Code for Pressure Piping.
 2. ANSI B16.3, Malleable-Iron Threaded Fittings, Classes 150 and 300.
 3. ANSI B16.4, Cast Iron Threaded Fittings, Classes 125 and 250.
 4. ANSI B16.5, Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.
 5. ANSI B16.9, Factory-Made Wrought Steel Butt Welding Fittings.
 6. ANSI B16.11, Forged Steel Fittings, Socket-Welding and Threaded.
 7. ANSI D1.1, Structural Welding Code.
 8. AWWA C111, Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 9. AWWA C206, Field Welding of Steel Water Pipe Joints.
 10. AWWA C600, Installation of Ductile Iron Water Mains and Their Appurtenances.
 11. AWWA C606, Grooved and Shouldered Type Joints.
 12. AWWA C651, Disinfecting Water Mains.
 13. AWWA M11, Steel Water Pipe Design and Installation.
 14. AWWA M23, PVC Piping.
 15. AWS D10.9, Standard for Qualification of Welding Procedures and Welders for Piping and Tubing.
 16. ASME Boiler and Pressure Vessel Code.
 17. NFPA 14, Standpipe and Hose Systems

1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:
 1. Detailed drawings, in plan and section, and laying schedules for each piping system showing piping, valves, supports, expansion joints, accessories, specials, joints, testing, harnessing, and connections to existing pipes, structures and appurtenances. To assist the CONTRACTOR in preparing the submittals, the project Contract Drawings showing the existing site, structures and backgrounds, without any new piping, will be made available to the CONTRACTOR.

- B. Tests: Submit description of proposed testing methods, procedures and apparatus. Submit copies of test report for each test.
- C. Certificates: Submit certificates of compliance with referenced standards.
 - 1. Welder's Certificate to comply with paragraph 3.1.D.4.b.1 of these specifications.
- D. Record Drawings:
 - 1. Submit Record Drawings prior to the time of Substantial Completion.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site to ensure uninterrupted progress of the Work.
- B. Handle all pipe, fittings and accessories carefully with approved handling devices. Do not drop or roll pipe off trucks. Do not otherwise drop, roll or skid piping.
- C. Store pipes and fittings on heavy wood blocking or platforms so they are not in contact with the ground.
- D. Unload pipe, fittings and specials opposite to or as close to the place where they are to be installed as is practical to avoid unnecessary handling. Keep pipe interiors completely free from dirt and foreign matter.
- E. Inspect delivered pipe for cracked, gouged, chipped, dented or other damaged material and immediately remove damaged materials from site.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Required pipe materials are listed in the Piping Schedule. Refer to applicable Sections for material specifications.
- B. General:
 - 1. Marking Piping:
 - a. Clearly mark each piece of pipe or fitting with a designation conforming to that shown on the Shop Drawings.
 - b. Cast or paint material, type and pressure designation on each piece of pipe or fitting 4-inches in diameter and larger.
 - c. Pipe and fittings smaller than 4-inches in diameter shall be clearly marked by manufacturer as to material, type and rating.
- C. Pipe Identification Markers and Arrows: Refer to Section 09900, Painting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install piping as shown, specified and as recommended by the manufacturer.
2. If there is a conflict between manufacturer's recommendations and the Contract Documents, request instructions from ENGINEER before proceeding.

B. Manufacturer's Installation Specialist:

1. Provide the services of a competent installation specialist of the pipe manufacturer when pipe installation begins for the following:
 - a. FRP pipe.
 - b. Thermoplastic pipe.
2. Retain installation specialist at the site for a minimum of two days or until competency of the pipe installation crew has been satisfactorily demonstrated.

C. Piping Installation:

1. Install straight runs true to line and elevation.
2. Install vertical pipe truly plumb in all directions.
3. Install piping parallel or perpendicular to building walls. Piping at angles and 45 degree runs across corners will not be accepted unless specifically shown or approved.
4. Install small diameter piping generally as shown when specific locations and elevations are not indicated. Locate such piping as required to avoid ducts, equipment, beams, and other obstructions.
5. Install piping so as to leave all corridors, walkways, work areas, and like spaces unobstructed. Unless otherwise approved, provide a minimum headroom clearance under all piping of 7-feet 6-inches.
6. Protect and keep clean water pipe interiors, fittings and valves.
7. Provide temporary caps or plugs over all pipe openings at the end of each day's work, and when otherwise required or directed by ENGINEER.
8. Cutting: Cut pipe from measurements taken at site, not from Drawings.
9. Install dielectric unions wherever dissimilar metals are connected, except for bronze or brass valves in ferrous piping.
10. Provide a union downstream of each valve with screwed connections.
11. Provide screwed or flanged unions at each piece of equipment, where shown, and where necessary to install or dismantle piping.
12. Additional Requirements for FRP and Thermoplastic Piping:
 - a. Support all valves independently of the piping system.
 - b. Utilize wide band supports, as recommended by manufacturer and approved by ENGINEER, to minimize localized stresses.
 - c. Provide piping passing through walls with a sleeve of wearing material to prevent abrasion damage to piping.
 - d. When anchors are required at locations other than equipment or tanks, they shall be placed at elbows, valve locations and at bends in pipe line.

- e. Spacing of supports shall be in accordance with the manufacturer's published recommendations at the maximum design operating temperature of the pipe.
- f. Use "U" clamps with wide band circumferential contact.
- g. Use guides on long runs of piping to maintain alignment and reduce chance of elastic failure of pipe. Space guides as recommended by manufacturer.
- h. Provide expansion loops in exposed piping, to limit excessive pipe movement and stresses between pipe anchor supports. Expansion loops and pipe supports shall be designed in accordance with the manufacturer's recommendations.
- i. Use bellows with low axial force to take up pipe expansion, where shown or where expansion loops are not practical. Provide anchors to restrain the expansion joint. Use of bellows joints shall be kept to a minimum. Flexible connectors may be used to absorb thermal movement, when approved by ENGINEER.
- j. Do not install pipe when ambient temperature is less than 60°F.

D. Joints:

- 1. General:
 - a. Make joints in accordance with the pipe manufacturer's recommendations and the requirements below.
 - b. Cut piping accurately and squarely and install without forcing or springing.
 - c. Ream out all pipes and tubing to full inside diameter after cutting. Remove all sharp edges on end cuts.
 - d. Remove all cuttings and foreign matter from the inside of pipe and tubing before installation. Thoroughly clean all pipe, fittings, valves, specials, and accessories before installing.
- 2. Mechanical Joint Pipe:
 - a. Wipe clean the socket, plain end and adjacent areas immediately before making joint. Make certain that cut ends are tapered and sharp edges are filed off smooth.
 - b. Lubricate the plain end and gasket with an approved pipe lubricant, in accordance with AWWA C111, just prior to slipping the gasket onto the plain end of the joint assembly.
 - c. Place the gland on the plain end with the lip extension toward the plain end, followed by the gasket with the narrow edge of the gasket toward the plain end.
 - d. Insert the pipe into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly.
 - e. Push gland toward socket and center it around pipe with the gland lip against the gasket.
 - f. Insert bolts and hand-tighten nuts.
 - g. Make deflection after joint assembly, if required, but prior to tightening bolts. Alternately tighten bolts 180 degrees apart to seat the gasket evenly. The bolt torque shall be as follows:

<u>Pipe Size</u> <u>(inches)</u>	<u>Bolt Size</u> <u>(inches)</u>	<u>Range of Torque</u> <u>(ft-lbs)</u>
3	5/8	45-60
4-24	3/4	75-90
30-36	1	100-120
42-48	1-1/4	120-150

3. Flanged Joints:
 - a. Assemble flanged joints using 1/8-inch ring-type gaskets for raised face flanges. Use full face gaskets for flat face flanges, unless otherwise approved by ENGINEER. Gaskets shall be suitable for the service intended in accordance with the manufacturer's ratings and instructions. Gaskets shall be properly centered.
 - b. Bolts shall be tightened in a sequence which will ensure equal distribution of bolt loads.
 - c. The length of bolts shall be uniform, and they shall not project beyond the nut more than 1/4-inch or fall short of the nut when fully taken up. The ends of bolts shall be machine cut so as to be neatly rounded. No washers shall be used.
 - d. Bolt threads and gasket faces for flanged joints shall be lubricated prior to assembly.
 - e. Alternately tighten bolts 180 degrees apart to compress the gasket evenly.
4. Steel Pipe Joints:
 - a. Joints in steel pipe shall be butt welded, flanged, or threaded joints, except that flexible couplings, mechanical couplings, or flanged connections shall be provided where shown on the Drawings.
 - b. Welding shall conform to the requirements of AWWA C206. Pipe 36-inches in diameter and larger shall be welded both inside and outside of the pipe.
 - 1) CONTRACTOR shall submit documentation that all welders have been qualified in accordance with ASME Boiler and Pressure Vessel Code Section IX or American Welding Society Structural Welding Code D1.1, Section 5, whichever is required. CONTRACTOR shall submit current certificates for the Project Representative's review.
 - c. After welding, the joint and the surrounding damaged or uncoated area shall be coated with the same material and to the same thickness as the shop applied coating.
 - d. Additional Welding Requirements:
 - 1) On pipe lines specified to be welded, all joints between sections of pipe and between pipe and fittings 2-inches and larger shall be electric arc welded, and all joints on pipe 1-1/2 inches and smaller shall be gas welded. CONTRACTOR shall be entirely responsible for the quality of the welding. CONTRACTOR shall:
 - a) Conduct tests not only of the welding procedure used by his organization to insure welds that will meet the required tests, but also of the welding operators to determine the ability of the operators to make sound welds under standard conditions.

- b) Be thoroughly familiar with ANSI B31.1, and American Welding Society Standard B3.0.
 - c) Be capable of performing all welding operations required for construction and installation of the piping systems.
 - 2) Qualification of Welders: Rules of procedure for qualification of all welders and general requirements for fusion welding shall conform with the applicable portions of ANSI B31.1 and American Welding Society Standard B3.0, and also as outlined below.
 - 3) Examining Welder: Each welder shall be examined at the job site by the CONTRACTOR in the presence of the Engineer to determine the ability of the welder to meet the qualifications required. Welders for piping shall be tested for all positions, including welds with the axis horizontal (not rolled) and with the axis vertical. Each welder shall be:
 - a) Allowed to weld only in the position in which the welder is qualified.
 - b) Required to identify the weld with the specific code marking signifying the name and number assigned.
 - 4) Examination Results: Engineer shall be provided with a listing of names and corresponding code markings. Where a welder fails to meet the prescribed welding qualifications, that welder shall be retested, and if the welder fails the second test the welder shall be disqualified for work on the project.
 - e. For threaded joints, use standard, right hand tapered full depth threads on steel piping and apply an approved joint compound, to the male threads only, before installation. Remove all cuttings and foreign matter from the inside of the pipe. Thoroughly clean all pipe, fittings, valves, specials, and accessories before installing.
5. Thermoplastic Pipe Joints:
- a. Solvent Cement Joints:
 - 1) Bevel pipe ends and remove all burrs before making joints. Clean both pipe and fittings thoroughly. Do not attempt to make solvent cement joints if temperature is below 40°F or above 90°F when exposed to direct sunlight nor in wet conditions.
 - 2) Use solvent cement supplied or recommended by the pipe manufacturer.
 - 3) Apply joint primer and solvent cement and assemble joints in strict accordance with the recommendations and instructions of the manufacturer of the joint materials and the pipe manufacturer.
 - 4) Observe safety precautions with the use of joint primers and solvent cements. Allow air to circulate freely through pipelines to permit solvent vapors to escape. Slowly admit water when flushing or filling pipelines to prevent compression of gases within pipes.

6. Copper Tubing Joints:
 - a. Assemble copper tubing with soldered joints. Solder shall be 95-5 tin-antimony conforming to ASTM B32.
 - b. Ream or file pipe to remove burrs.
 - c. Clean and polish contact surfaces of joints.
 - d. Apply flux to both male and female ends.
 - e. Insert end of tube into full depth of fitting socket.
 - f. Heat joint evenly.
 - g. Form continuous solder bead around entire circumference of joint.
 - h. Runs shall contain unions at connections to equipment and at reasonable distances along the lengths of runs to permit convenient disassembly of piping and removal of equipment.

- E. Installing Valves and Accessories:
 1. Provide supports for large valves, flow meters and other heavy items as shown or required.
 2. Install floor stands as shown and as recommended by the manufacturer.
 3. Provide lateral restraints for extension bonnets and extension stems as shown and as recommended by the manufacturer.
 4. Provide steel sleeves where operating stems pass through floor. Extend sleeves 2-inches above floor.
 5. Position valve operators as shown. When the position is not shown, install the valve so that it can be conveniently operated and as approved by ENGINEER. Avoid placing operators at angles to the floors or walls.
 6. Position flow measuring devices in pipe lines so that they have the amount of straight upstream and downstream runs as recommended by the manufacturer, unless specific location dimensions are shown. Position swing check valves so that they do not conflict with the discs of butterfly valves.

- F. Unions:
 1. Install dielectric unions wherever dissimilar metals are connected, except for bronze or brass valves, in ferrous piping.
 2. Provide a union downstream of each valve with screwed connections.
 3. Provide screwed or flanged unions at each piece of equipment, where shown, and where necessary to install or dismantle piping.

- G. Eccentric Reducers: Use eccentric reducers where shown and where air or water pockets would otherwise occur in mains because of a reduction in pipe size.

- H. Transitions from One Type of Pipe to Another:
 1. Provide all necessary adapters, specials and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.

- I. Taking Existing Pipelines Out of Service:
 - 1. Do not take pipelines out of service, unless specifically named below or approved by ENGINEER.
 - a. Refer to Section 01043, Coordination with Owner's Operations.
 - 2. Notify ENGINEER at least forty-eight (48) hours prior to taking pipeline out of service.

- J. Work on Existing Pipelines:
 - 1. Cut or tap pipes as shown or required with machines specifically designed for this work.
 - 2. Install temporary plugs to keep out all dirt, water and debris.
 - 3. Provide all necessary adapters, fittings, pipe and appurtenances required.

3.2 THRUST RESTRAINT

- A. Provide thrust restraint on all pressure piping systems and where otherwise shown or specified.

- B. Thrust restraint may be accomplished by means of restrained pipe joints. Thrust restraints shall be designed for the axial thrust exerted by the test pressure specified in the Exposed Piping Schedule.

- C. Restrained Pipe Joints:
 - 1. Pipe joints shall be restrained by means suitable for the type of pipe being installed.
 - a. Restrain ductile-iron mechanical joint pipe utilizing tie rods and clamps or proprietary restrained joint system such as American Lok-Fast, Fast-Tite, U.S. Trim-Tite or equal.
 - b. Restrain ductile iron pipe connected by flexible couplings or flanged coupling adapters by harnessing across the coupling or adapter using tie rods or extended bolts connecting between flanges.
 - c. Steel pipe shall have butt-welded joints, flanged joints, or flexible or mechanical coupling connectors. Provide tie rods connected to harness lugs welded to the steel pipe for restraint at all flexible coupling connectors.

3.3 PAINTING

- A. Field painting shall conform to the requirements of Section 09900, Painting.

3.4 TESTING OF PIPING

- A. General:
 - 1. Test all piping as specified below, unless otherwise authorized by ENGINEER.
 - 2. Notify ENGINEER forty-eight (48) hours in advance of testing.
 - 3. Provide all testing apparatus including pumps, hoses, gages, and fittings.

4. Pipelines shall hold the specified test pressure for two (2) hours.
5. Repair and retest pipelines which fail to hold specified test pressures or which exceed the allowable leakage rate.
6. Test pressures required are at the lowest elevation of the pipeline section being tested, unless otherwise specified.
7. Follow special test procedures below for gaseous chemical and liquid chlorine lines.
8. Conduct all tests in the presence of the ENGINEER. Repeat tests in the presence of local authorities having jurisdiction, if required.

B. Schedule of Pipeline Tests:

1. Test piping at the test pressure listed in the Exposed Piping Schedule.
2. For piping not included in the Schedule, the ENGINEER will notify CONTRACTOR in writing of the test pressure to be utilized.

C. Pressure Test Procedure:

1. Ensure that all supports and restraint protection are securely in place.
2. Fill section to be tested slowly with water and expel all air. Install cocks, if necessary, to ensure removal of air.
3. Test only one section of pipe at a time.
4. Apply specified test pressure required for two (2) hours and observe pressure gage. Check carefully for leaks while test pressure is being maintained.

D. Leakage Testing:

1. Conduct leakage test after satisfactory completion of pressure test.
2. Allowable Leakage Rates (gallons per hour per 1000 feet per inch diameter)
 - a. Copper, Steel, Ductile Iron, Thermoplastic, and all Other Piping: 0.0.
 - b. Ductile Iron Pipe with Mechanical Joints: 0.0.
3. Leakage Test Procedure:
 - a. Examine exposed pipe, joints, fittings and valves. Repair visible leakage or replace the defective pipe, fitting or valve.
 - b. Refill the line under test to reach the required test pressure.
 - c. Provide a test container filled with a known quantity of water at the start of the test. Attach the test pump suction to the test container.
 - d. Pump water from the test container into the line with the test pump to hold the specified test pressure for the test period. Water remaining in the container shall be measured and the amount used during the test shall be recorded on the test report.
 - e. Perform all repair, replacement, and retesting required because of failure to meet testing requirements.
 - f. Leakage shall be less than rate specified above.

E. Additional Procedures for Gaseous Chemical Piping:

1. Purge piping completely with dry compressed nitrogen or air after pressure and leakage tests have been satisfactorily completed.
2. Fill pipeline with dry air or nitrogen and pressurize to 50 psi.

3. Test all joints with a soapy water solution.
 4. Demonstrate that vacuum lines are completely tight under a vacuum of 25-inches of mercury.
- F. Test Procedures for Chlorine Piping: Conform to all requirements of the Chlorine Manual and Pamphlet No. 6 of the Chlorine Institute.
1. Dry the piping with steam and dry air, and then purge piping completely with dry compressed nitrogen or air after pressure and leakage tests have been satisfactorily completed.
 2. Fill pipeline with dry air or nitrogen and test as described in the Chlorine Manual.
 3. Test all joints with a soapy water solution.

3.5 TESTING OF DRAINAGE PIPING

A. General:

1. Test all drainage piping installed under this Section.
2. Provide all testing apparatus required.
3. Notify ENGINEER forty-eight (48) hours in advance of test.
4. Conduct all tests in presence of ENGINEER and in presence of local authorities having jurisdiction.

B. Procedures:

1. Perform test on entire system or on individual sections as approved by ENGINEER.
2. Completely seal all openings except highest opening in system or section to be tested.
3. Fill with water completely and test with at least ten (10) feet of water above highest point.
4. Allow water to stand in system for at least fifteen (15) minutes. Inspect for leaks and repair all leaks found. Retest repaired sections.

3.6 CLEANING AND DISINFECTION

A. Cleaning:

1. Thoroughly clean all piping and flush prior to placing in service in a manner approved by ENGINEER.
2. Piping 24-inches in diameter and larger shall be inspected from inside and all debris, dirt and foreign matter removed.
3. If piping that requires disinfection has not been kept clean during storage or installation, CONTRACTOR shall swab each section individually with a five percent hypochlorite solution, to ensure clean piping.

3.7 DISPOSAL OF WATER

- A. CONTRACTOR shall provide suitable means for disposal of test and flushing water so that no damage results to facilities or waterways.

B. Means of disposal of test and flushing water shall be subject to the approval of ENGINEER, local governing authorities and regulatory agencies.

C. CONTRACTOR shall be responsible for any damages caused by the water disposal operations.

3.8 IDENTIFICATION OF PIPING

A. Piping markers shall conform to the requirements of Section 09900, Painting.

3.9 PIPING SCHEDULE

The following abbreviations are used in the Exposed Piping Schedule at the end of this Section.

A. Material Abbreviations

Cast Iron	CI	Copper	C
Double Contained		Carbon Steel	CS
Fiberglass Reinforced		Stainless Steel	SS
Plastic	DCFRP	Polyvinyl Chloride	PVC
Fiberglass Reinforced		Chlorinated Polyvinyl	
Plastic	FRP	Chloride	CPVC
Ductile-Iron	DI	Polyethylene	PE
		Reinforced Polyvinyl	
		Chloride Tubing	RPVCT

B. Lining Abbreviations

Cement Mortar Coated	CC	Galvanized	Galv
Cement Lined	CL	Plastic Lined	PL
Glass Lined	GL	Painted	P
Bituminous Coated	BC		
Epoxy Coating	EC		

C. Joint Abbreviations

Bell and Spigot	BS	Screwed Fittings	S
Flanged	FLG	Compression Sleeve	
Mechanical Joint	MJ	Coupling	CSC
Grooved or Shouldered		Compression Flange	
End Couplings	GSEC	Adaptor	CFA
Butt Welded	BW	Soldered	Sd
Solvent Welded	SW	Tube Fittings	TF

EXPOSED PIPING SCHEDULE

Service	Material	Interior Linings	Exterior Coating	Thickness Class	Joint	Pressure Test (psig)
Foul Air Ductwork	FRP	-	P	-	BW/Flg	5

++ END OF SECTION ++

SECTION 15220

PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scope:
1. CONTRACTOR shall provide all labor, materials, equipment, and incidentals as shown, specified and required to design, furnish and install all hangers, supports and appurtenances necessary to complete the Work.
- B. Related Sections:
1. Section 03300, Cast-In-Place Concrete.
 2. Section 05504, Miscellaneous Metal Fabrications.
 3. Section 09900, Painting.
 4. Division 15, Sections on Piping, Valves and Appurtenances.

1.2 QUALITY ASSURANCE

- A. Each type of pipe hanger or support shall be the product of one (1) manufacturer.
- B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
1. The Manufacturers Standardization Society of the Valve and Fittings Industry:
 - a. MSS SP-58, Pipe Hangers and Supports - Materials and Design.
 - b. MSS SP-69, Pipe Hangers and Supports - Selection and Application.
 2. Federal Specification, FS W-H-171, Hangers and Support, Pipe.
 3. ASTM A 575, Merchant Quality Hot-Rolled Carbon Steel Bars.
 4. Underwriters' Laboratories, Inc., Standard UL-203-Pipe Hanger Equipment.

1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:
1. Detailed drawings showing all hangers and supports for each piping system specified. Shop Drawings shall show location, installation, material, loads or forces, and deflection of all hangers and supports. Each pipe system shall be analyzed for all loads and forces on the hangers and supports, and their reaction forces to the structure to which they are fastened.
 2. Submit and coordinate these with Shop Drawings required for all piping systems, valves and appurtenances.

- B. Product Information: Submit manufacturer's catalogs, literature, and engineering data on all hangers and supports. Load ratings, materials and installation shall be consistent with the recommendations of the MSS SP-58, MSS SP-69 and Federal Specification WW-H-171.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver equipment to the site to ensure uninterrupted progress of the Work.
 - 1. Deliver pipe hanger inserts, which are to be embedded in cast-in-place concrete, in ample time not to delay that Work.
- B. Store materials to permit easy access for inspection and identification. Keep steel members off the ground using pallets, platforms or other supports. Protect steel members and packaged materials from corrosion and deterioration.
- C. Store materials in covered storage off the ground and prevent condensation.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Hangers and supports shall meet with the following requirements:
 - 1. Standard and fabricated hangers and supports shall be furnished complete with necessary inserts, bolts, nuts, rods, washers, and other accessories.
 - 2. Run piping in groups where practicable and parallel to building wall generally. Provide minimum clearance of 1-inch between pipe and other work.
 - 3. Install hangers or supports at all locations where pipe changes direction.
 - 4. All hangers and supports shall be capable of adjustment after placement of piping.
 - 5. Different types of hangers or supports shall be kept to a minimum.
 - 6. All suspended or supported cast iron pipe shall have a hanger or support adjacent to each hub.
 - 7. Support vertical piping at each floor and between floors by stays or braces to prevent rattling and vibration.
 - 8. Hanger rods shall be straight and vertical. Chain, wire, strap or perforated bar hangers shall not be used. Hangers shall not be suspended from piping, unless shown on Drawings.
 - 9. Maximum support spacing, unless otherwise shown or approved for standard weight steel pipe shall be as follows:

<u>Pipe Size (in.)</u>	<u>Spacing (ft)</u>
Up to 1-1/2	6
2 through 3	10
3-1/2 and greater	12

10. Maximum support spacing, unless otherwise shown for plastic pipe at ambient temperature, shall be 1/2 of the values specified for steel pipe.
11. Plastic pipe at temperature greater than 130EF shall be continuously supported in a metal cradle or tray.
12. Where proper hanger or support spacing does not correspond with joist or rib spacing, structural steel channels may be attached to joists or ribs and pipes suspended therefrom.
13. Prevent contact between dissimilar metals when supporting copper tubing by use of copper plated, rubber or vinyl coated, or stainless steel hangers or supports.
14. Isolate thin walled stainless steel piping from carbon steel by use of plastic coated hangers or supports or by taping at points of contact with PVC or vinyl.
15. Supports, hangers, pipe guides, and anchors shall be of a material that is compatible with the fluid being conveyed in the pipe being supported.
16. Anchors for pipe support systems shall be compatible, or protected by a coating system which is compatible, with the fluid being conveyed in the pipe being supported.

2.2 HANGERS AND SUPPORTS

- A. Hangers and supports where shown shall be in accordance with the Drawings. Hangers and supports not shown shall be in accordance with MSS SP-58 and SP 69.
- B. Product and Manufacturer: Provide one of the following:
 1. Anvil International, Inc.
 2. Elcen.
 3. Unistrut Corporation.
 4. B-Line.
 5. Or equal.

2.3 ACCESSORIES

- A. Hanger rods shall be made according to ASTM A 575, with square head nut on top and running thread on bottom end.
- B. Concrete Inserts:
 1. Concrete inserts shall be MSS SP-58 malleable Type 18.
 2. Concrete inserts shall be of the continuous type, capable of supporting 2,000 pounds per foot of insert.
 3. Product and Manufacturer: Provide concrete inserts of one of the following:
 - a. Unistrut Corporation, Wayne, Michigan.
 - b. Elcan Metal Products, Company, Franklin Park, Illinois.
 - c. Or equal.
- C. Steel Beam Clamps:
 1. Steel beam clamps shall be of malleable iron and conform to MSS SP-58.

D. Inserts for Pipe Insulation:

1. Insulated pipe, larger than 1-1/2 inches in diameter, shall be supported by a rigid insert to protect the insulation. A steel metal saddle of sufficient gage to carry the weight of the pipe and its fluid, without deforming, shall extend 2-inches minimum on each side of the rigid insert. The joints between insert and insulation shall be sealed before saddle is installed. Sizes up to 6-inches Internal Pipe Size (IPS) shall be MSS SP-58 Type 40 and for sizes over 10-inches shall be MSS SP-58 Type 39.

E. Brackets:

1. Brackets for wall mounting shall be MSS SP-58 Type 32 or 34.

F. Pipe Roll:

1. To provide for pipe expansion, pipe shall be supported on adjustable malleable or steel pipe rolls, Grinnell Figure 175, or equal.

G. Fabricated Pipe Rack:

1. Pipes shall be supported and anchored to the fabricated pipe rack as shown on the Drawings. Clamps, rollers, and supports for piping shall conform to the general requirements of MSS SP-69.

2.4 PAINTING

- A. Clean and prime ferrous metal surfaces in the shop in accordance with the requirements of Section 09900, Painting.
- B. Field painting shall conform to the requirements under Section 09900, Painting.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Locate hangers, supports, and accessories to support piping, valves, and fittings at all concentrated loads.
- B. Locate hangers, supports, and accessories within maximum span lengths specified to support continuous pipeline runs unaffected by concentrated loadings.
- C. Locate hanger and supports to prevent vibration or swaying and to provide for expansion and contraction.
 1. Support piping independently so that equipment is not stressed by piping weight or expansion.
 2. For Uninsulated Copper Pipe or Tubing: Clamps and supports shall be electroplated copper finish. Instrumentation tubing shall be supported in steel or aluminum troughs with covers. All tubing layout and connections shall be as approved by the manufacturer of the equipment.

3. Uncoated Hangers, Rods and Supports: Dip in zinc chromate primer before installation.
4. Maximum spacing for horizontal piping:
 - a. Steel, 1-inch and Smaller: 7 feet.
 - b. Steel, 1-1/2-inch and Larger: 10 feet.
 - c. Brass or Copper, 3-inch and Smaller: 7 feet.
 - d. Brass or Copper, 4-inch and Larger: 10 feet.
 - e. Additional supports at:
 - 1) Change in pipe direction.
 - 2) Branch piping and runouts over 5 feet.
 - 3) Concentrated loads due to valves, strainers and other similar items.
 - f. Maximum support spacing for plastic pipe at ambient temperature shall be 1/2 the above values.
5. Hanger types for horizontal piping, except as noted and shown on Drawings:
 - a. Forged steel adjustable clevis type, rod support for all service.
 - b. Slide Bases:
 - 1) Pipe stand, brackets, trapeze or other equivalent structural support.
 - 2) For piping 2-inches or larger.
 - c. For pipe and covering provide:
 - 1) Saddles for roller or slide bases.
 - 2) Protective shields or saddles for all other types of supports.
 - d. Threaded Steel Rods:
 - 1) 2-inch vertical adjustment with two (2) nuts each end for positioning and locking.
 - 2) Size hanger rods according to the schedule below, unless otherwise noted on the Drawings:

Nominal Pipe (inches)	Rod Diameter (inches)
2 and less	3/8
2-1/2 to 3-1/2	1/2
4	5/8
6	3/4
8 through 12	7/8
14 through 18	1
20 through 30	1-1/4
 - 3) For Double Rod Hangers: One size smaller than above.
 - 4) Connection to Structural for Piping up to 2-Inches: Concrete inserts, or expansion shields in shear into sides of beams.
 - 5) Connection to Structural for Piping 2-1/2-Inches or Larger: Concrete inserts, beam clamps or suitable bridging.
6. Vertical Piping:
 - a. Base Support: Base elbow or welded equivalent.
 - 1) Bearing plate on structural support.
 - b. Guides not to exceed:
 - 1) 25 feet for piping up to 2-inches.
 - 2) 36 feet for piping 2-1/2-inches or larger.

- c. Top Support:
 - 1) Special hanger or saddle in horizontal connection.
 - 2) Provisions for expansion.
 - d. Intermediate Supports: Steel pipe clamp at floor.
 - 1) Bolted and welded to pipe.
 - 2) Extension ends bearing on structural steel or bearing plates.
 - e. For Multiple Pipes: Coordinate guides, bearing plates and accessory steel.
7. Insulated Piping:
- a. Horizontal Pipe Shields at Supports:
 - 1) Minimum 120 degree arc.
 - 2) Length equal to diameter of insulation, 12-inch minimum.
 - 3) To 6-Inch Pipe Size: No. 18 USSG galvanized steel.
 - b. Vertical Pipe Shields at Guides:
 - 1) Full 360 degree arc, securely banded.
 - 2) Length equal to diameter of insulation, 12-inch minimum.
 - 3) To 6-Inch Pipe Size: No. 18 USSG galvanized steel.
8. Chemical Piping:
- a. All pipe supports and fasteners shall be glass fiber-reinforced plastic with a flame spread rating of 25, in accordance with ASTM E-84.
 - b. Materials shall be manufactured by either the pultrusion or extrusion process.
 - c. All pipe supports shall have a surface veil over 100 percent of the surface which, along with a filler system, shall protect against degradation from ultra-violet light.
 - d. All fasteners shall be manufactured from long glass fiber-reinforced polyurethane to ensure strength and corrosion resistance.
 - e. All-thread rods shall be made from vinylester resin.
 - f. Product and Manufacturer: Provide one of the following:
 - 1) Ackinstrut, RobRoy Industries.
 - 2) Or equal.
9. Exposed Sludge Piping:
- a. All pipe supports shall be galvanized and coated with zinc after being roll formed or after all manufacturing operations are completed, conforming to ASTM 123 or ASTM 153.
 - b. Where horizontal pipe supports required are made of a single member only and not a combination of members, the single member shall be perforated and equal to Unistrut Type P1000 HS.
 - c. Pipe supports shall have the same requirements as those listed above.
- D. Install items to be embedded before concrete placement.
- E. Fasten embedded items securely to prevent movement during concrete placement.
- F. Install hangers and support units on piping systems in accordance with manufacturer's recommendations.

- G. Adjust hangers and supports and place grout for concrete supports to bring pipelines to specified elevations.
- H. Bring all pipe systems up to operating pressures and temperatures. Cycle systems to duplicate operating conditions. Correct all support malfunctions.

++ END OF SECTION ++

SECTION 15812

CORROSION RESISTANT DUCTWORK, DAMPERS AND ACCESSORIES

PART 1 - GENERAL

1.1 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 a complete corrosion resistant duct system with all appurtenances required for proper operation.
 2. CONTRACTOR shall field verify locations, sizes and elevations for all connections, supports, dampers, and flexible connections.
 3. Items to be furnished and installed under this Section include, but are not limited to the following:
 - a. Fiberglass Reinforced Plastic (FRP) duct, fittings and accessories.
- B. 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 necessarily limited to, Work that is directly related to this Section.
1. Section 09900, Painting.
 2. Section 15052, Exposed Piping Installation.
 3. Section 15220, Pipe Hangers and Supports.

1.2 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
1. Engage a single firm, with undivided responsibility for performance and other requirements and components of the corrosion resistant ductwork and accessories.
 2. Engage a firm which can demonstrate successful experience in the fabrication and erection of corrosion resistant ductwork systems of at least five systems of the scope and type similar to the required Work.
- B. Installer's Qualifications:
1. Engage a single installer regularly engaged in FRP ductwork installation and who agrees to employ only tradesmen with specific skill and experience in this type of Work. Submit name and qualifications of installers to ENGINEER.
 2. Engage a single installer for the entire corrosion resistant ductwork system with undivided responsibility for performance and other requirements.
- C. Requirements of Regulatory Agencies: Comply with the applicable provisions of regulatory agencies below and others having jurisdiction.
1. Uniform Building Code.

2. Underwriters' Laboratories, Incorporated (UL).
 3. National Fire Protection Association (NFPA).
- D. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
 2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
 - a. HVAC Duct Construction Standards.
 - b. Thermoset FRP Duct Construction Manual.
 - c. Fire Damper Guide for Air Handling Systems.
 3. ASTM C 581-655 Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass Fiber Reinforced Structures.
 4. ASTM D 2310, Classification for Machine-Made Reinforced Thermosetting Resin Pipe.
 5. ASTM D 2563, Practice for Classifying Visual Defects In Glass Reinforced Plastic Laminate Parts.
 6. ASTM D 2583, Test Method for Indentation Hardness of Plastics by Means of a Barcol Impressor.
 7. ASTM D 2996, Specification for Filament-Wound Reinforced Thermosetting Resin Pipe.
 8. ASTM D 4024, Specification for Machine Made Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Flanges.
 9. ASTM D 4097, Specification for Contact Molded Glass Fiber Reinforced Thermoset Chemical Resistant Tank.
 10. Standards of Society of the Plastic Industry, PS15-69, Custom Contact Molded Reinforced-Polyester Chemical Resistant Process Equipment.
 11. NFPA 91, Blowers and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying.
 12. ANSI B16.1, Cast Iron Pipe Flanges and Flanged Fittings.
 13. ANSI B16.5, Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.
- E. Field Measurements: Take field measurements where required prior to installation to ensure proper fitting of Work.
- F. CONTRACTOR shall provide certification that all hardware and appurtenances including screws, bolts, nuts and other support and expansion joint hardware shall be Type 316L stainless steel.

1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:
1. 1/4-inch scale duct layouts, dimensioned to show length of duct runs, duct sizes, support spacing and expansion provisions.
 2. Details of installation, including duct support loads on channel covers.

3. Manufacturer's literature, illustrations, specifications and engineering data.
 4. Flexible connections.
 5. Duct sealants.
 6. Specifications for FRP resins and reinforcing material used.
 7. Submit color samples of pigmented gel coat to ENGINEER for selection.
 8. Specifications for fire-retardant epoxy FRP ductwork coating and reinforcing material used.
 9. Submit FRP round duct schedule with laminate construction, sizes, thickness, vacuum pressure, weight per foot pressure, spans, joint type and flange data.
 10. Gasket material.
 11. Deviations from Contract Documents.
- B. Test Reports: Submit the following test reports for approval where required.
1. Volume Damper leakage tests from an AMCA approved testing laboratory.
- C. Submit a letter stating that the proposed resins proposed in the fabrication of the FRP ductwork will provide satisfactory performance under the specified service conditions or a corrosion resistance chart indicating same.
- D. Manufacturer's calculations indicating the laminate sequence meets the proposed pressure and vacuum classification and deflection criteria indicated below.
- E. Tabulation in check list forms to indicate compliance with ASTM D 2563 Table I, Level II visual acceptance levels.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Store equipment and materials so as to keep free from moisture, damage, and deterioration.
- B. Manufacturer shall protect all flange faces and the more fragile appurtenances of the sub-assemblies, with padding between pieces in order to prevent one piece from impacting with another, and by crating or other means for shipment.
- C. Duct sub-assemblies shall be unloaded with care and stored in a location where they will be free from damage. Impact of a tool or other heavy object may result in a fracture of the inner lining and affect the service life of the duct or equipment.
- D. Large sub-assemblies shall be supported during unloading to prevent excessive deflection and overstressing.
- E. Corrosion resistant ductwork shall be protected, by padding or bracing, from banding or ropes used in shipment. No chains are to be used to secure any corrosion resistant ductwork during transportation.

1.5 GENERAL REQUIREMENTS

- A. The Drawings show general arrangement and extent of Work to be done, but the exact location and arrangement of all connections, fittings, dampers, supports and expansion joints/flexible connectors shall be determined as the Work progresses, to conform in the best possible manner with its surroundings. Connections shown on the Drawings to the various units are intended as an indication only. The actual connections shall be made and to best suit each particular case, provide for expansion, circulation and minimize the amount of space required.
- B. Drawings do not show all offsets, fittings, accessories and details which may be required. CONTRACTOR shall examine all the Contract Documents for conditions which may affect the installation of the Work, and shall arrange the Work accordingly. Provide all required items to complete the systems to the extent required by the Contract Documents.
- C. If piping or ductwork can be run to better advantage, CONTRACTOR, before proceeding with the Work, shall prepare and submit complete drawings showing all details of the proposed rearrangement for written approval by the ENGINEER.
- D. Resin cure for all FRP ductwork shall be checked by Barcol hardness and acetone tests. Hardness shall be within 90 percent of resin manufacturer's specification. Barcol test shall be required for inside and outside surfaces of all fiberglass fabrications in accordance with ASTM D 2583. Acetone test shall be conducted on interior surfaces of ducts.
- E. Prior to final inspection, all surfaces shall be made clean by brushing, wiping, or with a compressed-air blast to remove all loose foreign materials.
- F. A thorough inspection of each piece of ductwork will be conducted upon arrival at construction site to inspect for damage incurred in transit. Any damage shall be immediately repaired by respective equipment fabricator's personnel (not a sales representative).

1.6 DUCTWORK FABRICATION

- A. FRP ductwork and accessories shall be fabricated in a heated and well ventilated structure protected from weather and temperature extremes. Entire fabrication, curing and assembly process of any piece of FRP equipment shall occur under appropriate temperature and humidity conditions as recommended by the FRP fabricator and resin provider. CONTRACTOR shall submit an affidavit certifying that all FRP equipment shall be fabricated, cured and assembled as described in this Section.

2.1 DESIGN CONDITIONS

- A. Maximum allowable deflection for any size of corrosion resistant ductwork shall be 1/10-inch between supports and for any side of duct under worse case operating conditions.

2.2 FIBERGLASS REINFORCED PLASTIC (FRP) DUCTWORK AND ACCESSORIES

- A. The fiberglass reinforced plastic duct system shall be specifically designed, constructed, and installed as shown on the Drawings for the following minimum conditions.
 - 1. Ambient Air Temperature: 20°F to 125°F.
 - 2. Corrosion resistance to hydrogen sulfide, chlorine, mercaptans and other gases commonly encountered in wastewater treatment plants.
 - 3. Vacuum Service: Minimum 10-inch water gage.
 - 4. Pressure Service: 20-inch water gage.
- B. Fiberglass reinforced plastic (FRP) ductwork shall be of filament wound or hand lay-up construction. FRP ductwork shall be of flame retardant material inside and outside in accordance with NFPA-91. All ducts shall be installed in accordance with manufacturer's recommendations.
- C. FRP Duct Construction: Duct shall meet the applicable requirements of ASTM D 2310, Type 1, Grade 1 or 2, with Class "E" liner, 20 mils minimum thickness, and be manufactured in accordance with ASTM D 2996. Flanges and bolt drilling circles and diameters shall conform to NBS PS 15-69, except that flanges shall be a minimum of 0.75-inches thick. Ductwork shall be fabricated of vinylester resin as specified below. All interior and exterior surfaces of ducts, dampers and FRP accessories shall be coated with a minimum 90 percent resin, five percent antimony trioxide and nexus veil reinforcement. Exterior surfaces shall have a factory applied paraffinated pigmented gel coat finish with ultra-violet inhibitors.
 - 1. Ductwork shall be in accordance with SMACNA Thermoset FRP Duct Construction Manual.
- D. Laminates shall consist of a 20 mil chemical resistant liner with a synthetic surfacing veil embedded in a resin rich surface. The corrosion barrier shall be a minimum of 100 mils and include no less than two layers of 1-1/2 ounce mat with 25 percent glass and 75 percent resin content. The structural layer shall be of sufficient thickness to meet the minimum thickness requirements specified. The exterior surface layer shall be resin rich appertured nexus veil not less than 20 mils thick. Outside finish shall have a paraffinated pigmented gel coat finish with an ultra violet inhibitor. Provide standard and custom color chart for color selection. The composition specified for the inner surface and interior layer is intended to achieve optimum chemical resistance.

- E. Resins used in the laminate shall be premium corrosion resistant and fire retardant brominated biphenol-A vinylester resins such as Dow Chemical Company, Derakane 510A with five percent antimony trioxide, Reichhold Dion 9300 FR with five percent Antimony Trioxide or Ashland Chemical Company, Hetron FR 992 with three percent antimony trioxide or equal. The synthetic surfacing veil shall be Veil-Nexus 1012 (apertured) as manufactured by Burlington Industries.
- F. All cut edges shall be sealed with a resin coating of the same resin as used in the fabrication. The resin shall contain paraffin.
- G. Product and Manufacturer: Provide one of the following:
1. A.O. Smith-Inland, Incorporated.
 2. CorBan, Armco Steel Corporation.
 3. Fibercast Company, Division of Youngstown Sheet and Tube Company.
 4. Ameron Bondstrand.
 5. Or equal.
- H. (NOT USED).
- I. Fittings and Joints: All fittings such as elbows, laterals, tees, and reducers shall be of the same resin as and equal or superior in strength to the adjacent duct section and shall have the same internal diameter as the adjacent duct. Round duct joints shall be butt wrapped or bell and spigot joints as shown on the Drawings or required. Bell and spigot joints shall be sealed with a standard butt joint overlay in accordance with PS 15-69. All interior surfaces of joint to be coated with a paraffinated resin-rich gel coat.
- J. Total width of overlay for butt-wrap joints shall be not less than 6-inches for diameters from 8-inches up to and including 30-inches, 36-inch and larger shall be not less than 10-inches.
- K. Standard Elbows:
1. Standard elbow centerline radius shall be equal to a minimum of 1-1/2 times the diameter.
 2. Standard elbows up to 24-inch diameter shall be smooth radius molded elbows. Standard elbows 30-inch diameter and greater may be mitered sections as specified below.
 3. 0 to 44 degree elbows shall contain one mitered joint and two sections. 45 to 80 degree elbows shall have a minimum of two mitered joints and three sections. Elbows greater than 80 degrees shall have a minimum of four mitered joints and five sections.
- L. Tolerances:
1. Out-of-roundness of duct shall be limited to $\pm 1/8$ -inch or \pm one percent of duct inside diameter; whichever is greater for duct sizes 8-inch diameter and greater.
 2. Length of all flange pipe sections shall not vary more than $\pm 1/8$ -inch at 70°F.

3. All unflanged duct shall be square on the ends in relation to the pipe axis and $\pm 1/8$ -inch up to and including 24-inch diameter and $\pm 3/16$ -inch for all diameters greater than 24-inch.
 4. Fittings:
 - a. The tolerance on angles of all fittings shall be \pm one degree, up to and including 24-inch diameter and $\pm 1/2$ degree for 30-inch diameter and above.
 5. Flanges:
 - a. Flange faces shall be perpendicular to the axis of the duct within $1/2$ degree.
 - b. Flange faces shall be flat to within $\pm 1/32$ -inch, up to and including 18-inch diameter and flat within $\pm 1/16$ -inch for 20-inch diameter and larger.
 - c. Provide custom filler pieces as required to mate flanges squarely.
- M. Calculations for wall thickness determination shall be based on the structural fiberglass reinforced wall only. FRP ductwork shall be designed using a safety factor of ten to one for pressure and five to one for vacuum service. Ductwork shall be designed by manufacturer to resist all system forces and meet specified deflection requirements, but in no case shall FRP be less than the thickness listed in the table below.

MINIMUM FRP ROUND DUCT DIMENSION AND PERFORMANCE SCHEDULE							
ID (in.)	Wall Thickness (min.) (in.)	Minimum Allowable Vacuum ¹ (in. of water)	Minimum Allowable Pressure ¹ (in. of water)	Flange Thickness (in.)	Bolt Circle Diameter (in.)	Bolt Size and No. of Bolt Holes	Maximum Allowable Span ² (ft)
6	0.125	64	350	3/4	9-1/2	5/16 /8	8
8	0.187	182	693	3/4	11-3/4	5/16 /8	10
10	0.187	94	693	3/4	14-1/4	5/16 /12	12
12	0.187	55	693	3/4	17	5/16 /12	12
14	0.250	91	693	3/4	18-3/4	1 /12	15
16	0.250	61	693	3/4	21-1/4	1 /16	20
18	0.250	44	693	3/4	22-3/4	1-1/8 /16	20
20	0.250	33	693	3/4	25	1-1/8 /20	20
24	0.250	18	693	3/4	28-1/2	1-1/4 /20	20
30	0.312	20	693	3/4	36	1-1/4 /28	20

NOTES:

1. These ratings were suitable for use up to 180°F (82.2°C) in pressure service and ambient atmospheric temperatures on vacuum service. For ratings at high temperatures, consult manufacturer.
2. Based on 1/10-inch span deflection on air conveying systems at 180°F maximum. Also, based on duct systems not subjected to more severe service conditions such as additional weight caused by liquid or solids build-up in duct system, effects of wind loading on outdoor

installations, or possible failure of intermediate duct hangers. Provide as a minimum, the number of duct supports as shown on the Drawings. Support continuous at all non-flanged pipe end connections.

- N. All connections to expansion joints/flexible connectors, butterfly dampers, covers, or other equipment shall be flanged. Duct flanges shall conform to the FRP Duct Schedule, above. Gaskets shall be EPDM. Bolts, nuts and washers shall be Type 316 stainless steel. Flanges shall be hand laid up to PS 15-69 thickness, except that minimum thickness shall be 3/4-inch. The flange shall be hand laid-up anchored to a waxed table to achieve the flatness tolerance outlined in Paragraph 2.4.M.5., above. The face shall be textured for use with full-face gaskets, as specified above, 1/8-inch minimum thickness. Pipe flange drilling shall be NBS PS 16-69. All FRP duct and pipe flange bolt holes shall be back spot faced for a washer seat. All flange bolts shall be torqued to values as recommended by manufacturer.
- O. Hangers:
1. All ductwork shall be supported as shown. Hanger rods shall be minimum 3/8-inch for all ducts with half perimeter up to 72-inches, and 1/2-inch diameter for all ducts with half perimeter larger than 72-inches.
 2. All hangers, rods, supports, bolts, nuts, washers, inserts, and appurtenances located in corrosive areas shall be Type 316 stainless steel.
 3. Hanger Construction and installation shall conform to SMACNA Standards, except as specified. No sheet metal duct hangers or straps will be allowed.
 4. Supports shall be provided at each fitting.
- P. There shall be not less than a 1/4-inch buildup of FRP over the duct at each support. Each support shall be furnished with a 1/8-inch thick teflon sheet to shield the duct from the support. The teflon sheet shall extend beyond the support plate at least 1/2-inch on all sides.
- Q. Furnish expansion joints/flexible connectors, as shown on the Drawings and details, with anchors and guides.
1. Product and Manufacturer: Provide one of the following:
 - a. Holz Rubber Company.
 - b. Pathway Bellows Incorporated.
 - c. Mercer Rubber Company.
 - d. Or equal.
- R. Round Fiberglass Reinforced Plastic Butterfly Dampers:
1. Furnish and install where shown on the Drawings manually operated round butterfly dampers.
 2. Rating Conditions:
 - a. Velocity Through Damper: 6,000 fpm.
 - b. Pressure Rating: 30-inches water column.
 - c. Maximum Allowable Leakage: Three cfm per square foot at 10-inch w.g. pressure.
 3. Materials:

- a. Bearings: Teflon.
 - b. Blade: FRP, reinforced.
 - c. Frame: FRP channel.
 - d. Axles: Type 316L stainless steel rods, full length of damper size as shown on the Drawings.
 - e. Finish: FRP.
 - f. Handle: Type 316L stainless steel.
 - g. Pins: Type 316L stainless steel.
 - h. Bushings: Teflon.
 - i. Hardware: Hastelloy-C.
 - j. Angles: FRP.
 - k. Flanged ends with bolt holes drilled to match connecting ductwork.
 - l. Blade Stops: FRP angles with full circumference EPDM seal.
- 4. Dimensions: As required.
 - 5. Leakage test and performance data from an AMCA approved testing laboratory shall be submitted.
 - 6. Provide the dampers for manual operation with hand quadrant and shaft seals.
 - 7. Product and Manufacturer: Provide one of the following:
 - a. Swartwout, Phillips Industries, Model 914.
 - b. Or equal.
- S. Tools, Spare Parts and Maintenance Materials:
- 1. The duct system shall be furnished with the following:
 - a. Two sets of special tools required to maintain and repair the system.
 - b. All materials in kit form to make or repair joints. Kits shall be in a number sufficient to repair ten percent of the joints.
 - c. Names and addresses of all manufacturers of: Fiberglass reinforcements, resins, hardeners and components used to repair and maintain FRP duct system.
 - 2. Spare parts shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location, until transferred to the OWNER at the conclusion of the Project.

2.3 SURFACE PREPARATION AND PAINTING

- A. Surface preparation and painting shall conform to the requirements of Section 09900, Painting.
- B. CONTRACTOR shall certify, in writing, that the shop primer and shop finish coating system conforms to the requirements of Section 09900, Painting.
- C. All FRP exterior surfaces of pipe duct and fittings shall be painted with an approved epoxy paint system conforming to the requirements of Section 09900, Painting.
- D. CONTRACTOR shall provide a sample FRP panel not less than two square feet which shall be painted and allowed to dry for not less than 48 hours and then be

checked for paint adhesion by the paint system manufacturer and submitted to the ENGINEER.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install all ductwork in accordance with manufacturer's recommendations and instructions and as shown on the Drawings and specified.
- B. All ductwork shall conform accurately to the dimensions shown on the Drawings, the ducts shall be straight and smooth inside with joints neatly finished; ductwork shall be installed so as to preclude the possibility of vibration under all operating conditions.
- C. Elbows shall have a minimum centerline radius of 1-1/2 times the width of the duct. Turning vanes shall be provided at all square elbows. Turning vanes shall be double wall and shall be quiet and free from vibration when the system is in operation.
- D. (NOT USED).
- E. Provide manual volume dampers where shown on the Drawings and as required to facilitate accurate volume control. Damper blades shall be reinforced to prevent vibration.
- F. (NOT USED).
- G. Provide access doors for all dampers for inspection and maintenance.
- H. Install all ductwork and accessories to provide a system free from buckling, warping, breathing or vibration.
- I. All expansion joints/flexible connectors and ducts shall be suitably supported at each end by support guides within 12-inches of joint.
- J. (NOT USED).
- K. Provisions shall be made for supporting all ductwork, dampers, and other ductwork accessories, where required.
- L. (NOT USED).
- M. (NOT USED).

- N. CONTRACTOR shall receive field assistance, if required, from the corrosion resistant ductwork manufacturer to ensure that the corrosion resistant ductwork is installed and jointed correctly.
- O. All fittings, valves, expansion joints/flexible connectors, specials and similar items shall be supported within 12-inches of the joint, unless otherwise noted.

3.2 ADJUSTMENT

- A. Set volume control devices for approximate positions in preparation for final testing and balancing.
- B. Testing, balancing, and adjusting of the odor control system will be performed by others. CONTRACTOR to coordinate with OWNER regarding testing, balancing, and adjusting of the odor control system.

3.3 CLEANING

- A. Remove all loose materials and obstructions from interior of ducts.
- B. Remove debris and waste materials resulting from installation.

3.4 INSPECTION OF DUCTWORK

- A. ENGINEER reserves the right to reject any and all equipment found to have the following: blisters, chips, crazing, exposed glass, dry cracks, burned areas, dry spots, foreign matter, or entrapped air at the laminate surfaces which do not satisfy the tolerances specified in ASTM D 2563, Table I Acceptance Level II inside and outside surfaces. Unacceptable Barcol hardness and acetone sensitivity shall also be cause for rejection.

++ END OF SECTION ++