DEAN|MEAD

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Orlando
Fort Pierce
Naples
Viera/Melbourne
Vero Beach

MARTIN FRIEDMAN
407-310-2077
mfriedman@deanmead.com

December 13, 2024
via efiling

Adam Teitzman, Commission Clerk
Office of Commission Clerk
Florida Public Service Commission
2540 Shumard Oak Blvd.
Tallahassee, FL 32399-0850

Re: Docket No. 20240108-SU - Application for increase wastewater rates in Monroe County by K W Resort Utilities Corp.

Dear Mr. Teitzman:

Attached for electronic filing, on behalf of K W Resort Utilities Corp., please find MFR Vol. III (engineering information-Pro Forma Documents).

Should you or Staff have any questions regarding this filing please do not hesitate to contact me.

Very truly yours,

/s/ Martin S. Friedman
Martin Friedman

MSF:

CLASS A and B
WATER AND/OR WASTEWATER UTILITIES

FINANCIAL, RATE AND ENGINEERING MINIMUM FILING REQUIREMENTS

OF

K W Resort Utilities Corp

VOLUME III
Pro Forma Project Documents

FOR THE

Test Year Ended: 06/30/2024

Martin S. Friedman

From: Steve Suggs <ssuggs@weilerengineering.org>
Sent: Wednesday, September 4, 2024 8:36 PM
To: egathercole@ferreiraconstruction.com; mgathercole@ferreiraconstruction.com
Cc: Yanay Ferral; greg@kwru.com
Subject: KWRU Blower & Electrical Upgrades - Bid Invitation
Attachments: KWRU Blower & Electrical Upgrades Tech Specs Final 240904.pdf; KWRU Blower & Electrical Upgrades Project Bid Documents 240904.pdf; KWRU Electrical & Blower Upgrades Plans 240904.pdf

Hi All,

I have a new project down at KWRU in Key West FL for replacement of their existing East & West tank blower system as well as implementation of a new SCADA system we are looking for bids on. I have attached the following:

1. Project Plans
2. Bid Documents (including GC and SC)
3. Technical Specifications

Mandatory Prebid Meeting: September 26th @ 11AM (Virtual Attendance Satisfies mandatory requirement)
Bid Due Date: October 21st by 4:00 pm.
Bids Shall be Submitted Via email to: yferral@weilerengineering.org

Microsoft Teams Need help?

Join the meeting now

Meeting ID: 294 506 235 80

Passcode: c3FCGr

Please send any questions regarding the bid documents to Yanay Ferral (yferral@weilerengineering.org) as she will be the project administrator on this one. She is also copied on this email.

Best Regards,

Steve Suggs P.E.
(941) 323-1787
Director of Utilities Engineering
ssuggs@weilerengineering.org
Weiler Engineering Corp

Martin S. Friedman

From: Steve Suggs <ssuggs@weilerengineering.org>
Sent: Wednesday, September 4, 2024 8:32 PM
To: Jason Brownlee; Amanda Haire; Joshua Vondersaar
Cc: greg@kwru.com; Yanay Ferral
Subject: KWRU Blower & Electrical Upgrades - Bid Invitation
Attachments: KWRU Blower & Electrical Upgrades Tech Specs Final 240904.pdf; KWRU Blower & Electrical Upgrades Project Bid Documents 240904.pdf; KWRU Electrical & Blower Upgrades Plans 240904.pdf

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Director of Utilities Engineering
ssuggs@weilerengineering.org
Weiler Engineering Corp

Martin S. Friedman

From: Steve Suggs <ssuggs@weilerengineering.org>
Sent: Wednesday, September 4, 2024 8:34 PM
To: Roman; Christian Brisson; Brenna Brockway
Cc: Yanay Ferral; greg@kwru.com
Subject: KWRU Blower & Electrical Upgrades - Bid Invitation
Attachments: KWRU Blower & Electrical Upgrades Tech Specs Final 240904.pdf; KWRU Blower & Electrical Upgrades Project Bid Documents 240904.pdf; KWRU Electrical & Blower Upgrades Plans 240904.pdf

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Director of Utilities Engineering
ssuggs@weilerengineering.org
Weiler Engineering Corp

Martin S. Friedman

From: Steve Suggs <ssuggs@weilerengineering.org>
Sent: Wednesday, September 4, 2024 8:30 PM
To: jwiley@whartonsmith.com; jcontino@whartonsmith.com; gwilliams@whartonsmith.com
Cc: greg@kwru.com; Yanay Ferral
Subject: KWRU Blower & Electrical Upgrades - Bid Invitation
Attachments: KWRU Blower & Electrical Upgrades Tech Specs Final 240904.pdf; KWRU Blower & Electrical Upgrades Project Bid Documents 240904.pdf; KWRU Electrical & Blower Upgrades Plans 240904.pdf

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Steve Suggs P.E.
(941) 323-1787
Director of Utilities Engineering
ssuggs@weilerengineering.org
Weiler Engineering Corp

Martin S. Friedman

From: Gregory Williams <gwilliams@whartonsmith.com>
Sent: Thursday, September 5, 2024 8:40 AM
To: Steve Suggs; Jeff Wiley; James Contino
Cc: greg@kwru.com; Yanay Ferral
Subject: RE: KWRU Blower & Electrical Upgrades - Bid Invitation

Good morning, Steve,

Thank you for providing us with this invitation.

While we've always appreciated the opportunity to work with you (Weiler) and enjoyed working with KWRU in the past, unfortunately we no longer have a presence in the area and as such would be at a disadvantage at being competitive and efficient. Thanks again and we wish you good luck with the project.

Gregory L. Williams | Vice President – S. Florida Water
Wharton-Smith, Inc. | Construction Group of Choice |
www.whartonsmith.com
5210 Hood Road, Palm Beach Gardens, FL 33418 | Office: (561) 748-5956 x 2301

From: Steve Suggs <ssuggs@weilerengineering.org>
Sent: Wednesday, September 4, 2024 8:30 PM
To: Jeff Wiley <jwiley@whartonsmith.com>; James Contino <jcontino@whartonsmith.com>; Gregory Williams <gwilliams@whartonsmith.com>
Cc: greg@kwru.com; Yanay Ferral <yferral@weilerengineering.org>
Subject: KWRU Blower & Electrical Upgrades - Bid Invitation

Hi All,

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Best Regards,

Steve Suggs P.E.
(941) 323-1787
Director of Utilities Engineering
ssuggs@weilerengineering.org
Weiler Engineering Corp

BID DOCUMENTS

FOR

KWRU Blower & Electrical Upgrades Project

OWNER:

KW Resort Utilities Corporation
6630 Front Street
Key West, FL 33040

by

THE WEILER ENGINEERING CORPORATION

6805 OVERSEAS HIGHWAY
MARATHON, FLORIDA

AUGUST 2024

WEILER ENGINEERING CORPORATION
WEC xcellence in engineering
201 WEST MARION AVENUE - SUITE 1306 | PUNTA GORDA | FL 33950
TEL 941·505·1700 | FAX 941·505·1702 | WWW.WEILERENGINEERING.ORG

Key West Resort Utilities
KEY WEST, FLORIDA
Blower & Electrical Upgrades Project

ADVERTISEMENT FOR BIDS

Sealed Bids for the **Blower & Electrical Upgrades Project** will be received by **Weiler Engineering Corporation,** at the office of the **6805 Overseas Highway Marathon, FL 33050**, until **4PM** local time on **Monday, October 21st, 2024** at which time the Bids received will be **privately** opened and read. Upon owner's selection of contractor, WEC will publish a bid ranking and provide it to prospective bidders. The proposed project at KW Resort Utilities (KWRU) involves extending an existing concrete platform to accommodate the installation of three new rotary screw blowers (two duty and one spare) equipped with Variable Frequency Drives (VFDs) tailored to meet the facility's specific operational requirements for airflow, pressure, and efficiency. The extension will include the addition of an OSHA-compliant stair system and handrails. The project also includes installing 250 linear feet of 6-inch 316 Stainless Steel Schedule 10 air piping, which will be configured in two trains to serve the East and West Treatment Tanks. All existing electrical distribution panels connected to the original 600 amp service, and conduits will be replaced and mounted on a new pre-fabricated platform, with panels housed in weatherproof NEMA 3R or 4X stainless steel enclosures. A new SCADA system is also planned to replace the current system. Furthermore, all existing equipment slated for replacement will need to be removed, and the new blowers and electrical equipment will require rerouting to accommodate their new locations. Throughout the construction phases, the contractor will ensure the continuous operation of all electrical features, including the use of temporary generators for power supply. Coordination with the Keys Energy and KWRU staff is essential. All construction will adhere to the guidelines outlined in the Construction Plans, Bid Documents, and Technical Specifications. This is a brief overview, please refer to the Plan and Technical Specifications for a more detailed scope.

Bids will be received for a single prime Contract. Bids shall be on unit price basis, with additive alternate bid items as indicated in the Bid Form.

The Issuing Office for the Bidding Documents is: **Weiler Engineering Corporation, 6805 Overseas Highway Marathon FL 33050 ATN: Yanay Ferral yferral@weilerengineering.org**. Prospective Bidders may examine the Bidding Documents at the Issuing Office on Mondays through Fridays between the hours of **8am-4pm** and may obtain copies of the Bidding Documents from the Issuing Office as described below.

Prospective bidders may examine bidding documents on Mondays through Fridays at the office of the Engineer, **Weiler Engineering Corporation 6805 Overseas HWY, Marathon FL 33050** between the hours of **8am-4pm.**

Printed copies of the Bidding Documents may be obtained from the Weiler Engineering Corporation, during the hours indicated above.

Bidding Documents are available as portable document format ((PDF) files) from the Weiler Engineering via email. Alternatively, printed Bidding Documents may be obtained from the Issuing Office via in person pick up.

A pre-bid conference will be held at **11am** local time on **Thursday, September 26th, 2024** at **6630 Front Street, Key West, Florida 33040**. Attendance at the pre-bid conference is **mandatory.**

+ + END OF ADVERTISEMENT FOR BIDS + +

Blower & Electrical Upgrades Project

INSTRUCTIONS TO BIDDERS

TABLE OF CONTENTS

ARTICLE 1 – DEFINED TERMS

1.01 Terms used in these Instructions to Bidders have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. Issuing Office – The office from which the Bidding Documents are to be issued.

ARTICLE 2 – COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents may be obtained from the Issuing Office in the number and format stated in the advertisement or invitation to bid.

2.02 Complete sets of Bidding Documents shall be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 Owner and Engineer, in making copies of Bidding Documents available on the above terms, do so only for the purpose of obtaining Bids for the Work and do not authorize or confer a license for any other use.

ARTICLE 3 – QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit with its Bid (a) written evidence establishing its qualifications such as financial data, previous experience, and present commitments, and (b) the following additional information:

A. Evidence of Bidder's authority to do business in the state where the Project is located.

B. Bidder's state or other contractor license number, if applicable.

C. Subcontractor and Supplier qualification information; coordinate with provisions of Article 12 of these Instructions, "Subcontractors, Suppliers, and Others."

3.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.

3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

3.04 Bidder is advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

ARTICLE 4 – SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE; OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

4.01 Site and Other Areas

A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

4.02 Existing Site Conditions

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions

1. The Supplementary Conditions identify:

    a. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site.

    b. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

2. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

B. Underground Facilities: Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or adjacent to the Site are set forth in the Contract Documents and are based upon information and data furnished to Owner and Engineer by owners of such Underground Facilities, including Owner, or others.

C. Adequacy of Data: Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Paragraphs 5.03, 5.04, and 5.05 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work, appear in Paragraph 5.06 of the General Conditions.

4.03 Site Visit and Testing by Bidders

A. Bidder shall conduct the required Site visit during normal working hours and shall not disturb any ongoing operations at the Site. Site visits are to be conducted by appointment only. Contact the Greg Wright at KW Resort Utilities Corp. to coordinate a site visit.

B. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.

C. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on Owner's authority regarding the Site.

D. Bidder shall comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.

E. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

4.04 Owner's Safety Program

A. Site visits and work at the Site may be governed by an Owner safety program. As the General Conditions indicate, if an Owner safety program exists, it will be noted in the Supplementary Conditions.

4.05 Other Work at the Site

A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 5 – BIDDER'S REPRESENTATIONS

5.01 It is the responsibility of each Bidder before submitting a Bid to:

A. examine and carefully study the Bidding Documents, and any data and reference items identified in the Bidding Documents.

B. visit the Site, conduct a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfy itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. become familiar with and satisfy itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work;

D. consider the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; and the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs;

E. agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Bid no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;

F. become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents;

G. promptly give Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder;

H. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work; and

I. agree that the submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 6 – PRE-BID CONFERENCE

6.01 **A mandatory pre-Bid conference will be held Thursday, September 26th, 2024 at 11:00 am at 6630 Front Street, Key West, Florida 33040**. Representatives of Owner and Engineer will be

available to discuss the Project with Bidders by appointment. Bidders are encouraged to schedule such a meeting. Owner will transmit to all prospective Bidders of record such Addenda as Engineer considers necessary in response to questions arising at the meetings. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 7 – INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Owner in writing. Interpretations or clarifications considered necessary by Owner in response to such questions will be issued by Addenda delivered to all parties recorded as having received the Bidding Documents. Questions received less than seven days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, supplement, or change the Bidding Documents.

ARTICLE 8 – BID SECURITY

8.01 A Bid Security will NOT be required.

ARTICLE 9 – CONTRACT TIMES

9.01 The number of days within which, or the dates by which the Work is to be substantially completed, and completed and ready for final payment, are set forth in the Agreement.

ARTICLE 10 – LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 11 – SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration during the bidding and Contract award process of possible substitute or "or-equal" items. In cases in which the Contract allows the Contractor to request that Engineer authorize the use of a substitute or "or-equal" item of material or equipment, application for such acceptance may not be made to and will not be considered by Engineer until after the Effective Date of the Contract.

11.02 All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of "or-equal" or substitution requests are made at Bidder's sole risk.

ARTICLE 12 – SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 A Bidder shall be prepared to retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of the Work if required by the Bidding Documents (most commonly in the Specifications) to do so. If a prospective Bidder objects to retaining any such Subcontractor, Supplier, or other individual or entity, and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

12.02 Subsequent to the submittal of the Bid, Owner may not require the Successful Bidder or Contractor to retain any Subcontractor, Supplier, or other individual or entity against which Contractor has reasonable objection.

12.03 The apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to Owner a list of the Subcontractors or Suppliers proposed for the following portions of the Work: Electrical, Plumbing, Asphalt and Testing.

If requested by Owner, such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, or other individual or entity. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder shall submit a substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

12.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, or other individuals or entities. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.06 of the General Conditions.

ARTICLE 13 – PREPARATION OF BID

13.01 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.

B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."

13.02 A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown.

13.03 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The partnership's address for receiving notices shall be shown.

13.04 A Bid by a limited liability company shall be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the firm's address for receiving notices shall be shown.

13.05 A Bid by an individual shall show the Bidder's name and address for receiving notices.

13.06 A Bid by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture's address for receiving notices shall be shown.

13.07 All names shall be printed in ink below the signatures.

13.08 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid Form.

13.09 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.

13.10 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located, or Bidder shall covenant in writing to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder's state contractor license number, if any, shall also be shown on the Bid Form.

ARTICLE 14 – BASIS OF BID

14.01 Lump Sum

A. Bidders shall submit a Bid on a lump sum basis as set forth in the Bid Form.

14.02 Unit Price

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.

B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity" (which Owner or its representative has set forth in the Bid Form) for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

14.03 Allowances

A. For cash allowances the Bid price shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 13.02.B of the General Conditions.

ARTICLE 15 – SUBMITTAL OF BID

15.01 With each copy of the Bidding Documents, a Bidder is furnished one separate unbound copy of the Bid Form, and, if required, the Bid Bond Form. The unbound copy of the Bid Form is to be completed and submitted with the other documents required to be submitted under the terms of Article 7 of the Bid Form.

15.02 A Bid shall be received no later than the date and time specified by the Engineer and **shall be emailed to Yanay Ferral at yferral@weilerengineering.org with the subject of the email as "KWRU Blower & Electrical Upgrades – Bid". Attached to the email shall be a PDF of the prospective bidder's bid package that conforms to the requirements laid out in these documents. Only emailed bids will be considered.**

15.03 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will NOT be accepted.

ARTICLE 16 – MODIFICATION AND WITHDRAWAL OF BID

16.01 A Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.

16.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 16.01 and submit a new Bid prior to the date and time for the opening of Bids.

16.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17 – OPENING OF BIDS

17.01 Bids will be opened privately. Once the Owner has reviewed bids and selected a Bidder, WEC will send a memo with bid pricing that was received by all prospective Bidders along with a notice of award to the selected Bidder.

ARTICLE 18 – BIDS TO REMAIN SUBJECT TO ACCEPTANCE

18.01 All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 19 – EVALUATION OF BIDS AND AWARD OF CONTRACT

19.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible. If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Owner will reject the Bid as nonresponsive; provided that Owner also reserves the right to waive all minor informalities not involving price, time, or changes in the Work.

19.02 If Owner awards the contract for the Work, such award shall be to the responsible Bidder deemed to be in the best interest of the Owner, based solely on the Owners discretion.

19.03 Evaluation of Bids

A. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

B. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.

19.04 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for

those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.

19.05 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 20 – BONDS AND INSURANCE

20.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. **Payment and Performance Bonds will be required for this project.**

ARTICLE 21 – SIGNING OF AGREEMENT

21.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder shall execute and deliver the required number of counterparts of the Agreement (and any bonds and insurance documentation required to be delivered by the Contract Documents) to Owner. Within ten days thereafter, Owner shall deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in

BID FORM

KWRU Blower & Electrical Upgrades Project

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ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

KW Resort Utilities Corp.

6630 Front Street

Key West, Florida 33040

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for **60 days** after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

Addendum No.	**Addendum, Date**
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions (if any) at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.

F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.

J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 *Bidder certifies that:*

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the e execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
1.00	**General**				
1.01	Mobilization (no more than 5% of bid price)	LS	1		
1.02	Bonds & Insurance (no more than 2.5% of bid price)	LS	1		
1.03	Prepare & Submit Submittals for All Products	LS	1		
1.04	Erosion Control (BMPS)	LS	1		
2.00	**Blower**				
2.01	Demo & Removal of Existing Blowers, Piping, and Concrete	LS	1		
2.02	Install Rotary Screw Blowers	EA	3		
2.03	Furnish & Install 6" SS 316 SCH.10 Air Piping	LS	1		
2.04	Furnish & Install Butterfly Valves & Fittings	LS	1		
2.05	Install Concrete Platform Extension	LS	1		
2.06	Reroute Existing PVC Pipe	LS	1		
3.00	**Electrical**				
3.01	Demo Existing Electrical Equipment	LS	1		
3.02	Furnish & Install New Electrical Equipment	LS	1		
3.03	Furnish & Install New Electrical Conduits	LS	1		

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
3.04	Furnish & Install New Electrical Wires & Cables	LS	1		
3.05	Removal of Existing Conduits, Wires & Cables	LS	1		
3.06	Furnish & Install Pre-Engineered/Fabricated Aluminum Platform	LS	1		
3.07	Demo Existing Concrete Foundation	LS	1		
3.08	Install New Concrete Foundation	LS	1		
4.00	**SCADA Integration**				
4.01	Provide and install SCADA System	LS	1		
4.02	Provide and install fiber optic SCADA network	LS	1		
4.03	Provide and Install cellular backup system for SCADA	LS	1		
5.00	**Closeout**				
5.01	Record Documents	LS	1		
	Total of Bid Items				$

Bidder acknowledges that (1) each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and (2) estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

Total of Unit Price Bids = Total Bid Price $ _____

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete within **_330_** calendar days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **_360_** calendar days after the date when the Contract Times commence to run.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 *The following documents are submitted with and made a condition of this Bid:*

A. List of Proposed Subcontractors;

B. List of Project References;

C. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;

D. Contractor's License No.: _____ ;

E. Required Bidder Qualification Statement with supporting data

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

BIDDER: *[Indicate correct name of bidding entity]*

_____

By:
[Signature] _____

[Printed name] _____
(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:
[Signature] _____

[Printed name] _____

Title: _____

Submittal Date: _____

Address for giving notices:

_____

_____

_____

Telephone Number: _____

Fax Number: _____

Contact Name and e-mail address: _____

_____

Bidder's License No.: _____
(where applicable)

AGREEMENT
BETWEEN OWNER AND CONTRACTOR
FOR CONSTRUCTION CONTRACT (STIPULATED PRICE)

THIS AGREEMENT is by and between KW Resort Utilities Corp. ("Owner") and

("Contractor").

Owner and Contractor hereby agree as follows:

ARTICLE 1 – WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

ARTICLE 2 – THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: The project at KW Resort Utilities (KWRU) involves the installation of three new rotary screw blowers (two duty and one spare) equipped with Variable Frequency Drives (VFDs). While the Owner will supply the blowers, the Contractor is responsible for coordinating their delivery, unloading, handling, and installation. To accommodate these blowers, the existing concrete platform will be extended with a reinforced foundation and platform, including an OSHA-compliant stair system and handrails for safe access. Approximately 250 linear feet of 6-inch 316 Stainless Steel Schedule 10 air piping will be installed in two trains to serve the East and West Treatment Tanks, with efforts made to minimize operational disruptions. Once the new blowers are operational, the existing blower building will be demolished to clear space for a new elevated electrical equipment platform. This platform will be pre-engineered and fabricated from aluminum, supported by a concrete foundation built to design specifications. The platform will house new electrical services, including distribution panels and weatherproof NEMA 3R or 4X stainless steel enclosures, with careful coordination required to phase out the existing 600 amp electrical service and transfer loads to the new system without downtime. Additionally, the project includes a comprehensive SCADA system upgrade to integrate the new blowers and enhance remote monitoring, control, and data collection. The upgraded SCADA system will support remote access via Operator Workstations (OWS) and mobile devices, with secure remote control features and redundant cellular network access through AT&T's FirstNet service. The Contractor will also configure multiple levels of access control to ensure secure operations and provide training for the Owner's staff on the new system functionalities. Coordination of work with Florida Key's Electric Cooperative (FKEC) and KW Resort Utilities staff will be required throughout construction. All construction must adhere to the guidelines outlined in the Construction Plans, Bid Documents, and Technical Specifications.

2.02 **See attached plan and scope document.**

ARTICLE 3 – ENGINEER

3.01 The part of the Project that pertains to the Work has been designed by Weiler Engineering Corporation.

3.02 The Owner has retained Weiler Engineering Corporation ("Engineer") to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned

to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Contract Times: Days*

A. The Work will be substantially completed within **330** days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **360** days after the date when the Contract Times commence to run.

4.03 *Liquidated Damages*

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Substantial Completion: Contractor shall pay Owner $1000 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in Paragraph 4.02.A above for Substantial Completion until the Work is substantially complete.

2. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay Owner $500 for each day that expires after such time until the Work is completed and ready for final payment.

3. Liquidated damages for failing to timely attain Substantial Completion and final completion are not additive and will not be imposed concurrently.

ARTICLE 5 – CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract:

A. For all Work other than Unit Price Work, a lump sum of: $_____.

All specific cash allowances are included in the above price in accordance with Paragraph 13.02 of the General Conditions.

ARTICLE 6 – PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

A. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

A. Owner shall make progress payments on account of the Contract Price on the basis of Contractor's Applications for Payment on or about the 30th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured as the percentage completion of the Work as determined by the Engineer.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract

a. 90 percent of Work completed (with the balance being retainage). If the Work has been 50 percent completed as determined by Engineer, and if the character and progress of the Work have been satisfactory to Owner and Engineer, then as long as the character and progress of the Work remain satisfactory to Owner and Engineer, there will be no additional retainage; and

b. 90 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 100 percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 200 percent of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

6.03 *Final Payment*

A. Upon final completion and acceptance of the Work in accordance with Paragraph 15.06 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer as provided in said Paragraph 15.06.

ARTICLE 7 – INTEREST

7.01 All amounts not paid when due shall bear interest at the rate of *1* percent per annum.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce Owner to enter into this Contract, Contractor makes the following representations:

A. Contractor has examined and carefully studied the Contract Documents, and any data and reference items identified in the Contract Documents.

B. Contractor has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Contractor is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (3) Contractor's safety precautions and programs.

E. Based on the information and observations referred to in the preceding paragraph, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

F. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

G. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

H. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

I. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

ARTICLE 9 – CONTRACT DOCUMENTS

9.01 *Contents*

A. The Contract Documents consist of the following:

1. This Agreement (pages 1 to 7, inclusive).
2. General Conditions (pages i to 65, inclusive).
3. Drawings (not attached but incorporated by reference)
4. Exhibits to this Agreement (enumerated as follows):
    a. Contractor's Bid (pages __ to _, inclusive).
5. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:
    a. Notice to Proceed.
    b. Work Change Directives.
    c. Change Orders.
    d. Field Orders.

B. The documents listed in Paragraph 9.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 9.

D. The Contract Documents may only be amended, modified, or supplemented as provided in the General Conditions.

ARTICLE 10 – MISCELLANEOUS

10.01 *Terms*

A. Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.

10.02 *Assignment of Contract*

A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

10.03 *Successors and Assigns*

A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 *Severability*

A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

10.05 *Contractor's Certifications*

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on _____ (which is the Effective Date of the Contract).

1.

OWNER: KW Resort Utilities Corp.	CONTRACTOR:
By: Greg Wright	By:
Title: Vice President	Title:
	(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)
Attest:	Attest:
Title:	Title:
Address for giving notices:	Address for giving notices:
KW Resort Utilities Corp	
6630 Front Street	
Key West, Florida 33040	
	License No.: *(where applicable)*

00700

STANDARD GENERAL CONDITIONS
OF THE CONSTRUCTION CONTRACT

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*—(a) A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein: seeking an adjustment of Contract Price or Contract Times, or both; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract; or (b) a demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal; or seeking resolution of a contractual issue that Engineer

has declined to address. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to (a) the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. §§9601 et seq. ("CERCLA"); (b) the Hazardous Materials Transportation Act, 49 U.S.C. §§5101 et seq.; (c) the Resource Conservation and Recovery Act, 42 U.S.C. §§6901 et seq. ("RCRA"); (d) the Toxic Substances Control Act, 15 U.S.C. §§2601 et seq.; (e) the Clean Water Act, 33 U.S.C. §§1251 et seq.; (f) the Clean Air Act, 42 U.S.C. §§7401 et seq.; or (g) any other federal, state, or local statute, law, rule, regulation, ordinance, resolution, code, order, or decree regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between the Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents. .

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Engineer*—The individual or entity named as such in the Agreement.

21. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

22. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated in the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, does not establish a Hazardous Environmental Condition.

23. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

24. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

25. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date or by a time prior to Substantial Completion of all the Work.

26. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

27. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

28. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

29. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

30. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

31. *Project Manual*—The written documents prepared for, or made available for, procuring and constructing the Work, including but not limited to the Bidding Documents or other construction procurement documents, geotechnical and existing conditions information, the Agreement, bond forms, General Conditions, Supplementary Conditions, and Specifications. The contents of the Project Manual may be bound in one or more volumes.

32. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative or "RPR" includes any assistants or field staff of Resident Project Representative.

33. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

34. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals and the performance of related construction activities.

35. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

36. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

37. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands furnished by Owner which are designated for the use of Contractor.

38. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

39. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

40. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

41. *Successful Bidder*—The Bidder whose Bid the Owner accepts, and to which the Owner makes an award of contract, subject to stated conditions.

42. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

43. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

44. *Technical Data*—Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (a) subsurface conditions at the Site, or physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) or (b) Hazardous Environmental Conditions at the Site. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then the data contained in boring logs, recorded measurements of subsurface water levels, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical or environmental report prepared for the Project and made available to Contractor are hereby defined as Technical Data with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06.

45. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, fiber optic transmissions, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

46. *Unit Price Work*—Work to be paid for on the basis of unit prices.

47. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

48. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

A. The words and terms discussed in the following paragraphs are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*:

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day*:

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*:

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents; or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or 15.04).

E. *Furnish, Install, Perform, Provide*:

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. *Bonds*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Contractor’s Insurance*: When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract), the certificates and other evidence of insurance required to be provided by Contractor in accordance with Article 6.

C. *Evidence of Owner’s Insurance*: After receipt of the executed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each named insured and additional insured (as identified in the Supplementary Conditions or otherwise), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise specifically required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.03.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may transmit, and shall accept, Project-related correspondence, text, data, documents, drawings, information, and graphics, including but not limited to Shop Drawings and other submittals, in electronic media or digital format, either directly, or through access to a secure Project website.

B. If the Contract does not establish protocols for electronic or digital transmittals, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. When transmitting items in electronic media or digital format, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the recipient's use of software application packages, operating systems, or

computer hardware differing from those used in the drafting or transmittal of the items, or from those established in applicable transmittal protocols.

ARTICLE 3 – DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic or digital versions of the Contract Documents (including any printed copies derived from such electronic or digital versions) and the printed record version, the printed record version shall govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

3.02 *Reference Standards*

A. Standards Specifications, Codes, Laws and Regulations

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard specification, manual, reference standard, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*:

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict,

error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract Documents issued pursuant to Paragraph 11.01.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*:

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work thereunder.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly give written notice to Owner and Contractor that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4 – COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to such date.

4.03 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Times and Contract Price. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

1. severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

2. abnormal weather conditions;

3. acts or failures to act of utility owners (other than those performing other work at or adjacent to the Site by arrangement with the Owner, as contemplated in Article 8); and

4. acts of war or terrorism.

D. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5.

E. Paragraph 8.03 governs delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

F. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor.

G. Contractor must submit any Change Proposal seeking an adjustment in Contract Price or Contract Times under this paragraph within 30 days of the commencement of the delaying, disrupting, or interfering event.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*:

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.12, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or at law; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part

by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner of explorations and tests of subsurface conditions at or adjacent to the Site;

2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities); and

3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site either:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate; or

2. is of such a nature as to require a change in the Drawings or Specifications; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine the necessity of Owner's obtaining additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A above; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, or both, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise; or

b. the existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

c. Contractor failed to give the written notice as required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or adjacent to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer do not warrant or guarantee the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

b. locating all Underground Facilities shown or indicated in the Contract Documents as being at the Site;

c. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

d. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, then Contractor shall, promptly after

becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer.

C. *Engineer's Review*: Engineer will promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the Underground Facility in question; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and advise Owner in writing of Engineer's findings, conclusions, and recommendations. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question, addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Possible Price and Times Adjustments*:

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, or both, to the extent that any existing Underground Facility at the Site that was not shown or indicated in the Contract Documents, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated the existence or actual location of the Underground Facility in question;

    b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

    c. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times; and

    d. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, or both, then any such adjustment shall be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, or both, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

2. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data (as defined in Article 1) contained in any geotechnical or environmental report prepared for the Project and made available to Contractor. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off.

H. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6 – BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of all of Contractor's obligations under the Contract. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the Supplementary Conditions, or other specific provisions of the Contract. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions or other specific provisions of the Contract.

B. All bonds shall be in the form prescribed by the Contract except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (as amended and supplemented) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

C. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds in the required amounts.

D. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state or jurisdiction where any part of the Project is located, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the bond and surety requirements above.

E. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

F. Upon request, Owner shall provide a copy of the payment bond to any Subcontractor, Supplier, or other person or entity claiming to have furnished labor or materials used in the performance of the Work.

6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this Article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Contractor shall deliver to Owner, with copies to each named insured and additional insured (as identified in this Article, in the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Contractor has obtained and is

maintaining the policies, coverages, and endorsements required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Contractor may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

D. Owner shall deliver to Contractor, with copies to each named insured and additional insured (as identified in this Article, the Supplementary Conditions, or elsewhere in the Contract), certificates of insurance establishing that Owner has obtained and is maintaining the policies, coverages, and endorsements required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies and endorsements, and documentation of applicable self-insured retentions and deductibles. Owner may block out (redact) any confidential premium or pricing information contained in any policy or endorsement furnished under this provision.

E. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, shall not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

F. If either party does not purchase or maintain all of the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

G. If Contractor has failed to obtain and maintain required insurance, Owner may exclude the Contractor from the Site, impose an appropriate set-off against payment, and exercise Owner's termination rights under Article 16.

H. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price shall be adjusted accordingly.

I. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests.

J. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner and other individuals and entities in the Contract.

6.03 *Contractor's Insurance*

A. *Workers' Compensation*: Contractor shall purchase and maintain workers' compensation and employer's liability insurance for:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts.

2. United States Longshoreman and Harbor Workers' Compensation Act and Jones Act coverage (if applicable).

3. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees (by stop-gap endorsement in monopolist worker's compensation states).

4. Foreign voluntary worker compensation (if applicable).

B. *Commercial General Liability—Claims Covered*: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against:

1. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees.

2. claims for damages insured by reasonably available personal injury liability coverage.

3. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

C. *Commercial General Liability—Form and Content*: Contractor's commercial liability policy shall be written on a 1996 (or later) ISO commercial general liability form (occurrence form) and include the following coverages and endorsements:

1. Products and completed operations coverage:

a. Such insurance shall be maintained for three years after final payment.

b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.

2. Blanket contractual liability coverage, to the extent permitted by law, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.

3. Broad form property damage coverage.

4. Severability of interest.

5. Underground, explosion, and collapse coverage.

6. Personal injury coverage.

7. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together); or CG 20 10 07 04 and CG 20 37 07 04 (together); or their equivalent.

8. For design professional additional insureds, ISO Endorsement CG 20 32 07 04, "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

D. *Automobile liability*: Contractor shall purchase and maintain automobile liability insurance against claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy shall be written on an occurrence basis.

E. *Umbrella or excess liability*: Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the paragraphs above. Subject to industry-standard exclusions, the coverage afforded shall follow form as to each and every one of the underlying policies.

F. *Contractor's pollution liability insurance*: Contractor shall purchase and maintain a policy covering third-party injury and property damage claims, including clean-up costs, as a result

of pollution conditions arising from Contractor's operations and completed operations. This insurance shall be maintained for no less than three years after final completion.

G. *Additional insureds*: The Contractor's commercial general liability, automobile liability, umbrella or excess, and pollution liability policies shall include and list as additional insureds Owner and Engineer, and any individuals or entities identified in the Supplementary Conditions; include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds; and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby (including as applicable those arising from both ongoing and completed operations) on a non-contributory basis. Contractor shall obtain all necessary endorsements to support these requirements.

H. *Contractor's professional liability insurance*: If Contractor will provide or furnish professional services under this Contract, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance shall provide protection against claims arising out of performance of professional design or related services, and caused by a negligent error, omission, or act for which the insured party is legally liable. It shall be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. If such professional design services are performed by a Subcontractor, and not by Contractor itself, then the requirements of this paragraph may be satisfied through the purchasing and maintenance of such insurance by such Subcontractor.

I. *General provisions*: The policies of insurance required by this Paragraph 6.03 shall:

1. include at least the specific coverages provided in this Article.

2. be written for not less than the limits of liability provided in this Article and in the Supplementary Conditions, or required by Laws or Regulations, whichever is greater.

3. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed, or renewal refused until at least 10 days prior written notice has been given to Contractor. Within three days of receipt of any such written notice, Contractor shall provide a copy of the notice to Owner, Engineer, and each other insured under the policy.

4. remain in effect at least until final payment (and longer if expressly required in this Article) and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract Documents.

5. be appropriate for the Work being performed and provide protection from claims that may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.

J. The coverage requirements for specific policies of insurance must be met by such policies, and not by reference to excess or umbrella insurance provided in other policies.

6.04 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 6.03, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

B. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

6.05 *Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the full insurable replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the Owner and Contractor as named insureds, and all Subcontractors, and any individuals or entities required by the Supplementary Conditions to be insured under such builder's risk policy, as insureds or named insureds. For purposes of the remainder of this Paragraph 6.05, Paragraphs 6.06 and 6.07, and any corresponding Supplementary Conditions, the parties required to be insured shall collectively be referred to as "insureds."

2. be written on a builder's risk "all risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire; lightning; windstorm; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; flood; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; water damage (other than that caused by flood); and such other perils or causes of loss as may be specifically required by the Supplementary Conditions. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake; volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance may be provided through other insurance policies acceptable to Owner and Contractor.

3. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

4. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects).

5. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).

6. extend to cover damage or loss to insured property while in transit.

7. allow for partial occupation or use of the Work by Owner, such that those portions of the Work that are not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

8. allow for the waiver of the insurer's subrogation rights, as set forth below.

9. provide primary coverage for all losses and damages caused by the perils or causes of loss covered.

10. not include a co-insurance clause.

11. include an exception for ensuing losses from physical damage or loss with respect to any defective workmanship, design, or materials exclusions.

12. include performance/hot testing and start-up.

13. be maintained in effect, subject to the provisions herein regarding Substantial Completion and partial occupancy or use of the Work by Owner, until the Work is complete.

B. *Notice of Cancellation or Change*: All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 6.05 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured.

C. *Deductibles*: The purchaser of any required builder's risk or property insurance shall pay for costs not covered because of the application of a policy deductible.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide notice of such occupancy or use to the builder's risk insurer. The builder's risk insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy; rather, those portions of the Work that are occupied or used by Owner may come off the builder's risk policy, while those portions of the Work not yet occupied or used by Owner shall remain covered by the builder's risk insurance.

E. *Additional Insurance*: If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.05, it may do so at Contractor's expense.

F. *Insurance of Other Property*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, such as tools, construction equipment, or other personal property owned by Contractor, a Subcontractor, or an employee of Contractor or a Subcontractor, then the entity or individual owning such property item will be responsible for deciding whether to insure it, and if so in what amount.

6.06 *Waiver of Rights*

A. All policies purchased in accordance with Paragraph 6.05, expressly including the builder's risk policy, shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all Subcontractors, all individuals or entities identified in the Supplementary Conditions as insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 6.06.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them.

D. Contractor shall be responsible for assuring that the agreement under which a Subcontractor performs a portion of the Work contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by builder's risk insurance and any other property insurance applicable to the Work.

6.07 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of insurance required by Paragraph 6.05 will be adjusted and settled with the named insured that purchased the

policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.05 shall distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the money so received applied on account thereof, and the Work and the cost thereof covered by Change Order, if needed.

ARTICLE 7 – CONTRACTOR'S RESPONSIBILITIES

7.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

B. All materials and equipment incorporated into the Work shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and

guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.04 *"Or Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment, or items from other proposed suppliers under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer shall deem it an "or equal" item. For the purposes of this paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

3) it has a proven record of performance and availability of responsive service; and

4) it is not objectionable to Owner.

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an "or-equal", which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request shall result in any change in Contract Price. The Engineer's denial of an "or-equal" request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer considered the proposed item as a substitute pursuant to Paragraph 7.05.

7.05 *Substitutes*

A. Unless the specification or description of an item of material or equipment required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of material or equipment under the circumstances described below. To the extent possible such requests shall be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of material or equipment from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.05.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

a. shall certify that the proposed substitute item will:

1) perform adequately the functions and achieve the results called for by the general design,

2) be similar in substance to that specified, and

3) be suited to the same use as that specified.

b. will state:

1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times,

2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

c. will identify:

1) all variations of the proposed substitute item from that specified, and

2) available engineering, sales, maintenance, repair, and replacement services.

d. shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request shall be final and binding, and may not be reversed through an appeal under any provision of the Contract Documents. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.05.D, by timely submittal of a Change Proposal.

7.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner.

B. Contractor shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within five days.

E. Owner may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.

F. If Owner requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions.

J. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.

K. Contractor shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed herein.

L. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

M. All Work performed for Contractor by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer.

N. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor on account of Work performed for Contractor by the particular Subcontractor or Supplier.

O. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier, or other individual or entity; nor

2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

7.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.08 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work

7.09 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.10 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It shall not be Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Owner or Contractor may give notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.11 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.12 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify Owner; the owners of adjacent property, Underground Facilities, and other utilities; and other contractors and utility owners performing work at or adjacent to the Site, when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 7.12.A.2 or 7.12.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and protection shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 15.06.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

G. Contractor's duties and responsibilities for safety and protection shall resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.13 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or

exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

7.16 *Shop Drawings, Samples, and Other Submittals*

A. *Shop Drawing and Sample Submittal Requirements*:

1. Before submitting a Shop Drawing or Sample, Contractor shall have:

a. reviewed and coordinated the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

c. determined and verified the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that submittal, and that Contractor approves the submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be set forth in a written communication separate from the Shop Drawings or Sample submittal; and, in addition, in the case of Shop Drawings by a specific notation made on each Shop Drawing submitted to Engineer for review and approval of each such variation.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals. Each submittal will be identified as Engineer may require.

1. *Shop Drawings*:

a. Contractor shall submit the number of copies required in the Specifications.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to

provide and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.D.

2. *Samples*:

   a. Contractor shall submit the number of Samples required in the Specifications.

   b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 7.16.D.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Other Submittals*: Contractor shall submit other submittals to Engineer in accordance with the accepted Schedule of Submittals, and pursuant to the applicable terms of the Specifications.

D. *Engineer's Review*:

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order.

5. Engineer's review and approval of a Shop Drawing or Sample shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, shall not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance or approval of a Shop Drawing, Sample, or other submittal shall result in such item becoming a Contract Document.

8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.D.4.

E. *Resubmittal Procedures*:

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

2. Contractor shall furnish required submittals with sufficient information and accuracy to obtain required approval of an item with no more than three submittals. Engineer will record Engineer's time for reviewing a fourth or subsequent submittal of a Shop Drawings, sample, or other item requiring approval, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved submittal item, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due to Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

7.17 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal;

6. the issuance of a notice of acceptability by Engineer;

7. any inspection, test, or approval by others; or

8. any correction of defective Work by Owner.

D. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract shall govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 7.18.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

7.19 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable Laws and Regulations.

B. If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and other submittals prepared by such professional. Shop

Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this paragraph, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 7.16.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria specified by Owner or Engineer.

ARTICLE 8 – OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any utility work at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford each other contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

D. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 8, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. the identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. an itemization of the specific matters to be covered by such authority and responsibility; and

3. the extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

A. If, in the course of performing other work at or adjacent to the Site for Owner, the Owner's employees, any other contractor working for Owner, or any utility owner for whom the Owner is responsible causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment shall take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract. When applicable, any such equitable adjustment in Contract Price shall be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due to Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this paragraph.

C. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due to Contractor.

D. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9 – OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents shall be that of the former Engineer.

9.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.08. Particularly, but without limitation, during

or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 10.08. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent, or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

10.04 *Rejecting Defective Work*

A. Engineer has the authority to reject Work in accordance with Article 14.

10.05 *Shop Drawings, Change Orders and Payments*

A. Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, are set forth in Paragraph 7.16.

B. Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, are set forth in Paragraph 7.19.

C. Engineer's authority as to Change Orders is set forth in Article 11.

D. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.06 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.07 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.08 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 15.06.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.08 shall also apply to the Resident Project Representative, if any.

10.09 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs (if any) of which Engineer has been informed.

ARTICLE 11 – AMENDING THE CONTRACT DOCUMENTS; CHANGES IN THE WORK

11.01 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

1. *Change Orders*:

a. If an amendment or supplement to the Contract Documents includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order. A Change Order also may be used to establish amendments and supplements of the Contract Documents that do not affect the Contract Price or Contract Times.

b. Owner and Contractor may amend those terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, without the recommendation of the Engineer. Such an amendment shall be set forth in a Change Order.

2. *Work Change Directives*: A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.04 regarding change of Contract Price. Contractor must submit any Change Proposal seeking an

adjustment of the Contract Price or the Contract Times, or both, no later than 30 days after the completion of the Work set out in the Work Change Directive. Owner must submit any Claim seeking an adjustment of the Contract Price or the Contract Times, or both, no later than 60 days after issuance of the Work Change Directive.

3. *Field Orders*: Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.02 *Owner-Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Such changes shall be supported by Engineer's recommendation, to the extent the change involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters. Such changes may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work shall be performed under the applicable conditions of the Contract Documents. Nothing in this paragraph shall obligate Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.03 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.

11.04 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment of Contract Price shall comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.04.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on

the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.04.C).

C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee shall be 15 percent;

b. for costs incurred under Paragraph 13.01.B.3, the Contractor's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.04.C.2.a and 11.04.C.2.b is that the Contractor's fee shall be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.A.1 and 13.01.A.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of five percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted work the maximum total fee to be paid by Owner shall be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the work;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 11.04.C.2.a through 11.04.C.2.e, inclusive.

11.05 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times shall comply with the provisions of Paragraph 11.06. Any Claim for an adjustment in the Contract Times shall comply with the provisions of Article 12.

B. An adjustment of the Contract Times shall be subject to the limitations set forth in Paragraph 4.05, concerning delays in Contractor's progress.

11.06 *Change Proposals*

A. Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; appeal an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; contest a set-off against payment due; or seek other relief under

the Contract. The Change Proposal shall specify any proposed change in Contract Times or Contract Price, or both, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents.

1. *Procedures*: Contractor shall submit each Change Proposal to Engineer promptly (but in no event later than 30 days) after the start of the event giving rise thereto, or after such initial decision. The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal. The supporting data shall be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event. Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal.

2. *Engineer's Action*: Engineer will review each Change Proposal and, within 30 days after receipt of the Contractor's supporting data, either deny the Change Proposal in whole, approve it in whole, or deny it in part and approve it in part. Such actions shall be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

3. *Binding Decision*: Engineer's decision will be final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

B. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice shall be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

11.07 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

2. changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.02, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise), or other engineering or technical matters; and

4. changes in the Contract Price or Contract Times, or other changes, which embody the substance of any final and binding results under Paragraph 11.06, or Article 12.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of this Paragraph 11.07, it shall be deemed to be of full force and effect, as if fully executed.

11.08 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12 – CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor shall be submitted to the Claims process set forth in this Article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents; and

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim shall rest with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, or both, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim shall be stated in writing and submitted to the other party, with a copy to Engineer.

D. *Mediation*:

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate shall stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process shall resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim

submittal and decision process shall resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action shall be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim shall be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim shall be incorporated in a Change Order to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. To determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 13.01.C, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, and vacation and holiday pay applicable

thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

    c. Rentals of all construction equipment and machinery, and the parts thereof, whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

    d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

    e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

    f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 6.05), provided such losses and damages have resulted from causes

other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*: When the Work as a whole is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 11.04.C.

E. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

13.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of the following paragraph.

E. Within 30 days of Engineer's written decision under the preceding paragraph, Contractor may submit a Change Proposal, or Owner may file a Claim, seeking an adjustment in the Contract Price if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement;

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that it is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price, and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 14 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

14.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work shall be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests shall be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering shall be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to

cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work shall be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, then Owner may, after seven days written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will

include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments*:

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens, and evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*:

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

a. to supervise, direct, or control the Work, or

b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

d. to make any examination to ascertain how or for what purposes Contractor has used the money paid on account of the Contract Price, or

e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

a. the Work is defective, requiring correction or replacement;

b. the Contract Price has been reduced by Change Orders;

c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*:

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

E. *Reductions in Payment by Owner*:

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

a. claims have been made against Owner on account of Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages on account of Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

c. Contractor has failed to provide and maintain required bonds or insurance;

d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

f. the Work is defective, requiring correction or replacement;

g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

h. the Contract Price has been reduced by Change Orders;

i. an event that would constitute a default by Contractor and therefore justify a termination for cause has occurred;

j. liquidated damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

l. there are other items entitling Owner to a set off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount

remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed shall be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 15.01.C.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than seven days after the time of payment by Owner.

15.03 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which shall fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have seven days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through E for that part of the Work.

2. At any time Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.05 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*:

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of

inspection, annotated record documents (as provided in Paragraph 7.11), and other documents, Contractor may make application for final payment.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents;

   b. consent of the surety, if any, to final payment;

   c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

   d. a list of all disputes that Contractor believes are unsettled; and

   e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Application and Acceptance*:

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the Application for Payment to Owner for payment. Such recommendation shall account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to the provisions of Paragraph 15.07. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment.

D. *Payment Becomes Due*: Thirty days after the presentation to Owner of the final Application for Payment and accompanying documentation, the amount recommended by Engineer (less any further sum Owner is entitled to set off against Engineer's recommendation,

including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions above with respect to progress payments) will become due and shall be paid by Owner to Contractor.

15.07 *Waiver of Claims*

A. The making of final payment will not constitute a waiver by Owner of claims or rights against Contractor. Owner expressly reserves claims and rights arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 15.05, from Contractor's failure to comply with the Contract Documents or the terms of any special guarantees specified therein, from outstanding Claims by Owner, or from Contractor's continuing obligations under the Contract Documents.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted or appealed under the provisions of Article 17.

15.08 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents, or by any specific provision of the Contract Documents), any Work is found to be defective, or if the repair of any damages to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas used by Contractor as permitted by Laws and Regulations, is found to be defective, then Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such other adjacent areas;

2. correct such defective Work;

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others).

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16 – SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension. Any Change Proposal seeking such adjustments shall be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) ten days written notice that Owner is considering a declaration that Contractor is in default and termination of the contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within seven days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses,

and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

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

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond shall govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate For Convenience*

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

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

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

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

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

16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for

expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this Article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full; and

2. Disputes between Owner and Contractor concerning the Work or obligations under the Contract Documents, and arising after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this Article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions; or

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18 – MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person, by a commercial courier service or otherwise, to the individual or to a member of the firm or to an officer of the corporation for which it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the sender of the notice.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision shall not constitute a waiver of that provision, nor shall it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

18.07 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SECTION 00800

Supplementary Conditions

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract, EJCDC® C-700 (2013 Edition). All provisions that are not so amended or supplemented remain in full force and effect.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

ARTICLE 5 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

SC 5.03 Delete Paragraphs 5.03.A and 5.03.B in their entirety and insert the following:

A. No reports of explorations or tests of subsurface conditions at or adjacent to the Site, or drawings of physical conditions relating to existing surface or subsurface structures at the Site, are known to Owner.

SC 5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:

A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

B. Not Used.

ARTICLE 6 – BONDS AND INSURANCE

SC 6.03 Add the following new paragraph immediately after Paragraph 6.03.J:

K. The limits of liability for the insurance required by Paragraph 6.03 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages under Paragraphs 6.03.A.1 and A.2 of the General Conditions:

State:		**Statutory**
Federal, if applicable (e.g., Longshoreman's):		**Statutory**
Jones Act coverage, if applicable:		
Bodily injury by accident, each accident	**$**	**N/A**
Bodily injury by disease, aggregate	**$**	**N/A**

Employer's Liability:

Bodily injury, each accident	**$**	**250,000**
Bodily injury by disease, each employee	**$**	**250,000**
Bodily injury/disease aggregate	**$**	**500,000**

For work performed in monopolistic states, stop-gap liability coverage shall be endorsed to either the worker's compensation or commercial general liability policy with a minimum limit of: **$ N/A**

Foreign voluntary worker compensation **Statutory**

2. Contractor's Commercial General Liability under Paragraphs 6.03.B and 6.03.C of the General Conditions:

General Aggregate	**$**	**2,000,000**
Products - Completed Operations Aggregate	**$**	**N/A**
Personal and Advertising Injury	**$**	**2,000,000**
Each Occurrence (Bodily Injury and Property Damage)	**$**	**2,000,000**

3. Automobile Liability under Paragraph 6.03.D. of the General Conditions:

Bodily Injury:

Each person	**$**	**2,000,000**
Each accident	**$**	**2,000,000**

Property Damage:

Each accident	**$**	**2,000,000**

[or]

Combined Single Limit of	**$**	**2,000,000**

4. Excess or Umbrella Liability:

Per Occurrence	**$**	**N/A**
General Aggregate	**$**	**N/A**

5. **Contractor's Pollution Liability:**

Each Occurrence	**$ N/A**
General Aggregate	**$ N/A**

☐ **If box is checked, Contractor is not required to provide Contractor's Pollution Liability insurance under this Contract**

6. **Additional Insureds: In addition to Owner and Engineer, include as additional insureds the following: N/A**

7. **Contractor's Professional Liability:**

Each Claim	**$ N/A**
Annual Aggregate	**$ N/a**

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.A:

B. The Resident Project Representative (RPR) will be Engineer's representative at the Site, will act as directed by and under the supervision of Engineer, and will confer with Engineer regarding RPR's actions.

1. General: RPR's dealings in matters pertaining to the Work in general shall be with Engineer and Contractor. RPR's dealings with Subcontractors shall only be through or with the full knowledge and approval of Contractor. RPR shall generally communicate with Owner only with the knowledge of and under the direction of Engineer.

2. Schedules: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and Schedule of Values prepared by Contractor and consult with Engineer concerning acceptability.

3. Conferences and Meetings: Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings, and prepare and circulate copies of minutes thereof.

4. Liaison:

a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.

b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.

c. Assist in obtaining from Owner additional details or information, when required for proper execution of the Work.

5. Interpretation of Contract Documents: Report to Engineer when clarifications and interpretations of the Contract Documents are needed and transmit to Contractor clarifications and interpretations as issued by Engineer.

6. Shop Drawings and Samples:

a. **Record date of receipt of Samples and Contractor-approved Shop Drawings.**

b. Receive Samples which are furnished at the Site by Contractor, and notify Engineer of availability of Samples for examination.

c. Advise Engineer and Contractor of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been approved by Engineer.

7. Modifications: Consider and evaluate Contractor's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, if any, to Engineer. Transmit to Contractor in writing decisions as issued by Engineer.

8. Review of Work and Rejection of Defective Work:

a. Conduct on-Site observations of Contractor's work in progress to assist Engineer in determining if the Work is in general proceeding in accordance with the Contract Documents.

b. Report to Engineer whenever RPR believes that any part of Contractor's work in progress is defective, will not produce a completed Project that conforms generally to the Contract Documents, or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise Engineer of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

9. Inspections, Tests, and System Start-ups:

a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate Owner's personnel, and that Contractor maintains adequate records thereof.

b. Observe, record, and report to Engineer appropriate details relative to the test procedures and systems start-ups.

10. Records:

a. Prepare a daily report or keep a diary or log book, recording Contractor's hours on the Site, Subcontractors present at the Site, weather conditions, data relative to questions of Change Orders, Field

Orders, Work Change Directives, or changed conditions, Site visitors, deliveries of equipment or materials, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to Engineer.

b. Record names, addresses, fax numbers, e-mail addresses, web site locations, and telephone numbers of all Contractors, Subcontractors, and major Suppliers of materials and equipment.

c. Maintain records for use in preparing Project documentation.

11. Reports:

a. Furnish to Engineer periodic reports as required of progress of the Work and of Contractor's compliance with the Progress Schedule and schedule of Shop Drawing and Sample submittals.

b. Draft and recommend to Engineer proposed Change Orders, Work Change Directives, and Field Orders. Obtain backup material from Contractor.

c. Immediately notify Engineer of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, force majeure or delay events, damage to property by fire or other causes, or the discovery of any Constituent of Concern or Hazardous Environmental Condition.

12. Payment Requests: Review applications for payment with Contractor for compliance with the established procedure for their submission and forward with recommendations to Engineer, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.

13. Certificates, Operation and Maintenance Manuals: During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Contract Documents to be assembled and furnished by Contractor are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to Engineer for review and forwarding to Owner prior to payment for that part of the Work.

14. Completion:

a. Participate in Engineer's visits to the Site to determine Substantial Completion, assist in the determination of Substantial Completion and the preparation of a punch list of items to be completed or corrected.

b. Participate in Engineer's final visit to the Site to determine completion of the Work, in the company of Owner and Contractor, and prepare a final punch list of items to be completed and deficiencies to be remedied.

c. Observe whether all items on the final list have been completed or corrected and make recommendations to Engineer concerning acceptance and issuance of the notice of acceptability of the work.

C. The RPR shall not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).

2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.

3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.

4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of Contractor's work.

5. Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.

6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.

7. Accept Shop Drawing or Sample submittals from anyone other than Contractor.

8. Authorize Owner to occupy the Project in whole or in part.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

SC 15.03.B Add the following new subparagraph to Paragraph 15.03.B:

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, shall be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under Article 15.

ARTICLE 17 – FINAL RESOLUTION OF DISPUTES

SC-17.02 Add the following new paragraph immediately after Paragraph 17.01.

SC-17.02 Arbitration

A. All matters subject to final resolution under this Article will be decided by arbitration in accordance with the rules of the selected arbitration agency, subject to the conditions and limitations of this paragraph. This agreement to arbitrate and any other agreement or consent to arbitrate entered into will be specifically enforceable under the prevailing law of any court having jurisdiction.

B. The demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitrator or arbitration provider, and a copy will

be sent to Engineer for information. The demand for arbitration will be made within the specific time required in this Article, or if no specified time is applicable within a reasonable time after the matter in question has arisen, and in no event shall any such demand be made after the date when institution of legal or equitable proceedings based on such matter in question would be barred by the applicable statute of limitations. The demand for arbitration should include specific reference to Paragraph SC-17.02.D below.

C. No arbitration arising out of or relating to the Contract shall include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:

1. the inclusion of such other individual or entity is necessary if complete relief is to be afforded among those who are already parties to the arbitration; and

2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration and which will arise in such proceedings.

D. The award rendered by the arbitrator(s) shall be consistent with the agreement of the parties, in writing, and include a concise breakdown of the award, and a written explanation of the award specifically citing the Contract provisions deemed applicable and relied on in making the award.

E. The award will be final. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal, subject to provisions of the Laws and Regulations relating to vacating or modifying an arbitral award.

F. The fees and expenses of the arbitrators and any arbitration service shall be shared equally by Owner and Contractor.

SC-17.03 Add the following new paragraph immediately after Paragraph 17.02.

SC-17.03 Attorneys' Fees: For any matter subject to final resolution under this Article, the prevailing party shall be entitled to an award of its attorneys' fees incurred in the final resolution proceedings, in an equitable amount to be determined in the discretion of the court, arbitrator, arbitration panel, or other arbiter of the matter subject to final resolution, taking into account the parties' initial demand or defense positions in comparison with the final result.

SPECIFICATIONS

FOR

Blower & Electrical Upgrades

OWNER:

Key West Resort Utilities (KWRU)

6630 Front Street,
Key West, Florida 33040

by

THE WEILER ENGINEERING CORPORATION

6805 OVERSEAS HIGHWAY
MARATHON, FLORIDA

September 2024

THIS IS TO CERTIFY THAT THE ENCLOSED ENGINEERING SPECIFICATIONS WERE PREPARED BY ME OR UNDER MY RESPONSIBLE CHARGE.

FOR BIDDING PURPOSES

_____
Stephen J. Suggs, PE, FL License No. 85237

_____
Date

TECHNICAL SPECIFICATIONS
FOR
KW RESORT UTILITIES CORPORATION
BLOWER & ELECTRICAL UPGRADES PROJECT

TABLE OF CONTENTS

Division 9: Finishes

Division 12: Special Construction

Division 13: Instrumentation & Controls

Division 16: Electrical

SECTION 01051

GRADES, LINES, AND LEVELS

PART 1 GENERAL

1.1 DESCRIPTION

A. All work under this contract shall be constructed in accordance with the lines and grades on the plans or as given by the Engineer or Owner. The full responsibility for holding to alignment and grade shall rest upon the Contractor.

B. The Contractor shall have a certified Land Surveyor set a bench mark for use as a control point in the project. The Contractor will be responsible for setting all grade stakes, slope stakes, offsets from these points, and all other layout and staking.

C. The Contractor shall safeguard all points, stakes, grade marks, bench marks, and monuments established on the work, shall bear the cost of re-establishing same if disturbed, and shall assume the entire expense of rectifying work improperly constructed due to failure to maintain and protect such established points, stakes, and marks.

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SECTION 01200

PROJECT MEETINGS

PART 1 GENERAL

1.1 SCOPE

A. This section specifies administrative and procedural requirements for project meetings including but not limited to:
   1. Pre-Construction Conference.
   2. Progress Meetings.

B. Construction schedules are specified in another Division 1 section.

1.2 RELATED DOCUMENTS

Drawings, general conditions of the Contract, including other Division 1 specification sections, apply to this section.

1.3 PRE-CONSTRUCTION CONFERENCE

A. Attend and participate in a pre-construction conference and organizational meeting at the project site or other convenient location no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

B. Attendees - The Owner, Engineer and their consultants, the contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.

C. Agenda - Discuss items of significance that could affect progress including such topics as:
   1. Tentative construction schedule.
   2. Critical work sequencing.
   3. Designation of responsible personnel.
   4. Procedures for processing field decisions and Change Orders.
   5. Procedures for processing Applications for Payment.
   6. Distribution of Contract Documents.
   7. Submittal of shop drawings, product data and samples.
   8. Preparation of record documents.
   9. Use of the premises.
   10. Office, work and storage areas.
   11. Equipment deliveries and priorities.
   12. Safety procedures.
   13. First aid.
   14. Security.

15. Housekeeping.
16. Working hours.

1.4 PROGRESS MEETINGS

A. Conduct progress meetings at the project site at regularly scheduled intervals but not less than monthly. Notify the Owner and Engineer of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.

B. Attendees - In addition to representatives of the Owner and Engineer, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings by persons familiar with the Project and authorized to conclude matters relating to progress.

C. Agenda - Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the project.
   1. Contractor's Construction Schedule
      a. Review progress since the last meeting.
      b. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule.
      c. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so.
      d. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the contract time.
   2. Contractor's Submittal Schedule.
      a. Review progress since the last meeting.
      b. Determine where each activity is in relation to the Contractor's Submittal Schedule, whether on time or ahead or behind schedule.
      c. Determine how submittals behind schedule will be expedited; secure commitments from parties involved to do so.
      d. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the contract time.
   3. Review the present and future needs of each entity present, including such items as:
      a. Interface requirements.
      b. Time.
      c. Sequences.
      d. Deliveries.
      e. Off-site fabrication problems.
      f. Access.
      g. Site utilization.
      h. Temporary facilities and services.
      i. Hours of work.
      j. Hazards and risks.
      k. Housekeeping.
      l. Quality and work standards.
      m. Change Orders.
      n. Documentation of information for payment requests.

D. Reporting - No later than 3 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

E. Schedule Updating - Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

END OF SECTION

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SECTION 01270

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 DESCRIPTION

A. Payment for all Work done in compliance with the Contract Documents, inclusive of furnishing all manpower, equipment, materials, and performance of all operations relative to construction of this project, will be made under Pay Items listed herein. Work for which there is not a Pay Item will be considered incidental to the Contract and no additional compensation will be allowed.

B. The CONTRACTOR shall take no advantage of any apparent error or omission in the Drawings or Specifications, and the OWNER'S REPRESENTATIVE shall be permitted to make corrections and interpretations as may be deemed necessary, for fulfillment of the intent of the Contract Documents.

C. The OWNER'S REPRESENTATIVE will make measurements and determinations, as necessary, to classify the work within pay items and determine the quantities for pay purposes.

D. Where pay item numbers are shown on the bid form, they generally follow FDOT pay item number formatting; however, they are only provided to use them for pay application purposes. FDOT pay item descriptions do not apply; utilize the descriptions on the bid form and within this section to determine the work associated with each pay item.

PART 2 PAY ITEMS

2.01 MOBILIZATION (PAY ITEM No. 1.01)

A. Mobilization/Demobilization includes preparatory work and operations in mobilizing for beginning work on the project, including, but not limited to those operations necessary for the movement of personnel, equipment, preconstruction video, supplies, and incidentals to the project site and to remove all personnel, equipment, excess supplies, and incidentals for the project site at the completion of the Work. Mobilization/Demobilization shall not exceed 5% of the total Bid. 80% of Mobilization may be claimed upon job startup once a CPM schedule, schedule of values, all bond paperwork, and insurance documents have been provided. The remaining 20 % may be claimed at Substantial completion.

B. Unit of measure is Lump Sum (LS)

2.02 BONDS, INSURANCE, TAXES, ETC. (PAY ITEM No. 1.02)

A. Bonds, insurance, and taxes as required by the General Conditions.

B. Unit of measure is Lump Sum (LS)

2.03 PREPARE & SUBMIT SUBMITTALS FOR ALL PRODUCTS (PAY ITEM No. 1.03)

A. Work includes providing submittals to the Engineer for approval prior to commencement of work and installation of equipment/materials. Submittal of equipment/materials must be according to the Contract Plans & Technical Specifications.

B. Unit of measure is Lump Sum (LS)

2.03 EROSION CONTROL/BMPs (PAY ITEM No. 1.04)

A. Work includes preparation and implementation of all stormwater pollution prevention and erosion control measure as identified on the CONTRACT PLANS or as needed, including installation and maintenance of silt fence, inlet protection, and other Best Management Practices per FDOT Index No. 102, monitoring, inspecting, and reporting as applicable, preparing and filing EPA NPDES NOI and NOT forms, and providing required contractor certifications.

B. Unit of measure is Lump Sum (LS)

2.04 REROUTE EXISTING PVC PIPE (PAY ITEM No. 2.06)

A. Contractor is to reroute the existing PVC piping in direct conflict with the location of the new blowers per Contract plans, Contract Specifications, and other Contract Documents.

B. Unit of measure is Lump Sum (LS)

2.05 DEMO AND REMOVAL OF EXISTING BLOWERS, PIPING, AND CONCRETE (PAY ITEM No. 2.01)

A. Contractor is to remove existing blowers, piping, and concrete while keeping the WWTP operational and coordinating with KWRU staff per Contract plans, Contract Specifications, and other Contract Documents.

B. Unit of measure is Lump Sum (LS)

2.06 INSTALL ROTARY SCREW BLOWERS (PAY ITEM No. 2.02)

A. Work includes installation of Owner-purchased three (3) rotary screw blowers equipped with VFDs. Blowers will be per the Contract plans, Contract Specifications, and Contract Documents.

B. Unit of measure is Each (EA)

2.07 FURNISH & INSTALL 6” SS 316 SCH.10 AIR PIPING (PAY ITEM No. 2.03)

A. Work includes procurement and installation of approximately 250 linear feet of 6” stainless steel schedule 10 air piping. This includes prepping and coating of piping. All work is in accordance with the Contract plans, Contract Specifications, and Contract Documents.

B. Unit of measure is Linear Feet (LF)

2.08 FUNRISH & INSTALL BUTTERFLY VALVES & FITTINGS (PAY ITEM No. 2.04)

A. Work includes procurement and installation butterfly valves & fittings per the Contract Plans,

Contract technical specifications and other Contract Documents.

B. Unit of measure is Lump Sum (LS)

2.09 INSTALL CONCRETE PLATFORM EXTENSION (PAY ITEM No. 2.05)

A. Work includes installation of the concrete platform extension for the new blowers per the Contract Plans, Contract technical specifications, and other Contract Documents. This includes installation of the handrails and stairs per Contract Plans, Technical Specifications, and other Contract Documents.

B. Unit of measure is Lump Sum (LS).

2.10 DEMO EXISTING ELECTRICAL EQUIPMENT (PAY ITEM No. 3.01)

A. Work includes demolition of the existing electrical equipment according to the Contract Plans and Technical Specifications.

B. Unit of measure is Linear Foot.

2.11 FURNISH & INSTALL NEW ELECTRICAL EQUIPMENT (PAY ITEM No. 3.02)

A. Work includes procurement and installation of new electrical equipment according to the Contract Plans and Technical Specifications.

B. Unit of measure is Lump Sum (LS)

2.12 FURNISH & ISNTALL NEW ELECTRICAL CONDUITS (PAY ITEM No. 3.03)

A. Work includes procurement and installation of new electrical conduit for the project. This includes trenching, backfilling, conduit, pull boxes, wiring, hand hole, meter, brackets, fittings, and all other appurtenances necessary to complete all electrical work as identified in the CONTRACT PLANS.

B. Unit of measure is Lump Sum (LS)

2.13 FURNISH & INSTALL NEW ELECTRICAL WIRES & CONDUITS (PAY ITEM No. 3.04)

A. Work includes procurement, installation and connection of the new electrical system including wiring, cables and other components. This includes trenching, backfilling, conduit, pull boxes, wiring, hand hole, meter, brackets, fittings, and all other appurtenances necessary to complete all electrical work as identified in the CONTRACT PLANS.

B. Unit of measure is Lump Sum (LS)

2.14 REMOVAL OF EXISTING CONDUITS, WIRES & CABLES (PAY ITEM No. 3.05)

A. Work includes removal of existing conduits, wires & cables. This includes trenching, backfilling, conduit, pull boxes, wiring, hand hole, meter, brackets, fittings, and all other appurtenances necessary to complete all electrical work as identified in the CONTRACT PLANS.

B. Unit of measure is Lump Sum (LS).

2.15 DEMO EXISTING CONCRETE FOUNDATION (PAY ITEM No. 3.07)

A. Work includes demolition of existing concrete foundation where existing blowers are located per the Contract Plans, Contract technical specifications, and other Contract Documents.

B. Unit of measure is Lump Sum (LS)

2.16 INSTALL NEW CONCRETE FOUNDATION (PAY ITEM No. 3.08)

A. Work includes installation of new concrete foundation for the pre-engineered/fabricated aluminum platform per the Contract Plans, Contract technical specifications, and other Contract Documents.

B. Unit of measure is Lump Sum (LS).

2.17 FURNISH & INSTALL PRE-ENGINEERED/FABRICATED ALUMINUM PLATFORM (PAY ITEM No. 3.06)

A. Work includes procurement and installation of pre-engineered/fabricated aluminum platform at proper design elevation for equipment along with stairs and ramps, railings, and anti-slip surfaces meeting current Florida Building Code and OSHA guidelines per Contract Plans and Contract Documents.

B. Unit of measure is Lump Sum (LS).

2.18 INSTALL ELECTRICAL & CONTROL SCADA INTEGRATION (PAY ITEM No. 4.01)

A. Contractor is to install an upgraded electrical system with remote capabilities that allows operators and authorized personnel to monitor the system performance as called for in the Contract Plans and per the Technical Specifications and other Contract Documents.

B. Unit of measure is Lump Sum (LS).

2.19 DENSITY TESTING (PAY ITEM No. 5.01)

A. Contractor is to perform density testing for each of the thirty areas as called for in the Contract Plans and per the Technical Specifications and other Contract Documents.

B. Unit of measure is Each (EA).

2.20 RECORD DRAWINGS (PAY ITEM No. 5.02)

A. Contractor is to provide record drawings in both CAD and PDF format per the Contract Documents and Technical Specifications.

B. Unit of measure is Lump Sum (LS).

PART 3 EXECUTION – NOT USED

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 EQUIPMENT DELIVERY AND CONSTRUCTION SCHEDULE

Not later than 10 consecutive calendar days after the issuance of the "Notice to Proceed," the Contractor shall submit to the Engineer for review a detailed schedule of major equipment delivery and installation and general construction operations, indicating the sequence of the work, the estimated dates of starting each task, and the estimated time of completion of each task. The schedule shall be broken down with respect to individual structures and facilities, indicating when existing structures or equipment would be taken out of service (if applicable). The form and content of the schedule shall be satisfactory to the Engineer.

1.2 SHOP DRAWINGS AND PRODUCT DATA

A. The Contractor shall submit to the Engineer for review and approval complete drawings and engineering data for all equipment, materials, and products to be incorporated into the work. Shop drawings and engineering data shall be provided, and the Engineer's review will be conducted in accordance with the requirements of this section. Shop drawings and/or engineering data, as appropriate, shall be submitted for the following items, including, but not limited to all items shown on the Drawings or specified in these Specifications.

B. Engineering data submitted for items of mechanical and electrical equipment shall include the following, as applicable:

1. Complete material specifications and bill of materials
2. Performance specifications and curves and operating characteristics
3. Shipping, handling, storage, and protection instructions
4. Anchorage and embedment details
5. Assembly, erection, and installation diagrams and instructions
6. Assembled weight
7. Welding qualifications and qualification procedures
8. Factory test data and results
9. Specifications on surface preparation and shop finishes
10. Manufacturers' product bulletins or catalog sheets.

C. Shop drawings and engineering data for equipment supplied as a pre-engineered or pre-assembled system shall include complete shop drawings and engineering data on each component of that system. In all cases, the information provided shall be sufficient to determine if the material or product conforms to the requirements of the Specifications.

D. Shop drawings and engineering data shall be prepared by the original equipment vendors or fabricators, as applicable. Purchase specifications by the Contractor or his Supplier shall not be acceptable as a substitute for actual vendor drawings and data.

E. Shop drawings for motor control circuits shall include complete schematic control diagrams, wiring diagrams, and terminal connection diagrams. Each control step in the schematic control diagrams shall include a step identification number and a brief functional description. Each control step shall be cross-referenced with other control steps with which it connects using the appropriate step identification numbers.

F. Shop drawings for instrument and control systems shall include, where applicable, complete process and instrumentation diagrams in ISA format, detailed loop diagrams, program descriptions, logic diagrams, wiring diagrams, and terminal connection diagrams.

G. All controls shall be completely described as to function: normally-open, normally-closed, fail open, fail closed, direct acting, reverse acting, air-to-open, air-to-close, etc. Settings of all pressure and temperature switches, relief valves, rupture discs, pressure regulators, etc., shall be noted.

H. All shop drawings shall include a legend or other suitable means to identify all symbols and abbreviations used on the drawing. Where an accepted, industry-wide drafting standard or symbol has been established for a particular item, information depicted on the shop drawings shall conform to that standard.

I. Shop drawings shall be dimensioned using the U.S. standard unit of measurement (feet and/or inches). Size of drawing shall not exceed 24 by 36 inches. All scaled drawings and details shall have the scale clearly noted on the drawing or detail. All information shall be clear and legible.

J. Each shop drawing and each item of engineering data shall contain a cover sheet that bears the Contractor's approved stamp indicating that the Contractor has reviewed the drawing or data for conformance with the Contract Documents. The cover sheet shall also allow room for the Engineer's review stamp, which is approximately $3^1/_2$ inches wide by $4^1/_2$ inches high.

K. All design calculations and drawings for foundations and footings, sheeting and shoring, and concrete formwork shall bear the signed and dated stamp of a licensed professional engineer.

1.3 MISCELLANEOUS SUBMITTALS

A. The Contractor shall submit to the Engineer miscellaneous information, procedures, test data, samples, etc., in the manner and at the time specified in these Specifications and Contract Documents. Miscellaneous submittals shall include, but not be limited to, the following:
   1. Procedures for handling and disposing of sewage flows during construction.
   2. Factory test data and results where specified for specific items of equipment.
   3. Schedule of values.
   4. Preliminary Operation and Maintenance Manuals.
   5. Final Operation and Maintenance Manuals.
   6. Samples of wire and cable, casework, window glazing details, concrete masonry units, quarry tile, roofing and flashing, push-on PVC joint details, and other items as specified in the Specifications.
   7. Preliminary concrete mix design reports.

8. Satisfactory written evidence in the form of laboratory or mill test reports indicating that all cement, aggregate, masonry, structural steel, fencing, castings, steel reinforcement, conduit, pipe, grout, grass seed and other items incorporated into the work are in compliance with the requirements of these Specifications.
9. Project record documents.
10. Copies of original invoices of all equipment delivered to the site.
11. When requested, analysis and design data on concrete formwork and sheeting and shoring.
12. Drawings and details of erosion and sediment control structures.
13. Written evidence of equipment warranties.

1.4 SAMPLES

At the Engineer's request, the Contractor shall furnish certified samples of materials utilized in the fabrication or production of equipment, materials, and products supplied under these Contract Documents. Cost of all such samples shall be borne by the Contractor. The samples will be tested by a qualified independent testing laboratory selected by the Owner to determine if the mechanical and chemical properties of the materials supplied are in accordance with the requirements of these Specifications and Contract Documents. The Owner shall pay for the laboratory testing of material samples provided by the Contractor. The Contractor shall pay for all retests made necessary by the failure of materials to conform to the requirements of these Specifications and Contract Documents.

1.5 PROGRESS RECORD PICTURES

A. The Contractor shall furnish three copies of 5- by 7-inch pictures as a record of progress made each month. These pictures will be a minimum of six each month taken from locations designated by the Resident Project Representative to best show progress of Project and will include the following:
   1. Project name
   2. Owner's name and contract number
   3. Contractor's name and job number
   4. View and general description of what photograph shows
   5. Date photograph was taken.

   Prints shall be submitted to the Engineer in a regular photograph mailer marked "Photographs-Do Not Bend." Cost of photographs shall be included in the lump sum price bid and no separate payment will be made therefore.

END OF SECTION

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SECTION 01310

CONSTRUCTION SCHEDULING

PART 1 GENERAL

1.1 DESCRIPTION

The Contractor shall submit to the Engineer for approval construction planning, scheduling, and cost value documentation pertaining to the Project as detailed herein and shall update same throughout Project as required.

1.2 SUBMITTAL PROCEDURES

A. Within ten (10) working days of Notice to Proceed, the Contractor shall submit to the Engineer for approval the products required by this section of the Specifications.

B. Within five (5) working days following receipt of same the Engineer shall arrange for a meeting with the Contractor so as to familiarize the Engineer with the Contractor's proposed construction plans and schedules.

C. Within five (5) working days following the Engineer's review the Contractor shall resubmit a corrected copy of those documents requiring revision.

D. Within five (5) working days following his receipt of the adequately revised documents the Engineer will approve same for use on the Project.

E. Once approved, the Contractor shall submit four (4) copies of the construction scheduling documents to the Engineer for use on the Project.

F. The Contractor shall update the work schedules at least monthly and indicate those activities whose completion dates are in jeopardy because of activities behind schedule.

G. The Owner may require the Contractor to modify any portions of the work schedule that become infeasible because of "activities behind schedule" or for any other valid reason. Any such modification will be at the Contractor's expense unless the modification is required to accommodate schedule revisions required by the Owner.

H. An activity that cannot be completed by its original latest completion date shall be deemed to be behind schedule.

1.3 CHANGE ORDERS

Upon approval of a Change Order by the Owner the approved change shall be reflected in the next submittal by the Contractor.

PART 2 PRODUCTS

2.1 CONSTRUCTION PROGRESS SCHEDULE

A. The Construction Progress Schedule shall be submitted in form satisfactory to the Owner showing the following items of each of the various subdivisions of work required under the Contract Document, Specifications, and Drawings.
   1. Activity Number
   2. Activity Description
   3. Estimated Activity Duration (Work Days)
   4. Activity Start Date (Calendar Dated)
   5. Activity Finish Date (Calendar Dated)
   6. Activity Cost

B. The anticipated amount of each monthly payment that will become due the Contractor in accordance with the progress schedule shall be included thereon. This anticipated monthly payment schedule shall distribute the costs of the project more or less evenly over the scheduled project life in a manner acceptable to the Owner and compatible with the Owner's funding arrangements for the project. Resubmittal will be required until anticipated monthly payment schedule is acceptable to Owner. For this Project, substantial variation from this schedule of payments will not be permitted.

C. Schedule Format
   1. The project schedule shall be in the form of a Gantt chart depicting the anticipated critical path for construction activities or equipment delivery. A critical path bubble type schedule shall also be acceptable.
   2. The schedule shall be updated monthly or at appropriate intervals that are consistent with the actual project schedule. Shall at any time the actual project work be found to deviate more than 45 days from the schedule, the schedule shall be modified to reflect the actual and newly project work completion date.

D. The Contractor shall prepare a separate schedule of anticipate partial payments (commonly referred to as an “S” curve) in lieu of a combined payment and work activity schedule.

2.2 TEMPORARY FACILITIES AND CONSTRUCTION TRAFFIC MANAGEMENT

A. The contractor shall provide a schematic plan for routing of construction traffic. The plan must minimize the impact to regular landfill and road department traffic. Where an unavoidable conflict exists, a plan for management of that conflict must be provided.

B. Along with the Construction Progress Schedule, a list of required temporary facilities, including but not limited to temporary haul roads and temporary soil erosion sedimentation control shall be provided.

2.3 ESTIMATES

A. The Detailed Estimates shall give a complete and satisfactory breakdown of the Contract amount.

B. Periodic Itemized Estimates shall detail work done for the purpose of tabulating partial payments thereon.

2.4 PROJECT INFORMATION

A. Each tabulation shall be prefaced with the following summary data:
   1. Project Name
   2. Contractor
   3. Type of Tabulation (Initial or Updated with revision number)
   4. Project Duration
   5. Project Scheduled Completion Date
   6. Effective or Starting Date of the Schedule
   7. If an updated (revised) schedule, the new project completion date and project status

2.5 SCHEDULE MONITORING

A. When specifically requested by the Engineer, the Contractor shall submit to the Engineer a revised schedule for those activities that remain to occur.

B. The revised schedule shall be submitted in the form, sequence, and of the number of copies requested for the initial schedule.

2.6 COST VALUE FOR ACTIVITIES

A. The Contractor shall establish and submit a cost value for each activity in his progress schedule and estimates so that monthly partial payments to the Contractor can be calculated on the basis of work in place.

B. Subject to the provisions for "Partial Payments" in the General Conditions of the Contract all cost value reports for network activities shall be based upon the close of books as of the 20th day of each month, and the submittal of such costs value for activities shall be submitted to the Engineer for review and approval not later than the 25th day of each month.

C. Wherever in the Supplementary General Provisions it is provided that payments will be allowed for materials delivered to the site but not yet incorporated in the work, subject to the terms and conditions specified in the General Conditions, separate pay items shall be established for furnishing and installation of such items.

D. Costs of materials delivered to the site but not yet incorporated into the work shall be included as a separate pay item and shall not be included in the cost value of the installation activity for such materials.

END OF SECTION

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SECTION 01315

PRECONSTRUCTION VIDEO

PART 1 GENERAL

1.1 DESCRIPTION

Provide continuous color audio-video recording along the entire length of all proposed work prior to construction to serve as a record of pre-construction conditions. Supplement audio-video recordings with color photographs (digital) for areas which require details not ascertainable on the recording.

1.2 QUALIFICATIONS

The preconstruction audio-video recording shall be of professional quality that will clearly log an accurate visual description of existing conditions. Any portion of the recording not acceptable for the determination of the existing conditions shall be re-recorded at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 GENERAL

The total audio-video recording system and the procedures employed in its use shall be such as to produce a finished product that will fulfill the technical requirements of the project. The video portion of the recording shall produce bright, sharp, clear pictures with accurate colors and shall be free from distortion, tearing, rolls or any other form of picture imperfection. The audio portion of the recording shall produce the commentary of the camera operator with proper volume, clarity, and be free from distortion.

2.2 CAMERA

1. Resolution: Minimum 1080p HD resolution, with preference for 4K support.

2. Color Profile: Must support at least sRGB color profile. Adobe RGB and RAW format support is desirable.

3. Zoom Capabilities: Must have an optical zoom function with a minimum of 10x zoom.

4. Image Stabilization: Must have built-in image stabilization.

5. Auto-Focus: Must include an auto-focus system with face detection and tracking capabilities.

6. Low Light Performance: Must perform well in low light conditions and possess high dynamic range capabilities.

7. Frame Rate: Minimum required frame rate is 30fps, with preference for 60fps.

8. Durability: Must be built with durability in mind, with bonus for dust and water resistance.

9. Battery Life: Must have a battery life adequate for extended shooting sessions. The capability to swap batteries is required.

10. Storage: Must support external storage, with a minimum support for 128GB SD

2.3 RECORDER

1. Recording Format: Must support MP4 format, due to its wide compatibility and good balance between file size and quality. Support for MOV format can also be useful for Mac users.

2. Codec: Must support modern efficient codecs such as H.264 or H.265 (HEVC) for video, and AAC or MP3 for audio.

3. Bit Rate: The minimum video bit rate should be 50 Mbps when recording in 1080p and a minimum of 100 Mbps when recording in 4K.

4. Audio: Must have a built-in microphone for audio capture, with an option to attach an external microphone for better audio quality. Should support stereo audio recording.

5. Frame Rate: Must support multiple frame rates including 24fps, 30fps, and 60fps to cater to different shooting requirements.

6. Recording Modes: Must support continuous recording, with automatic file splitting when the file size reaches 4GB.

2.4 VIDEO PLAYBACK COMPATIBILITY

1. Supported Formats: The playback device or software must support MP4 and MOV formats.

2. Supported Codecs: Must be compatible with H.264 or H.265 (HEVC) for video, and AAC or MP3 for audio.

3. Resolution: Must support playback in at least 1080p resolution, with preference for devices or software that support 4K playback.

4. Frame Rate: Should be capable of playing videos at various frame rates, such as 24fps, 30fps, and 60fps.

5. Bit Rate: The playback system should be capable of handling high bit rate videos. Ideally, it should support videos with bit rates of 50 Mbps for 1080p and 100 Mbps for 4K.

6. Sound: Must support stereo audio playback.

PART 3 EXECUTION

3.1 GENERAL

A. The recordings shall contain coverage of all surface features located within the construction's zone of influence. The construction's zone of influence shall be defined (1) as the area within the permanent and temporary easements or right- of-way, and areas adjacent to these areas which may be affected by routine construction operations, and (2) by the direction of the

Owner. The surface features within the construction's zone of influence shall include, but not be limited to, all roadways, pavements, curbs, driveways, ponds, sidewalks, culverts, headwalls, retaining walls, buildings, landscaping, trees, shrubbery, and fences. Of particular concern shall be the existence of any faults, fractures, or defects. Recorded coverage shall be limited to one side of the street at any one time and shall include all surface conditions located within the zone of influence of construction supported by appropriate audio description.

B. The recording of each video segment shall be a simultaneously recorded with the audio recording. This audio recording, exclusively containing the commentary of the camera operator, shall assist in viewer orientation and in any needed identification, differentiation, clarification, or objective description of the feature being shown in the video portion of the recording. The audio recording also shall be free from any conversations between the camera operator and any other production technicians.

C. All videos shall be permanently labeled and shall be properly identified by project title, number, and date of recording.

D. Each video shall have a log of that media's contents. The log shall describe the various segments of coverage contained on that video tape in terms of the names of streets or easements, coverage beginning and end, directions of coverage, and video unit counter/segment numbers.

3.2 RECORDING SCHEDULE

A. The recording shall be performed prior to the placement of any construction materials or equipment on the proposed construction site.

B. The Contractor shall coordinate the recording with the construction schedule so that those portions of the construction that will be completed first will be recorded first. The recording company shall deliver the videos to the Owner upon their completion. Upon delivery of the videos, transfer of ownership of those videos shall be made to the Owner.

3.3 VISIBILITY

All recordings shall be performed during times of good visibility. No recording shall be done during periods of significant precipitation, mist, or fog. The recording shall only be done when sufficient sunlight is present to properly illuminate the subject, and to produce bright, sharp video recordings of those subjects. No taping shall be performed when more than 10% of the area to be taped contains debris or obstructions unless otherwise authorized by the Engineer.

3.4 CONTINUITY OF COVERAGE

A. In order to increase the continuity of the coverage, the coverage shall consist of a single, continuous, unedited recording which begins at one end of a particular construction area. However, where coverage is required in areas not accessible by conventional wheeled vehicles and smooth transport of the recording system is not possible, such coverage shall consist of an organized, interrelated sequence of recordings at various positions along that proposed construction area (e.g., wooded easement area).

B. The average rate of travel during a particular segment of coverage (e.g., coverage of one side of the street) shall be directly proportional to the number, size, and value of the surface features within that construction area's zone of influence.

3.5 CAMERA HEIGHT AND STABILITY

When conventional wheeled vehicles are used as conveyances for the recording system, the distance between the camera lens and the ground shall not be less than 10 feet. The camera shall be firmly mounted, such that transport of the camera during the recording process will not cause any unsteady picture.

3.6 CAMERA CONTROL

Camera pan, tilt, zoom-in, and zoom-out rates shall be sufficiently controlled such that recorded objects will be clearly viewed during video tape playback. In addition, all other camera and recording system controls, such as lens, focus, and aperture, video level, pedestal, chroma, white balance, and electrical focus, shall be properly controlled or adjusted to maximize recorded picture quality.

3.6 VIEWER ORIENTATION TECHNIQUES

The audio and video portions of the recording shall maintain viewer orientation. To this end, overall establishing views and visual displays of all visible house and building addresses shall be utilized. In easements where the proposed construction location will not be readily apparent in the video tape viewer, highly visible yellow flags shall be placed in such a fashion as to clearly indicate the proposed centerline of construction.

3.7 AREAS TO BE RECORDED

A. The Contractor shall be able to televise and record areas with paved roads, along easements, through parks, lawns, open fields, and inside buildings. When recording on private property, the Contractor shall give the Owner sufficient prior notice of such entry so that property owners may be advised of, and their permission obtained for, the work.

B. At no time shall the Contractor be allowed to use any electrical circuits within private property building structure. All recording shall be done during regular business hours, unless otherwise specified by the private property owner or the Engineer. The Contractor shall enter and leave private property in a professional and orderly, workmanlike manner.

END OF SECTION

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SECTION 01400

QUALITY CONTROL SERVICES

PART 1 GENERAL

1.1 SUMMARY

A. This section specifies administrative and procedural requirements for quality control services.

B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.
   1. Specific quality control requirements for individual construction activities are specified in the sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.
   2. Requirements for the Contractor to provide quality control services required by federal, state, or local authorities having jurisdiction are not limited by provisions of this section.

1.2 RESPONSIBILITIES

A. Contractor Responsibilities
   1. Provide inspections, tests, and similar quality control services, specified in individual specification sections and required by governing authorities.
   2. Employ and pay for the services of an independent agency, testing laboratory, or other qualified firm to perform services for:
      a. Compaction testing as specified in Section 02200.
      b. Concrete testing as specified in Section 03310.

   Note: Costs for these services shall be included in the contract sum.

B. Retesting – The Contractor is responsible for retesting where results of required inspections, tests, or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

C. Associated Services – Cooperate with agencies performing required inspections, tests, and similar services and provide reasonable auxiliary services as requested. Auxiliary services required include but are not limited to:
   1. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
   2. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.

3. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
4. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
5. Security and protection of samples and test equipment at the project site.

1.3 QUALITY ASSURANCE

Qualification for Service Agencies – Engage inspection and testing service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

PART 2 EXECUTION

2.1 REPAIR AND PROTECTION

A. General – Upon completion of inspection, testing, sample-taking, and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.

B. Protect construction exposed by or for quality control service activities, and protect repaired construction.

C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION

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DIVISION 1: GENERAL REQUIREMENTS

SECTION 01010
SUMMARY OF WORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General Conditions, Supplementary Conditions (if included), any issued addenda during bidding, and other Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. Contract description.

B. Work by others.

C. Contractor use of the site.

D. Work sequence.

E. Owner occupancy.

1.3 CONTRACT DESCRIPTION

Contract Type: Stipulated lump sum price as described in the bid documents.

1.4 WORK BY OTHERS

Work under these Contracts includes any portion of work described in the plans as work to be performed by others. Unless specifically stated, it is implied that all work shown is the responsibility of the contractor.

1.5 CONTRACTS

The strategy for the completion of the project consists of the contracts as follows:

Scope of Work

The proposed project at KW Resort Utilities (KWRU) involves multiple upgrades, including the

installation of new blower systems, modifications to existing structures, upgrades to the electrical distribution system, and enhancements to the SCADA system for improved control and monitoring capabilities. The Contractor shall ensure continuous operation of all essential systems throughout the construction phases, utilizing temporary power supplies where necessary. Coordination with the Florida Keys Electric Cooperative (FKEC) and KWRU staff is essential to maintain uninterrupted operations. All construction shall adhere to the guidelines outlined in the Construction Plans, Bid Documents, and Technical Specifications.

A. Blowers Upgrade

1. Installation of New Blowers:

    a. The project includes the installation of three new rotary screw blowers (two duty and one spare) equipped with Variable Frequency Drives (VFDs). The blowers will be supplied by the Owner, but the Contractor is responsible for coordinating delivery, unloading, handling, and installation.

    b. To accommodate the new blowers, the existing concrete platform must be extended. This extension includes constructing a reinforced concrete foundation and platform, complete with an OSHA-compliant stair system and handrails for safe access.

    c. Install approximately 250 linear feet of 6-inch 316 Stainless Steel Schedule 10 air piping configured in two trains to serve the East and West Treatment Tanks. All piping installations shall be coordinated to minimize disruption to ongoing operations.

2. Demolition and Reinstallation:

    a. After the new blowers are installed and fully operational, the Contractor shall demolish the existing blower building. This will clear the area for the construction of a new electrical equipment platform.

    b. All existing equipment slated for replacement must be carefully removed, and new

blowers and associated electrical equipment will require rerouting to accommodate their new locations.

B. Electrical Service Upgrade

1. New Electrical Equipment Platform:
    - Construct a new platform for electrical equipment, elevated above the flood elevation as specified in the project plans. The platform will be pre-engineered and fabricated from aluminum, with designs provided by the fabricator during the shop drawing phase. The Contractor is responsible for constructing the concrete foundation for this platform, per the provided design specifications.
    - The platform shall support the installation of a new electrical service, including multiple distribution panels, conduits, wires, and cables. All new electrical equipment must be housed in weatherproof NEMA 3R or 4X stainless steel enclosures to ensure durability and safety.
2. Transition to New Electrical Service:
    - The existing 600 amp electrical service will be phased out, and all loads currently served by it will be transferred to the new elevated system. This transition must be carefully planned and executed to prevent downtime and maintain plant operations. The Contractor is responsible for coordinating all electrical switchovers with the Owner and FKEC.

C. SCADA System Upgrades

1. SCADA System Enhancement:
    - The project includes a comprehensive upgrade of the SCADA system to enhance monitoring and control capabilities for both existing and new equipment. This upgrade involves integrating the new blowers with built-in VFDs into the SCADA system, allowing for remote monitoring, control, and data collection.

- The SCADA system shall be upgraded to support remote access via Operator Workstations (OWS) and mobile devices (e.g., tablets like iPads). The system must allow for secure remote control, including alarm resets, setpoint adjustments, and manual operation of equipment such as pumps and blowers.

2. Remote Access and Security Requirements:

    - The upgraded SCADA system must support redundant cellular network access through AT&T's FirstNet service, providing a backup communication pathway in the event of hardline internet failure. The Contractor shall provide and install all necessary equipment for this capability, coordinating account setup with the Owner.

    - The system shall include multiple levels of access control (Administrator, Operator, Viewer) to ensure secure operations and prevent unauthorized changes to critical settings. The Contractor shall configure the SCADA system according to these security protocols and provide training to the Owner's staff on the new functionalities.

D. General Requirements

1. Coordination and Communication:

    - Throughout the construction phases, the Contractor must coordinate closely with the Owner and other stakeholders to ensure continuous operation of the facility. Any necessary service outages must be scheduled with the Owner at least ten (10) days in advance, and all efforts should be made to minimize disruption to plant operations.

2. Site Access and Use:

    - The Contractor's use of the site shall be limited to areas designated by the Owner to allow for ongoing operations and work by others. All work areas must be kept clean and free of obstructions, and the Contractor is responsible for restoring any disturbed areas to their original condition or better.

1.6 CONTRACTOR USE OF SITE

A. Limit use of the site to allow:

- Owner occupancy.
- Work by others.

B. The existing facility must remain in operation while new construction is in progress.

C. The Contractor shall coordinate their work with the Owner to ensure that construction will not unduly restrain or hinder the operation of the existing facility or others working on-site. If any portion of the facility must be taken out of service for the work to proceed, the Contractor must obtain approval from the Owner regarding the date, time, and duration of the outage, at least ten (10) days in advance.

1.7 WORK SEQUENCE

Construct work in phases to accommodate the Owner's occupancy requirements and work by others during the construction period. Coordinate the construction schedule and operations with the Owner. The WWTP facility shall remain operational at ALL times except during planned short duration shutdowns coordinated with the owner 1 week in advance.

1.8 OWNER OCCUPANCY

The Owner intends to occupy the existing portion of the facility to maintain operations. The Owner will occupy the site during the entire construction period to conduct normal operations. Cooperate with the Owner to minimize conflict and facilitate operations. Schedule the work to accommodate Owner occupancy.

1 PART 2 PRODUCTS

Not Used.

2 PART 3 EXECUTION

Not Used.

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SECTION 01630

PRODUCT SELECTION AND SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES: Product selection and substitution procedures.

1.2 PRODUCT SELECTION

A. Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, new at the time of installation.

B. To the fullest extent possible, provide products of the same kind from a single source.

C. Compatibility among product options is required. Where more than one choice is available as options during product selection, select an option which is compatible with other products and materials already selected.

D. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.

E. Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

F. Where Contract Documents are at variance with specific manufacturer's details and installation procedures, contact Engineer for resolution prior to start of work.

1.3 SUBSTITUTIONS

A. The intent of these Specifications is to provide the Owner with a quality facility without discouraging competitive bidding. Substitutions may be submitted and will be evaluated as specified herein.

B. The Contractor’s bid includes products named in the Specifications The Contractor may propose a substitute product under and in accordance with the Standard General Conditions (Section 00700) Subsection 6.05, as modified by the Supplementary Conditions (Section 00800.) Unless the Engineer expressly approves the substitute, the Contractor must provide a product named in the Specifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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SECTION 01640

STORAGE AND PROTECTION

PART 1 GENERAL

1.1 GENERAL

A. Equipment shall be received, inspected, unloaded, handled, stored, maintained, and protected by the Contractor in a suitable location on or off site, if necessary, until such time as installation is required.

B. Storage and protection of Contractor-furnished equipment shall be in strict conformance with the requirements of the Section 01610 "General Equipment Stipulations" of these Specifications.

1.2 STORAGE

A. The Contractor shall be responsible for providing satisfactory storage facilities which are acceptable to the Engineer. In the event that satisfactory facilities cannot be provided on-site, satisfactory warehouse facilities, acceptable to the Engineer, will be provided by the Contractor for such time until the equipment, materials, and products can be accommodated at the site.

B. Equipment, materials, and products which are stored in a satisfactory warehouse acceptable to the Engineer will be eligible for progress payments as though they had been delivered to the job site.

C. The Contractor shall be responsible for the maintenance and protection of all equipment, materials, and products placed in storage and shall bear all costs of storage, preparation for transportation, transportation, rehandling, and preparation for installation.

D. Equipment and products stored outdoors shall be supported above the ground on suitable wooden blocks or braces arranged to prevent excessive deflection or bending between supports. Items such as pipe, structural steel, and sheet construction products shall be stored with one end elevated to facilitate drainage.

E. Unless otherwise permitted in writing by the Engineer, building products and materials such as cement, grout, plaster, gypsum-board, particleboard, resilient flooring, acoustical tile, paneling, finish lumber, insulation, wiring, etc., shall be stored indoors in a dry location. Building products such as rough lumber, plywood, concrete block, and structural tile may be stored outdoors under a properly secured waterproof covering.

F. Tarps and other coverings shall be supported above the stored equipment or materials on wooden strips to provide ventilation under the cover and minimize condensation. Tarps and covers shall be arranged to prevent ponding of water.

1.3 EXTENDED STORAGE

In the event that certain items of major equipment such as air compressors, pumps, and mechanical aerators have to be stored for an extended period of time, Contractor shall provide satisfactory long-term storage facilities that are acceptable to the Engineer. The Contractor shall provide all special packaging, protective coverings, protective coatings, power, nitrogen purge, desiccants, and lubricants, exercising necessary or recommended directive by the manufacturer to properly maintain and protect the equipment during the period of extended storage.

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SECTION 01710

CLEANUP

PART 1 GENERAL

1.1 DESCRIPTION

This section covers general cleaning which the Contractor shall be required to perform both during construction and before final acceptance of the project unless otherwise shown on the Drawings or specified elsewhere in these Specifications.

1.2 HAZARD CONTROL

A. The Contractor shall store volatile wastes in covered metal containers and remove from premises daily.

B. The Contractor shall prevent accumulation of wastes which create hazardous conditions.

C. Burning or burying rubbish and waste materials on the site shall not be allowed.

D. Disposal of volatile wastes into sanitary or storm sewers shall not be allowed.

1.3 DISPOSAL OF SURPLUS MATERIALS

A. Unless otherwise shown on the Drawings, specified or directed, the Contractor shall dispose of all surplus materials and equipment from demolition, legally off the site, and shall provide his own suitable, off-site spoil area, or on a site designated by the Owner.

B. The Owner shall have the opportunity to inspect any equipment or materials removed prior to disposal by the Contractor. If said equipment and/or materials are determined to be salvageable by the Owner, the Contractor shall transport said equipment and material to a building or area designated by the Owner.

1.4 FINAL CLEANING

The Contractor shall:

A. Schedule cleaning operations so that dust and other contaminants resulting from the cleaning process will not fall on wet, newly painted surfaces.

B. Employ experienced workmen or professional cleaners for final cleaning.

C. Broom clean paved surfaces; rake clean other surfaces of grounds.

D. Upon completion of the work, Contractor shall remove from the site all plant, material, tools and equipment belonging to him, and leave the site with an appearance acceptable to the Engineer.

E. Restoration of Landscape Damage - Any landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition at the Contractor's expense. The Engineer will decide what method of restoration shall be used.

F. Post-Construction Cleanup or Obliteration - Contractor shall obliterate all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other vestiges of construction.

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SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1 MAINTENANCE OF DOCUMENTS

A. The Contractor shall maintain accurate and up-to-date record documents related to the furnishing, installation, and modification of equipment, materials, and products at the project site throughout the course of the work. The Contractor shall maintain at the project site one record copy of each of the following:
    1. Contract Drawings
    2. Specifications
    3. Addenda
    4. Reviewed Shop Drawings
    5. Change Orders
    6. Other Modifications to Contract Documents
    7. Field Test Records
B. Project record documents shall be stored in suitable files and racks in a location approved by the Engineer and shall be available at all times for review. The documents shall be maintained in a clean, dry, and legible condition and shall not be used for construction purposes.

1.2 RECORDING

A. The Contractor shall label each document "Project Record" in one-inch high letters. Record documents shall be kept current, and no work shall be permanently concealed until the required information has been recorded.

B. Contract Drawings:
The Contractor shall legibly mark the project record set of prints of the Contract Drawings, including reviewed shop drawings, to reflect the actual construction. This shall include:

    a. Horizontal and vertical locations of underground utilities and appurtenances, referenced to mean sea level or permanent surface improvements.
    b. Locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the structure.
    c. Field changes in dimensions and details, including elevations of foundations.
    d. Changes made by change order or field order.
    e. Details not on the original Drawings.
    f. Any encountered existing underground utilities not shown on the original Drawings. The Contractor shall document these utilities' locations and characteristics.
    g. After completing the work, the Contractor shall prepare a reproducible set of project record drawings by drafting the notations made on the record set of prints onto a set of reverse-reading translucent matte finish mylar reproducible Drawings furnished by the Owner. The Contractor shall also transfer notations on the record set of shop drawings onto translucent matte finish mylar reproducible copies of the reviewed shop drawings furnished by the Contractor.

C. Specifications and Addenda:
The Contractor shall legibly mark up each section to record:
    1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
    2. Changes made by change order or field order.

3. Other matters not originally specified.

1.3 AS-BUILT DRAWINGS

A. General Requirements:

1. The Contractor shall prepare comprehensive As-Built Drawings reflecting all changes, modifications, and deviations from the original Contract Drawings. These As-Built Drawings must include all updates to locations, routing, and dimensions that occurred during construction.
2. Format:
   As-Built Drawings shall be submitted in both hard copy and electronic formats. The electronic format shall be a DWG file compatible with the original CAD base files used in the design phase.
3. Incorporation of Redlines:
   The Contractor is responsible for incorporating all redline markups, field changes, and additional site survey data into the As-Built Drawings. Redlines shall be submitted to the Engineer monthly with each pay application. The Owner reserves the right to withhold payment if the redlines are not submitted or are deemed unsatisfactory.
4. Underground Utilities:
   Any existing underground utilities encountered during construction that are not shown on the original drawings must be accurately recorded and included in the As-Built Drawings. The Contractor shall provide horizontal and vertical location data for these utilities, referenced to known site benchmarks.

B. Survey Requirements:

1. Surveyed Data:
   All changes to locations, routing, and other site-specific modifications shall be verified through a professional survey. The surveyed data must be integrated into the As-Built Drawings to ensure accuracy.
2. Site Features:
   The survey shall include all new and existing site features, including but not limited to foundations, platforms, utilities, piping, and equipment pads.

C. Submittal and Approval:

1. Submittal Timing:
   As-Built Drawings shall be submitted to the Engineer upon completion of the work and prior to final acceptance by the Owner. These drawings must be reviewed and approved by the Engineer before final payment is released.
2. Final As-Built Package:
   The final As-Built package shall include a comprehensive set of updated DWG files, a certified list of changes, and any necessary explanatory notes to provide a complete and accurate representation of the constructed project.

1.4 SUBMITTAL

At the completion of the work and prior to final acceptance by the Owner, the Contractor shall deliver the Project Record Documents to the Engineer. The Project Record Documents shall be acceptable to the Engineer before final payment is made.

With the submittal of the Project Record Documents, the Contractor shall also submit a list of each document submitted and a certification that each document as submitted is complete and accurate.

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SECTION 01730

GUARANTEES AND WARRANTIES

PART 1 GENERAL

1.1 GENERAL WARRANTY

A. The Contractor shall warrant all equipment, materials, products, and workmanship provided by the Contractor under these Contract Documents for a period of 12 months after the date of final acceptance of the Work by the Owner.

B. If, during the warranty period

1. any equipment, materials, or products furnished and/or installed by the Contractor are found to be defective in service by reason of the Contractor's faulty process, structural and/or mechanical design or specifications, or
2. any equipment, materials, or products furnished and/or installed by the Contractor are found to be defective by reason of defects in material or workmanship, the Contractor shall, as soon as possible, after receipt of written notice from the Owner, repair or cause to be repaired such defective equipment, materials or products, or replace such defective equipment, materials or products.

C. In the event of multiple equipment failures of major consequence prior to the expiration of the one-year warranty described above, the affected equipment shall be disassembled, inspected, and modified or replaced as necessary to prevent further occurrences. All related components that may have been damaged or rendered non-serviceable as a consequence of the equipment failure shall be replaced. A new 12-month warranty against defective or deficient design, workmanship, and materials shall commence on the day that the item of equipment is reassembled and placed back into operation. As used herein, multiple equipment failures shall be interpreted to mean two or more successive failures of the same kind in the same item of equipment or failures of the same kind in two or more items of equipment. Major equipment failures may include, but are not limited to, cracked or broken housings, piping, or vessels, excessive deflections, bent or broken shafts or structural members, broken or chipped gear teeth, overheating, premature bearing failure, excessive wear, or excessive leakage around seals. Equipment failures which are directly and clearly traceable to operator abuse, such as operating the equipment in conflict with published operating procedures, or improper maintenance, such as substitution of unauthorized replacement parts, use of incorrect lubricants or chemicals, flagrant over- or under-lubrication, and the use of maintenance procedures not conforming with published maintenance instructions, shall be exempted from the scope of the 1-year warranty. Should multiple equipment failures occur in a given item or type of equipment, all equipment of the same size and type shall be disassembled, inspected, modified or replaced, as necessary, and rewarranted for 1 year.

D. Neither the foregoing paragraphs nor any provision in the Contract Documents, nor any special guarantee time limit implies any limitation of the Contractor's liability with the law of the place of construction.

1.2 START-UP OF OPERABLE COMPONENTS

A. Because of the need to maintain operation during construction, it will be necessary to accept and start-up operable components of the project at various times prior to the completion and final acceptance of the entire project.

B. A component of the project, as used herein, shall mean a complete process subsystem and shall include all associated structures, equipment, piping, and controls, etc.

C. When a component of the project has been completed, checked out, field- tested, and made ready for operation, the Contractor shall notify the Engineer in writing that the component is substantially complete and request an inspection for substantial completion. The Engineer will schedule the inspection within 10 days of the Contractor's request. If the Engineer concurs in the Contractor's statement, the Engineer will notify the Contractor in writing that the component is accepted as substantially complete. At the same time, the Engineer will submit to the Contractor a list of items that must be completed or corrected before final acceptance can be given.

D. If a component of the project is needed in order to maintain operation during construction and if it has been accepted as substantially complete, the Contractor shall start up the component when directed by the Engineer. Once the component has achieved stable and satisfactory operation (minimum 95 percent availability over a 7-day period), the Contractor shall request beneficial occupancy by the Owner. The Owner, if he concurs in the Contractor's statement, that stable and satisfactory operation has been achieved, will notify the Contractor in writing within 10 days that he is assuming beneficial occupancy of the component.

E. On the date that the Owner assumes beneficial occupancy, the following shall occur:
   1. The one-year warranties for the component specified in Part 1.01 of this section will begin; and
   2. The Owner will assume responsibility for operating and maintaining the component.

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SECTION 01740

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 DESCRIPTION

The Contractor shall provide six copies of a complete and comprehensive reference manual containing operation and maintenance data to enable operators and plant engineers correctly operate, service, and maintain all equipment and accessories covered by the detailed equipment specifications. The data contained in the manual shall explain and illustrate clearly and simply all principles and theory of operation, operating instructions, maintenance procedures, calibration procedures, and safety precautions and procedures for the equipment involved. Safety precautions and procedures shall be stressed.

1.2 SUBMITTAL

A. The Contractor shall submit to the Engineer for approval two preliminary copies of the data reference manual with all specified material before the work covered by these Contract Documents is 50 percent complete. No payment for greater than 50 percent of the Contract Price will be made until all the preliminary copies of the manual are submitted and the submittal is satisfactory to the Engineer. Before the work is 80 percent complete, the Contractor shall submit six copies of each manual complete in detail as specified below. No payment for more than 80 percent of the Contract Price will be made until all the final copies of the manuals are submitted and the submittal is satisfactory to the Engineer. The Engineer will notify Contractor in writing of any deficiencies in the manual and will return the manual for completion and/or correction. The Contractor shall submit six copies of any revised or additional data required to complete the manual or as required by the Engineer.

B. At the time of the inspection for substantial completion, the Engineer will notify the Contractor of any revisions, corrections or incomplete data required for the satisfactory completion of the Operation and Maintenance Data Reference Manual. The Engineer will not recommend final acceptance of the work until the Operation and Maintenance Data Reference Manual is complete and satisfactory to him.

1.3 CONTENTS OF OPERATION AND MAINTENANCE DATA REFERENCE MANUAL

A. The Operation and Maintenance Data Reference Manual shall contain, but is not limited to, the following information on all equipment and accessories furnished and installed under these Specifications:
   1. Equipment function, normal operating characteristics, and limiting conditions for all equipment furnished.
   2. Detailed assembly, installation, alignment, adjustment, and checking instructions for all equipment furnished.
   3. Detailed operating instructions for start-up, calibration, routine and normal operation, regulation and control, shutdown and emergency conditions for all equipment furnished.

4. Detailed lubrication instructions and schedules for all equipment furnished including identification of lubricant (description, specification, and trade name of at least two manufacturers), diagrams illustrating lubrication points.
5. Detailed guide to "troubleshooting" for all equipment furnished.
6. Detailed parts lists identified by generic title, materials of construction and part number (actual manufacturer's number, not Supplier's) list of recommended spare parts identified as specified above, predicted life of parts subject to wear, and an exploded view of each equipment assembly for all equipment furnished.
7. Detailed disassembly, overhaul, and reassembly instructions for all equipment furnished.
8. Electrical and instrumentation schematics for all equipment furnished, including motor control centers, control panels, instrument panels, and analyzer panels.
9. List of all special tools required and description of their use for all equipment furnished. Special tools include any tool not normally available in an industrial hardware or mill supply house.
10. Detailed preventative maintenance procedures and schedules for all equipment furnished.
11. Detailed list of settings for relays, pressure switches, temperature switches, level switches, thermostats, alarms, relief valves, and rupture discs, etc.
12. One copy of all record shop drawings and engineering data for all equipment furnished.
13. Performance and characteristic operating curves for all equipment furnished.
14. List of names and addresses of nearest service centers for parts, overhaul, and service.
15. One copy of any instructions and parts lists attached to equipment when delivered.
16. Procedures for storing, handling, and disposing of any chemicals or products used with the equipment or system.

1.4 ASSEMBLY OF OPERATION AND MAINTENANCE DATA REFERENCE MANUAL

A. Each copy of the data reference manual shall be assembled in one or more loose leaf binders, each with title page, typed table of contents, typed list of tables, typed list of figures, and heavy section dividers with copper reinforced holes and numbered plastic index tabs. Binders shall be three-ring, hardback type, black in color, with transparent vinyl front cover and zipper suitable for inserting identifying cover and with a transparent vinyl pocket on the spine for label. All data shall be punched for binding; and composition and printing shall be arranged so that punching does not obliterate any data. The cover and binding edge of each manual shall have the project number and title, specification division number and title, and manual title printed thereon, all as approved by the Engineer.

B. All copies of shop drawings, figures, and diagrams shall be reduced to either $8^1/_2$ by 11 inches or to 11 inches in the vertical dimension and as near as practicable to 17 inches in the horizontal dimensions. Such sheets shall be folded to $8^1/_2$ by 11 inches. The manual and other data shall be printed on first quality paper, $8^1/_2$ by 11-inch size with standard three-hole punching. Drawings and diagrams shall be reduced to $8^1/_2$ by 11 inches or 11 by 17 inches. Binders shall be labeled Vol. 1, Vol. 2, etc., where more than one is required. The table of contents for the entire set, identified by volume number, shall appear in each binder. Text, figures, and drawings shall be clearly legible and suitable for dry process reproductions.

C. No separate payment will be made for the Operation and Maintenance Data Reference Manual and the cost of said manual shall be included in the Contract Price.

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DIVISION 2: SITE WORK

SECTION 02100

CLEARING AND GRUBBING

PART 1 GENERAL

1.1 DESCRIPTION

A. Clearing and grubbing includes, but is not limited to removal from the project lands of trees, stumps, roots, brush, structures, abandoned utilities, trash, debris, and all other materials found on or near the surface of the ground in the construction area and understood by generally accepted engineering practice not to be suitable for construction of the type contemplated. Precautionary measures to prevent damage to existing features to remain is part of the work.

B. Existing structures left on the job site are to be removed by Contractor from the project lands upon the direction of the owner. Structures may be demolished and properly disposed of or moved.

1.2 QUALITY ASSURANCE

A. The Contractor shall comply with applicable codes, ordinances, rules, regulations, and laws of local, municipal, state or federal authorities having jurisdiction over the project. All required permits shall be obtained for construction operations by the Contractor.

B. Open burning will have to be permitted with the city/county air pollution bureau and/or the local fire department. The Contractor is hereby made responsible for said permit and for any fees to be paid in obtaining said permit.

1.3 JOB CONDITIONS

A. Prior to bidding the work, the Contractor shall examine and inspect the construction site as to the nature and location of the work, and the general and local conditions at the construction site; including, without limitation, the character of surface or sub-surface conditions and obstacles to be encountered on and around the construction site; and shall make such investigation as he may deem necessary for the planning and proper execution of the work.

B. The area to be cleared and grubbed is shown schematically on the drawings. It includes all areas designated for construction.

C. Disposal of unburnable debris shall be made off-site, or as directed by the Engineer. Burying of vegetative debris on site will not be permitted.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. The Contractor shall furnish equipment with operators of the type normally used in clearing and grubbing operations including, but not limited to tractors, trucks, loaders, root rakes, and burning equipment.

B. The Contractor shall furnish discing equipment capable of plowing the soil to a depth of 6 inches twice in a single pass.

PART 3 EXECUTION

3.1 CLEARING AND GRUBBING

A. Materials to be cleared, grubbed and removed from the construction area and lands of the Owner include, but are not limited to the following: all trees, stumps, roots, brush, trash, organic matter, paving, miscellaneous structures, houses, debris and abandoned utilities.

B. Surface rocks and boulders shall be grubbed from the soil, stockpiled, and/or placed in embankments in accordance with the Specifications.

C. The entire construction area shall be grubbed by heavy tractors with root rakes. Raking shall generally proceed along the contour rather than up and down slopes so as to inhibit soil erosion.

D. Grubbing shall consist of completely removing roots, stumps, trash, and other debris from all graded areas so that topsoil is free of roots and debris. Topsoil is to be left sufficiently clean so that further picking and raking will not be required.

E. Burying of residual materials will not be allowed.

F. Stumps and roots shall be grubbed and removed to a depth not less than 2 feet below grade. All holes or cavities which extend below the subgrade elevation of the proposed work shall be filled with crushed rock or other suitable material, compacted to the same density as the surrounding material.

G. The Contractor shall exercise special precautions for the protection and preservation of trees, cultivated shrubs, sod, fences, etc. situated within the limits of the construction area but not directly within excavation and/or fill limits. The Contractor shall be held liable for any damage his operations have inflicted on such property.

3.2 DISCING

A. After grubbing is complete, discing of the entire area is required. Discing shall be done in two directions at approximate right angles. The second discing shall generally be done along the contour.
B. The construction area is to be left free-draining with a finished agricultural appearance.

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SECTION 02200

EARTHWORK

PART 1 GENERAL

1.1 DESCRIPTION

A. Earthwork includes, but is not limited to excavating, filling, compacting, and grading to obtain the required finished ground surface properly prepared to receive pavements, buildings, and drainage structures.

B. The work includes ditching in ground areas of high water table to allow the soil to drain prior to making excavations.

C. The work includes adjustment of moisture content of soils placed in fills if soil tests show it necessary to allow compaction requirements to be met.

D. The work includes the reduction of all ripable rock materials encountered in the course of the work to the sizes and gradations suitable for placement in rockfills and riprap. Included are all surface boulders as well as ripable rock materials encountered in excavations.

E. The work includes the removal of surface soils into stockpiles and placement of same into designated locations including roadway embankments, drainage areas, curb and island backfills, and roadway shoulders.

F. The work includes construction staking to control earthwork construction.

G. The work includes undercutting unsuitable soil materials and replacing with compacted, approved on-site soils.

1.2 QUALITY ASSURANCE

A. Soil testing will be done on a continuous basis while grading operations are underway.

B. The Contractor shall be solely responsible for all lines, levels and measurements for this work. He shall provide his own instruments and survey crew to maintain this control throughout the duration of his work.

C. Testing and inspecting services will be the responsibility of the Contractor by an independent testing company provided approved by the Owner. When scheduling testing, the Owner requires a minimum of 24 hours' notice with a preferred 48-hour notice prior to testing. Copies of all test reports shall be submitted to the Engineer. The testing company will have an authorized representative on the site to check compaction and determine suitability of fill materials during the grading operations.

1.3 JOB CONDITIONS

A. Erosion control measures shall take place prior to the start of any grading work.

B. Prior to bidding the work, the Contractor shall examine and inspect the construction site as to the nature and location of the work, and the general and local conditions at the construction site; including, without limitation, the character of surface or subsurface conditions and obstacles to be encountered on and around the construction site; and shall make such investigation as he may deem necessary for the planning and proper execution of the work.

C. The Engineer shall be immediately notified if suspected unsuitable foundation or subgrade material is encountered during Contractor's grading activities.

D. A soil report and boring logs have been prepared for this site. This information was gathered solely for the use of the Designers and is not to be used as a basis for calculations in preparing a bid. The use and interpretation of the geotechnical information for any purpose will be entirely the responsibility of the using party. Neither the Owner nor the Engineer gives any guarantee, either expressed or implied; that the borings or geotechnical report represent a true cross section of all the material to be encountered in performing the excavation and earthwork on this project.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. Fill materials for embankments shall be clear soil containing no rocks larger than 6 inches and rockfill, if rock is produced by excavating on site.

B. The top 4 inches of all permanently vegetated areas shall be soil material of good quality.

C. Backfill material for structures and retaining walls shall be material obtained off site. Backfill material is subject to approval by the Engineer.

D. Special backfill, where specified, shall be crushed stone or natural or manufactured sand subject to approval of the Engineer.

E. Drainage fill shall be Size #57 crushed stone meeting ASTM C33.

PART 3 EXECUTION

3.1 GRADING

A. Stripping

1. Cut areas and embankment areas shall have all organic topsoil, brush, and other deleterious materials and obvious loose surface materials removed. Undercutting of alluvial soils which exist in drainage features is required.

B. General Grading Requirements

1. For general grading, the finished contours and spot elevations shown on the drawings indicate the finished surface to be obtained by construction. Grades not otherwise shown shall be straight lines between points where elevations are shown. Provide rounding at the top and bottom of slopes and at intersections of planes. Where profiles and typical sections are provided, the profiles and typical sections shall have precedence over the grading plans.
2. Where pavement or building construction is indicated, Contractor shall make due allowance for the thickness of pavement or building structures. Contractor shall note that areas to receive topsoil or riprap are to be left at such grades and elevations that when topsoil or riprap are placed, the finished surface will conform to that shown on Drawing.
3. Grading operations shall be so conducted that materials shall not be removed or loosened beyond the required limits.

C. The finished surfaces shall be left in smooth and uniform planes such as are normally obtainable from the use of hand tools. If the Contractor is able to obtain the required degree by evenness by means of mechanical equipment, he will not be required to use hand labor methods. Slopes and ditches shall be neatly trimmed and finished to slopes shown on the Plans unless otherwise approved by the Engineer in writing.

1. Mass Graded Areas: Finish areas within not more than 0.50 foot above or below the required subgrade elevation provided drainage patterns remain unchanged.
2. Pavements, Buildings, and Drainage Features: Shape surface of areas to line, grade, and cross-section with finished surface not more than 0.10 foot above or below the required subgrade elevation.

3.2 PROOFROLLING

All areas that will support fill, pavement, foundations, or slabs shall be proofrolled with a fully loaded tandem dump truck (or equivalent) to detect soft areas. Proofrolling shall be observed by an experienced Geotechnical Engineer from the testing laboratory hired by the Owner. Proofrolling shall be accomplished by making two complete passes in each of two perpendicular directions. Any areas which exhibit "pumping" (indicating soft spots) shall be undercut to a level specified by the Geotechnical Engineer and replaced with approved fill material compacted in accordance with requirements for fill as specified herein.

3.3 EXCAVATION

A. Excavation consists of removing all materials encountered in establishing required grade elevations, utility installations, and other job requirements. Excavation includes transporting and placing material in embankments, backfills, or temporary stockpiles as required to meet the requirements of the Plans and Specifications.

B. No classification of excavated materials will be made. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in the performance of contract work, regardless of type, character, composition, or condition thereof.

C. General Excavation Requirements
   1. Excavation operations shall be managed to ensure proper placement of soil materials not suitable for placement near the surface of embankments. If necessary, the Contractor shall temporarily stockpile excavated earth so that it will be available to top off embankments.
   2. Stability of Excavation: Slope sides of excavations to comply with local codes and ordinances having jurisdiction and with good construction engineering practice. Shore and brace where sloping is not possible either because of space restrictions or stability of material encountered. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.
   3. Dewatering Excavations: Prevent surface water and subsurface or groundwater from flowing into structure excavations.
      a. Do not allow water to accumulate in structure excavations. Remove water to prevent softening of foundations. Provide and maintain sumps, pumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
      b. Convey water removed from excavations to storm drain system or outfall ditches. Provide and maintain temporary drainage ditches and other diversions outside excavation limits for each structure. Do not use trench excavations as temporary drainage ditches.
   4. Material Storage: Stockpile as directed by Engineer satisfactory excavated materials until required for backfill or fill. Place, grade and shape stockpiles for proper drainage and protect from erosion. Locate and retain soil materials away from edge of excavations.
   5. Excavation for Structures: Conform to the elevations and dimensions shown within a tolerance of plus or minus 0.10 foot and extending a sufficient distance from footings and foundations to permit placement and removal of concrete formwork, installation of services, and other construction required, and for inspection.
   6. Areas of excavation as indicated on the Plans shall be excavated to the limits shown with no classification of excavated material. Excavated rippable rock shall be incorporated in construction of the fills with the method of construction subject to the Engineer's approval. Broken rock resulting from drilling, blasting or other methods may also be utilized in fill construction, subject to Engineer's approval of maximum size of rock, method of construction and areas of placement.

D. Limits of Rock Excavation: Limits are minimum dimensions to which any part of the rock encountered will be allowed to remain.
   1. Beneath pavements, excavate to 6 inches beneath base course.
   2. Beneath structures, excavate 12 inches beneath bottom of structure.
   3. Beneath pipe in trenches, excavated 8 inches beneath the bottom of pipe.

E. Unauthorized Excavation
   1. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Engineer.
   2. Unauthorized excavation shall be backfilled and compacted with fill material or special backfill as directed by the Engineer.

F. If the Contractor encounters unsuitable material below subgrade elevation while accomplishing excavation, it shall be removed and replaced as directed by the Engineer. In no case shall objectionable material be allowed in or under the subgrade. Final determination of the classification of any material as unsuitable shall be made by the Geotechnical Engineer and such decision shall be final.

3.4 EMBANKMENT AND BACKFILL CONSTRUCTION

A. Place acceptable and appropriate material in compacted layers to the required subgrade elevations for each area classification to be filled. All materials entering the fill shall be free of organic material, such as leaves, grass, roots and other objectionable material.

B. Embankments
   1. Prior to commencement of grading operations, the Contractor shall proofroll all areas that will receive fill with a fully loaded tandem dump truck. Where quicksand, soft clay, swampy or other material unsuitable for subgrade or foundation purposes is encountered, it shall be removed and disposed of to the level of suitable material. Areas so excavated shall be backfilled with approved material compacted by tamping to the density of the surrounding suitable material and to the lines and grades shown on the Drawings. Unsuitable material will be disposed of within the spoil areas, as designated by the Engineer. Final determination of the classification of any material as unsuitable shall be made by the Geotechnical Engineer and such decision shall be final. In areas that will receive deep fills, the material may remain and be bridged as directed by the Engineer. No additional payment will be made for bridging by using track vehicles only prior to placement and compaction of fill with pans and sheepsfoot rollers.
   2. Rockfill and soils classified other than common excavation may be used only in embankment areas and then in thin layers at the very bottom of fill and more than 8 feet below finished grade and more than 6 feet beneath paving subbase course.
   3. Fills shall be formed of satisfactory materials placed in successive horizontal layers of not more than 6 inches in loose depth for the full width of each strip. A strip shall be defined as being no less than 8 feet wide. Rockfill may be placed in layers up to 12 inches thick in the lower portion of fills unless otherwise approved by the Engineer.

C. Structure and pipe backfill shall be placed in thin layers and compacted to the required minimum densities for fills. Backfill placement shall be balanced to prevent wedging action on structures and pipes.

D. Backfill in storm sewer, sanitary sewer, water line, or any other trenches which lie *under pavement* shall be #57 crushed stone compacted to the required minimum densities for fills and installed according to City specifications.

E. Rockfill shall be placed in embankments from the bottom upward. In no case shall earthfill material be buried underneath rockfill or soils classified other than common excavation. Earthfill material shall be stockpiled as required to allow the total quantity of rockfill to be placed in permissible locations as defined above.

F. In areas where rock or unsuitable soils are excavated to allow construction of pavements, structural fill shall be placed and compacted as shown below.

G. Compaction
   1. General: Control soil compaction during construction providing densities as specified when tested by ASTM 698.
   2. Standard proctor tests (ASTM 698) shall be done in accordance with generally accepted practice by the testing laboratory hired by the Owner for the purpose of comparing field densities to standard proctor test maximum densities unless noted otherwise or instructed otherwise by the Engineer, field density testing. Field density testing should be performed on each lift prior to placement of additional lifts. Test locations should be evenly distributed throughout the fill area and should be performed at the frequencies shown on the following table:

Area	Method of Placement / Completion	Initial Test Frequency	Retest Frequency
General Site	Large self-propelled equipment	1 test per lift per 5,000 square feet	1 test per failed test
Isolated Areas	Hand-guided equipment	1 test per lift	1 test per failed test
Trench backfill and behind retaining walls	Hand-guided equipment	1 test per 50 linear feet per 6 inches of fill	1 test per failed test

   Test frequencies may be increased during the early stages of earthwork construction. Compaction requirements apply to all excavation/backfill operations conducted on site.
   3. Soils shall be placed at a moisture content which is within minus 1 or plus 3 percentage points of the optimum moisture content and to the following percentages of the maximum dry density as determined by ASTM 698:
      a. All Embankments and Backfills: Compact to 95 percent except as hereinafter specified.
      b. Top 12 Inches of Subgrade Under Pavements: Compact to 98 percent.
      c. Top 12 Inches of Subgrade Under Slabs: Compact to 98 percent.
      d. Rockfill shall be compacted by passes of heavy equipment or by drum type vibrating compactors as required to achieve a relative density of 75 percent or as directed by the Engineer.

H. Curbed shoulders and islands shall be backfilled with stockpiled surface soils if available after other uses are completed. Contractor shall place surface soils from stockpiles in a 4-inch minimum thickness layer on all areas designated for planting, grassing, etc.

I. Any areas inaccessible to a roller shall be consolidated and compacted by mechanical tampers. The equipment shall be operated in such a manner that weathered rock, cemented

gravel, clay or other chunky soil material will be broken up into small particles and become incorporated with the other material in the layer.

J. In the construction of filled areas, starting layers shall be placed in the deepest portion of the fill, and as placement progresses, additional layers shall be constructed in horizontal planes. Unless otherwise directed by the Engineer, original slope shall be continuously vertically benched to provide horizontal fill planes. The size of the benches shall be formed so that the base of the bench is horizontal, and the back of the bench is vertical.

K. As many benches as are necessary to bring the site to final grade shall be constructed. Filling operations shall begin on the lowest bench, with the fill being placed in horizontal 6 inch loose lifts unless otherwise authorized by the Engineer. The filling shall progress in this manner until the entire first bench has been filled, before any fill is placed on the succeeding benches. Proper drainage shall be maintained at all times during benching and filling of the benches, to ensure that all water is drained away from the fill area.

L. The Contractor shall be responsible for the stability of all fills made under the contract, and shall replace any portion which, in the opinion of the Engineer or his designated representative, has become displaced due to carelessness or negligence on the part of the Contractor. Fill damage by inclement weather shall be repaired at the Contractor's expense.

3.5 MAINTENANCE

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion and keep free of trash or debris. Repair and re-establish grades in settled, eroded and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, remove to sound material, reshape, and compact the required density prior to any further construction.

3.6 EROSION CONTROL

The Contractor shall utilize hay bales and other erosion control devices not only as detailed on the Drawings or required by the Specifications, but at such times and places are as necessary to satisfy local and governmental laws and regulations, to keep silt from washing onto existing paved surfaces, protect culverts or other drainage structures, or as directed by the Engineer.

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SECTION 02215

SUBGRADE CONSTRUCTION AND PREPARATION

PART 1 GENERAL

1.1 SCOPE

The work described in this section includes furnishing all labor and equipment necessary for the construction and preparation of part or all of the roadbed to receive the immediate construction of a base or pavement thereon.

PART 2 EXECUTION

2.1 EQUIPMENT

All equipment necessary and required for the construction of the subgrade must be on the project, proven to be in first-class working order, and approved by the Engineer before construction will be permitted to begin. This shall consist of at least one motor grader with scarifier and one pneumatic tired roller meeting the requirements of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction.

2.2 SUBGRADE PREPARATION

A. Road and drainage excavation and embankment construction shall be performed in accordance with the provisions set out in Section 02200 "Earthwork" of these Specifications.

B. The subgrade shall be prepared to the lines and grades staked by the Engineer and to correspond to the cross section of the bottom of the pavement as indicated on the Drawings or as directed.

C. Where excavation is necessary to prepare the subgrade, the material removed shall be carefully stored or placed for use in completing the roadbed. Unsuitable material shall be wasted as directed by the Engineer.

D. All rock shall be removed to a depth of not less than 6 inches below the surface of the subgrade and all holes or depressions, caused by the removal of rock, or otherwise, shall be backfilled with satisfactory material and thoroughly compacted.

E. Where the roadbed is below grade the Contractor shall prepare the subgrade by hauling and spreading satisfactory material excavated in channeling, or otherwise. The material shall be spread in layers not to exceed 6 inches in thickness and thoroughly compacted by rolling, and using water if directed. Each layer shall have been completed before the succeeding layer is started.

F. Where it is intended or required to use steel forms in the construction of the base of pavement, the subgrade shall be constructed at least 12 inches wider, on each side, than the neat width of

the base of pavement. For bases or pavements using wooden forms, the subgrade shall be constructed at least 6 inches wider, on each side, than the width of the base or pavement, as indicated on the Drawings or as directed.

G. Where sub-bases are to be constructed on the subgrade, the limits of the subgrade preparation shall extend across the entire section upon which any subbase course is to be applied, including the shoulders.

H. When the subgrade is being prepared for the construction of a Portland cement concrete base or Portland cement concrete pavement it shall be formed to the approximate grade and cross section. The preparation of the subgrade shall be performed in conformity with the requirements set out in the section covering the particular type of construction.

2.3 SUBGRADE COMPACTION

A. After the subgrade has been approximately prepared and shaped, it shall be loosened in its entirety by discing, harrowing or other approved methods to a depth of not less than 6 inches prior to its being compacted to the approved density. The subgrade shall then be thoroughly compacted with the approved 10-ton roller or pneumatic tired roller. The density shall be 100 percent of AASHTO density when tested by the Standard Specifications for Compaction and Density of Soils, AASHTO Serial Designation T 99 (latest revision). The limits of the subgrade compaction shall extend across the entire section upon which any base or subbase course is to be applied, including the shoulders. Prior to reworking and compacting the subgrade, all vegetation within the limits as set out above shall be removed and properly disposed of as directed by the Engineer.

B. All soft, yielding material, which will not compact readily under the roller, shall be removed as directed. All holes or depressions caused by the removal of material, as described above, shall be backfilled with satisfactory material and the entire surface thoroughly compacted with the roller where possible, or otherwise when directed by the Engineer.

C. The subgrade shall be checked after the rolling and adjusted so as to conform to the grade and cross section, as indicated or directed. It shall be rerolled if directed.

D. The final rolling of the subgrade, preparatory to the construction of the Portland cement concrete base or pavement thereon, shall be preformed between the forms after they are finally set to line and grade.

2.4 SCOPE OF SUBGRADE

The subgrade shall be true to lines, grades, and cross sections; must be free from dust or other loose material; must have a uniform bearing power; and shall be prepared and maintained at least 500 feet in advance of the placing of any materials thereon, except between November 1 and April 1, the distance may be reduced to 200 feet if permitted by Engineer.

2.5 DRAINAGE

A. Grading of the subgrade shall be performed in such a manner that berms of earth or other material which will interfere with the immediate drainage of water from the subgrade to the side ditches will not remain on the roadbed, at any time. All side ditches and drains shall be maintained to provide for proper drainage during the construction.

B. All ditches and drains shall be completed so as to drain the roadbed effectively before the placing of any construction materials will be permitted.

2.6 PROTECTION OF SUBGRADE

A. In handling materials, equipment, tools, etc., the Contractor shall take all precaution necessary to protect the subgrade from damage. Only hauling necessary for the purpose of construction will be permitted on the subgrade after it has been completed.

B. If ruts of 2 inches or more in depth are formed in the subgrade, all construction materials, whether stored or in place, within the range of such ruts, shall be removed and the subgrade shall be reshaped and rolled. All ruts or rough places developing in a completed subgrade shall be smoothed and the subgrade rerolled.

2.7 SUBGRADE CHECKING

A. The subgrade must conform to the lines, grades, and cross sections, indicated or directed, before it will be permitted to construct base or pavement thereon, and shall be subject to test just prior to construction.

B. The subgrade for base or pavement requiring steel side forms will be checked by a special tester, as provided in the section covering this type of construction.

C. All excess material shall be removed until the subgrade is at true elevation. Low subgrade shall be built up to the proper form and elevation when practical to roll, or if not practical to roll, it shall be filled as an integral part of the base or pavement at the Contractor's expense.

2.8 SITE CLEANING

The disposal of excess or unsuitable material shall be performed in accordance with the provisions set out in Section 01710 "Cleanup" of these Specifications and final cleanup shall be performed in accordance with the provisions set out in the Detailed Specifications of the Contract.

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DIVISION 3: CONCRETE

SECTION 03110

CONCRETE FORMWORK

PART 1 GENERAL

1.1 SCOPE

This specification section prescribes materials and methods to be used in fabricating, erecting, and removing forms for cast-in-place concrete. The Contractor shall furnish all form design, forms, shoring, ties, form coating, and materials and all labor, equipment, and other items necessary or convenient to the Contractor for the fabrication, erection, and removal of formwork.

1.2 GENERAL

A. Forms shall be fabricated, erected, and removed as specified herein and shall be of a type, size, shape, quality and strength to produce hardened concrete having the shape, lines, and dimensions indicated on the Drawings. The forms shall be true to line and grade in accordance with the tolerances as specified in “Cast-In-Place Concrete” and shall be mortar tight and sufficiently rigid to resist deflection during concrete placement. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes that would deface the finished surfaces.

B. The responsibility for correctly assessing and analyzing the erection stresses induced upon the structure, its elements and supporting foundations during construction will be the total obligation of the Contractor. Since the Engineer does not dictate or determine the Contractor's sequence of operations of construction, the Engineer cannot determine erection stresses and therefore assumes no responsibility or obligation to do so. The Contractor must employ or otherwise provide for adequate professional structural engineering supervision to determine erection stresses and notify the Engineer of the results of the study.

C. The responsibility for adequate formwork design for construction of cast-in-place, reinforced concrete will be the total obligation of the Contractor. The Contractor shall employ competent professional engineering services to design formwork and supervise the erection of all formwork needed for the job.

D. Except as modified herein, form design, fabrication, and erection shall conform to the requirements of the latest editions of ACI 347 and ACI 318 and shall be acceptable to the Engineer. Design criteria for plywood shall conform to APA Form V345.

E. Formwork shall comply with the requirements of ANSI A10.9 and OSHA Construction Standards, Part 1926, Subpart Q, "Concrete, Concrete Forms, and Shoring."

1.3 SUBMITTALS

A. When requested by the Engineer, the Contractor shall submit to the Engineer for review shop drawings and design calculations for formwork the Contractor intends to use in constructing

the work. The Contractor shall furnish said shop drawings and design calculations at no additional cost to the Owner.

B. Prior to beginning concreting operations, the Contractor shall submit to the Engineer for approval engineering data and manufacturer's literature on all form ties, spreaders, bar supports, form coatings, and prefabricated steel forms intended for use in the work.

1.4 STORAGE

All form materials and accessories shall be stored above-ground on framework or blocking and shall be covered with a suitable water-proof covering providing adequate air circulation and ventilation.

PART 2 PRODUCTS

2.1 FORMS

A. Forms for surfaces which will be exposed to view when construction is completed shall be prefabricated plywood panel forms, job-built plywood forms, or forms that are lined with plywood or fiberboard.

B. Plywood or lined forms will not be required for surfaces which are normally submerged or not ordinarily exposed to view, such as the insides of manholes or wet wells. Other types of forms, such as steel or unlined wooden forms, may be used for surfaces which are not restricted to plywood or lined forms, and may be used as backing for form linings. Forms are required above all extended footings.

C. Forms for cast-in-place concrete shall conform with the following requirements:
   1. Prefabricated Steel Forms – Simplex “Industrial Steel Frame Forms,” Symons “Steel Ply,” Universal “Uniform,” or equal.
   2. Plywood – Product Standard PSl, waterproof, resin bonded, exterior type Douglas fir.
      a. Normal – Face adjacent to concrete Grade B or better.
      b. Architectural – Face adjacent to concrete Grade B or better with plastic overlay.
   3. Lumber – Straight, dressed all sides, uniform width and thickness, and free from knots, offsets, holes, dents, and other surface defects.
   4. Fiberboard – Federal Specification LLL-B-810, Type IX, tempered, waterproof, screenback, concrete form hardboard.
   5. Chamfer Strips – Clear white pine, surface against concrete planed.

D. Reuse of job-built plywood forms shall be permitted only when specifically approved by the Engineer. Plywood shall be furnished and placed in 48-inch widths and in uniform lengths of not less than 96 inches, except where the dimension of the member is less. Where plywood is attached directly to studs or joists, the panels shall be not less than 5/8 inch thick. Studs shall be provided sufficiently sized and spaced to prevent bulging of the plywood sheeting.

E. Where earth is too unstable to serve as a form for sides of footings and foundations, the sides against the earth may be formed with 3/4 inch thick No. 2C Yellow Pine with tight butt joints, securely braced to hold a straight line.

2.2 FORM TIES

Form ties shall be approved by the Engineer and shall be of the snap cone or she-bolt with cone type as manufactured by a recognized manufacturer of concrete forming accessories. Cones shall leave a hole or depression in the concrete no larger than 7/8-inch in diameter. Plain snap ties or flat bar ties, unless otherwise approved by the Engineer, shall not be used. Ties shall be of a type that will accurately tie, lock, and spread the forms. Tie spacing shall be designed to withstand concrete pressures without bulging, spreading, or lifting of the forms. The tie shall be of such a design that when forms are removed no metal shall be within 2 inches of any surface unless stainless steel ties are used, in which case no metal shall be within 1 inch of any surface. Permanently embedded portions of form ties that are not provided with threaded ends shall be constructed so that the removable ends are readily broken off without damage to the concrete.

2.3 FORM COATINGS

Where specified herein, forms shall be coated with a nonstaining form release agent prior to concrete placement. Form coatings shall be Industrial Lubricants “Nox-Crete Form Coating,” L&M “Debond,” Prater “Pro-Cote,” Richmond “Rich Cote,” or equal.

PART 3 EXECUTION

3.1 FABRICATION AND ERECTION

A. Forms shall be substantial and sufficiently tight to prevent leakage of mortar. Forms shall be braced or tied to maintain the desired position, shape, and alignment during and after concrete placement. Walers, studs, internal ties, and other form supports shall be sized and spaced so that proper working stresses are not exceeded. Joints in forms shall be bolted tightly and shall bear on solid construction. Forms shall be constructed so they can be removed without hammering, wedging, or prying against the concrete. Form ties in exposed surfaces shall be uniformly spaced and aligned in horizontal and vertical rows. The forms shall produce finished surfaces that are free from off-sets, ridges, waves, and concave or convex areas.

B. Forms to be reused shall be thoroughly cleaned and repaired. Split, frayed, delaminated, or otherwise damaged forms shall not be used.

C. All form panels shall be placed in a neat, symmetrical pattern with horizontal joints level and continuous. The Contractor shall place special attention on mating forms to previously placed walls so as to minimize steps or rough transitions. Form panels shall be of the largest practical size to minimize joints and to improve rigidity.

D. Beams and slabs supported by concrete columns shall be formed so the column forms may be removed without disturbing the supports for the beams or slabs.

E. Wherever the top of a wall will be exposed to weathering, the forms on at least one side shall not extend above the top of the wall and shall be brought to true line and grade. At other locations forms for concrete which is to be finished to a specified elevation, slope, or contour, shall be brought to a true line and grade, or a wooden guide strip shall be provided at the proper location on the forms so that the top surface can be finished with a screed or template. At horizontal construction joints in walls the forms on one side shall not extend more than 2 feet above the joints.

F. Temporary openings shall be provided at the bottom of column and wall forms and at other points where necessary to facilitate cleaning and inspection prior to concrete placement.

G. Unless shown otherwise on the Drawings, all salient corners and edges of beams, columns, walls, slabs, and curbs shall be provided with a $^{3}/_{4}$- by $^{3}/_{4}$-inch chamfer formed by a wood or metal chamfer strip.

H. Forms for exposed surfaces and all steel forms shall be coated with a non-staining form release agent that shall be applied just prior to placement of steel reinforcement. After coating, any surplus form release coating on the form surface shall be removed. Wood forms for unexposed surfaces may be thoroughly wetted with water in lieu of coating immediately before concrete placement, except in freezing weather form release coating shall be used.

I. Should misalignment of forms or screeds, excessive deflection of forms, or displacement of reinforcement occur during concrete placement, immediate corrective measures shall be taken to ensure acceptable lines and surface to required dimensions and cross sections.

J. If any forms bulge or show excessive deflection, in the opinion of the Engineer, the concrete shall be removed and the forms rebuilt and strengthened.

3.2 FORM REMOVAL

A. Forms shall not be removed or disturbed until the concrete has attained sufficient strength to safely support all dead and live loads. Shoring beneath beams or slabs shall be left in place and reinforced as necessary to carry any construction equipment or materials placed thereon.

B. No forms shall be removed without the approval of the Engineer. In general and under normal conditions the Engineer will approve removal of forms after the following time has elapsed:

Item	**Time After Placement**
Elevated Slabs and Beams	14 days
Columns	7 days
Walls	3 days
Other Concrete	2 days

C. When ambient air temperatures during the curing period fall below 45°F, form removal will take place based on job-cured test cylinder strength only.

Care shall be taken in form removal to avoid surface gouging, corner or edge breakage, or other damage to the concrete. Immediately after form removal, any damaged or imperfect work shall be repaired as specified in “Cast-in-Place Concrete” of these Specifications.

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SECTION 03240

CAST-IN-PLACE CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SCOPE

This specification section describes steel reinforcement to be furnished and installed in cast-in-place concrete. The Contractor shall furnish all steel reinforcement, supports, and materials and all labor equipment, and other items necessary or convenient to the Contractor for the proper installation of the reinforcement. The Contractor shall also supply and install any additional reinforcement required by vendors at no additional cost to the Owner.

1.2 GENERAL

A. Steel reinforcement shall be designed, detailed, fabricated and placed in conformance with all applicable requirements of the latest editions of ACI 315, ACI 318, and the CRSI *Manual of Standard Practice*.

B. No concrete shall be placed until all steel reinforcement to be covered has been inspected in place and approved by the Engineer.

1.3 SUBMITTALS

A. Prior to placing any steel reinforcement, the Contractor shall submit to the Engineer written evidence that the steel reinforcement has been tested and is in conformance with the material and mechanical requirements specified herein. Certified copies of mill tests may be considered evidence of compliance provided such tests are regularly conducted by the reinforcement supplier by experienced, competent personnel using adequate testing equipment. In case of doubt as to the adequacy or accuracy of the mill tests, the Engineer may require the Contractor to furnish, at no additional cost to the Owner, test results from an independent testing laboratory acceptable to the Engineer on mill samples or delivered steel reinforcement. Mill or laboratory test results for verifying compliance with this Specification section shall be provided for each 15 tons of steel reinforcement shipped. Results of laboratory or mill tests submitted to the Engineer shall be of tests conducted not earlier than 90 days prior to delivery.

B. The cost of all sampling and testing of steel reinforcement necessary to furnish satisfactory evidence of compliance shall be borne by the Contractor and no separate payment will be made.

C. Prior to fabrication and bending of steel reinforcement, the Contractor shall submit to the Engineer for review and approval complete shop drawings, bending diagrams, and schedules of all steel reinforcement to be incorporated in the work.

D. The reinforcement shop drawings and bending diagrams shall show all dimensions, details, notes, location, size, length, and each bar mark, together with accessories and other materials belonging to the reinforcement for the concrete. Schedules shall show all information and be

of the same general form as those on the Drawings. Concrete walls shall be detailed in elevation. The reinforcement shop drawings and bending diagrams shall also show all dimensions, details, notes, location, size, length, and each bar mark, together with accessories and other materials belonging to each of the reinforcement types for the concrete. There shall be a lap splice table provided for each reinforcement type used in the design. Schedules shall show all information and be of the same general form as those on the Drawings. Concrete walls shall be detailed in elevation.

PART 2 PRODUCTS

2.1 MATERIALS

A. Reinforcing Bars: Reinforcing bars shall be deformed billet-steel bars conforming to ASTM A 615. All bars No. 4 and larger shall be Grade 60. All bars No. 3 and smaller shall be Grade 40. All bars shall be shop-fabricated and bent cold. Bars shall be free from defects and kinks and from bends not indicated on the Drawings or approved bending diagrams.

B. Mesh Reinforcement: Mesh reinforcement shall be electrically welded, cold-drawn, mild-steel, plain wire fabric conforming to ASTM A 185. Wire shall be cold-drawn steel conforming to ASTM A 82. Mesh will be provided in flat sheets only; rolls of mesh reinforcement are not acceptable.

C. Support Chairs
   1. Reinforcement supports shall conform to Product Standard PS7 and CRSI *Manual of Standard Pr*actice, Class D or E.
   2. Reinforcement support chairs shall be stainless steel or shall be plastic-tipped when used in walls and elevated slabs. Support chairs used in slabs on grade shall be stainless steel or shall be hot-dip galvanized after fabrication or plastic-tipped in such a manner as to provide 12 inches; the minimum protection from the subgrade as required in these documents. Nails shall not be used to support reinforcement.

D. Tie Wire: Tie wire shall conform to Federal Specification QQ-W-461 and shall be of black annealed steel, 16-gauge minimum.

PART 3 EXECUTION

3.1 DELIVERY AND STORAGE

Reinforcement shall be delivered to the job site carefully bundled and tagged for identification. Reinforcement shall be stored at least 12 inches above ground on timber mats or other supports acceptable to the Engineer. Contact between reinforcement and the ground shall not be permitted during storage. Reinforcement shall be supported so as not to bend or deflect excessively under its own weight.

3.2 SURFACE PREPARATION

Before placement, all reinforcement shall be thoroughly cleaned of oil, dirt, mill scale, rust scale, and other coatings that would tend to destroy or reduce bond. All coatings on epoxy-coated bars shall be intact or rejected and removed from the job site. Note that all epoxy-coated bars require additional lapped lengths per ACI 318. A thin coating of orange rust resulting from short exposure will not be considered objectionable, but any reinforcement having heavy rust scale or thick rust coating shall be thoroughly cleaned to the satisfaction of the Engineer or shall be rejected and removed from the job site. When there is a considerable delay between placement of reinforcement each of the reinforcement types and placement of concrete, the reinforcement each of the reinforcement types shall be reinspected prior to placement of concrete and recleaned if necessary.

3.3 PLACEMENT

A. Reinforcement shall be accurately positioned and tied at intersections with annealed wire or suitable clips approved by the Engineer. Reinforcement shall be supported by concrete or metal chairs, stays, spacers, hangers, or other supports acceptable to the Engineer.

B. Reinforcing bars shall be fastened with wire ties at a minimum of three places per bar. Bars shall be tied at every intersection around the periphery of slabs. Wall steel shall be tied at every fourth intersection as a minimum.

C. Reinforcement supports shall have sufficient strength and stability to maintain the reinforcement in place throughout placement and concreting operations. Supports and ties shall not be exposed at the face of the concrete nor shall they discolor the surface of the finished concrete.

D. Movement of steel reinforcement in place during concreting operations shall be prevented. Any reinforcement which is displaced shall be accurately repositioned in the proper place before being completely covered.

E. Dowels for successive work shall be securely fastened in correct position before placing concrete. The sticking of dowels after placing concrete shall not be permitted.

F. Reinforcement which has been exposed for bonding with future work shall be protected from corrosion by heavy wrappings of burlap saturated with a bituminous material.

G. No bars partially embedded in concrete shall be field-bent unless approved by the Engineer.

3.4 MINIMUM COVER AND CLEARANCE

The minimum concrete cover for the protection of embedded steel reinforcement shall be as follows:

A. Surfaces cast against crushed rock, sand, or earth:
All bar sizes 3 inches

B. Surfaces exposed directly to water, backfill, or weather after form removal:

All bar sizes	2 inches

C. Surfaces not exposed directly to water, backfill, or weather after form removal (Bar Size No. 11 and smaller):

1.	Elevated slabs	1 inch
2.	Floors, walkways, pavement	3/4 inch
3.	Walls	
	Less than 12 inches thick	3/4 inch
	12 inches or thicker	2 inches
4.	Beams	
	Stirrups	1 1/2 inches
	Principal reinforcement	2 inches

The minimum clearance between adjacent parallel bars shall not be less than the nominal diameter of the bars, not less than 1.5 times the maximum coarse aggregate size, and not less than 1 inch in beams, 1 1/2 inches in columns, and 2 inches in other locations.

3.5 TOLERANCES

A. Allowable tolerances for fabricating steel reinforcement shall be as follows:

Item	Maximum Tolerance
Sheared length of bars	+1/2"-1/2"
Depth of truss bars	+0.0"-1/2"
Outside dimensions of stirrups, ties, and spirals	+1/2"-1/2"
Location of bends	+1"-1"

B. Allowable tolerances for placing steel reinforcement shall be as follows:

Item	Maximum Tolerance
Concrete cover from outside of bar to finished surface	+3/8"-3/8"
Lateral spacing of bars in plane of reinforcement in beams and joists	+1/4"-1/4"
Lateral spacing of bars in plane of reinforcement in slabs and walls	+1/4"-1/4"
Spacing of stirrups, ties, and spirals along longitudinal axis of member	+1/4"-1/4"
Height of bottom bars in slabs, beams and joists	+3/8"-3/8"
Height of top bars in slabs, beams and joists	
Depth 8" and less	+3/8"-3/8"

Depth 9-24"	+1/2"-1/2"
Depth 25" and greater	+1"-1"

3.6 SPLICES

A. Splices in reinforcement shall conform to the requirements of ACI 318, Chapter 7, “Details of Reinforcement.” Additional lap length is required for all epoxy-coated wire fabric per ACI 318. The ACI 318 requirements will serve as a minimum only; additional splice length may be required as indicated in the design documents. Unless otherwise shown on the Drawings, all bars shall be lapped a minimum of 36 bar diameters where splicing is necessary and splices shall be staggered. Except where indicated on the Drawings, welding or tack welding of reinforcement shall not be permitted. Lapped connections shall be sufficient to transfer the full stress between the bars by bond and shear and to develop the full strength of the bars. In slabs and beams no splices shall be made at points of maximum positive or negative moment, and in no case shall adjacent bars be spliced at the same place.

B. Although tolerances are allowed in the lateral spacing of parallel bars in the plane of reinforcement layers and in the spacing of stirrups, ties, and spirals along the longitudinal axis of a member, in no case shall the number of bars per layer of reinforcement provided in walls and slabs be less than the lateral dimension of the wall or slab in the plane of the reinforcement layer divided by the specified spacing, nor shall the number of stirrups, ties, or spirals provided along the longitudinal axis of a member in a given segment be less than the length of the segment divided by the specified spacing.

C. Welded wire fabric reinforcement shall be lapped a minimum of 6 inches at joints and shall be wired securely. Mesh shall extend to within 2 inches of sides and ends of slabs. Lapped ends of welded wire fabric shall be offset to prevent continuous laps. Splices shall not be made midway between supporting beams or directly over beams of continuous structures.

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SECTION 03310

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SCOPE

A. This specification section covers all materials, equipment, and methods to be used by the Contractor in mixing, placing, testing, finishing, and curing cast-in-place concrete. The Contractor shall furnish all cement, aggregate, water, admixtures, and other materials and all labor, equipment, and supplies necessary or convenient to him for completing the work described in these Contract Documents.

B. Cast-in-place concrete reinforcement and form work shall be as specified in the Section 03240, “Cast-In-Place Concrete Reinforcement” and Section 03110, “Concrete Formwork” respectively of these Specifications.

1.2 CLASSIFICATION OF CONCRETE

A. Concrete shall be either Class A or Class B, as indicated on the Drawings or specified in these Specifications. If the class is not otherwise specified, the Contractor shall furnish Class A concrete.

B. In general, Class A concrete shall be used for reinforced concrete cast-in-place in forms for piers, headwalls, tanks, slabs, floors, walls, columns, footings, foundations, pile caps, manholes, and similar reinforced concrete structures coming under the scope of ACI 318. Class B concrete shall be plain concrete and shall be used for pipe cradles, pipe and conduit encasement, bedding, grade correction, anchors, collars, thrust blocks, massive sections, and other non-reinforced concrete.

1.3 GENERAL REQUIREMENTS

A. All cast-in-place concrete shall be accurately formed and properly placed and finished as shown on the Drawings and specified herein.

B. The materials, aggregate grading, cement content, and placement methods specified herein are intended to provide a concrete that satisfies the minimum strength requirements, exhibits sufficient plasticity and cohesiveness to facilitate placement and reduce honeycombing and porosity, and incorporates a minimum water-to-cement ratio to minimize bleeding and shrinkage and to provide maximum watertightness. However, the Contractor may submit to the Engineer for review and approval alternate material requirements and placement techniques for achieving the desired results.

C. All Class A cast-in-place concrete shall be designed in accordance with the applicable requirements of ACI 318, latest edition.

1.4 PRELIMINARY MIX DESIGN

A. Before starting any concreting operations, the Contractor shall submit to the Engineer for approval a preliminary mix design for each class of concrete and for each size and gradation of aggregate and each consistency within a given class of concrete intended for use in the work. The preliminary mix design submittals shall contain the following information for each:
   1. Fine Aggregate (Sampled per ASTM D 75)
      a. Source and type
      b. Sieve analysis per ASTM C 136
      c. Magnesium sulfate soundness per ASTM C 88
      d. Deleterious substances per ASTM C 117, C 123, and C 142
      e. Saturated surface dry weight per cubic yard of concrete
      f. Bulk specific gravity per ASTM 127
      g. Fineness modulus as defined in ASTM C 125
   2. Coarse Aggregate (Sampled per ASTM D 75)
      a. Source and type
      b. Sieve analysis per ASTM C 136
      c. Abrasion loss per ASTM C 535
      d. Magnesium sulfate soundness per ASTM C 88
      e. Deleterious substances per ASTM C 117, C 123, and C 142
      f. Saturated surface dry weight per cubic yard of concrete
      g. Bulk specific gravity per ASTM 128
   3. Cement (Sampled per ASTM C 183)
      a. Manufacturer, type, and ASTM designation
      b. Sacks per cubic yard of concrete
      c. Total gallons of water per sack (cf) of cement
      d. Compressive strength at 7 days per ASTM C 109
      e. Chemical analysis per ASTM C 114
   4. Slump per ASTM C 143
   5. Air content per ASTM C 231
   6. Unit weight per ASTM C 138
   7. Time to initial set at 70 °F per ASTM C 403
   8. Compressive strength at 7, 14, and 28 days ages per ASTM C 192 and C 39. A total of 9 standard test cylinders shall be prepared and cured in the laboratory for each preliminary mix design, three of which shall be tested each at 7-, 14-, and 28-day ages.
   9. Admixtures
      a. Manufacturer, type, and ASTM designation
      b. Dosage and point of introduction into the mix.

B. A preliminary mix design shall not be considered acceptable if the concrete resulting from that mix design does not produce an average 28-day compressive strength at least 1,200 psi higher than that required, unless a standard deviation for compressive strength testing has been established for the concrete supplier using the methods described in ACI 214. If a standard deviation has been established, the strength used as a basis for selecting concrete proportions shall exceed the required 28-day strength by the amounts given in ACI 318, Section 4.2.2.1, based on the appropriate value of the standard deviation. If a standard deviation is utilized, the Contractor or concrete supplier shall furnish written evidence to the Engineer that the standard deviation has been determined in accordance with the methods described in ACI 214. A written statement from an independent testing laboratory may be considered satisfactory evidence of compliance.

C. Tests for compressive strength and all sampling and testing of aggregate and cement shall be conducted in accordance with the specified ASTM standards by an independent testing laboratory acceptable to the Engineer. Alternately, when approved by the Engineer, testing of cement and aggregate may be conducted at the point of manufacture by reputable cement and aggregate suppliers who regularly provide such testing services by experienced, competent personnel. Tests for slump, air content, unit weight, and time to initial set may be conducted by the concrete supplier, providing such tests are performed in accordance with the specified ASTM standards by experienced, competent personnel using proper equipment.

D. The Contractor shall submit with each preliminary mix design four copies of certified laboratory or mill test reports on all aggregate and cement incorporated in the preliminary mix design and four copies of certified laboratory test reports on the compressive strength of the resulting concrete. Test reports on aggregate and cement shall contain written evidence that clearly indicates that all cement and aggregate covered by the test reports conform in all respects to the applicable material requirements of this specification section.

E. Approval of the preliminary mix designs shall in no way be interpreted to relieve the Contractor of any responsibilities, duties, or obligations for providing concrete conforming to the requirements of this specification section.

F. If, during the course of concreting operations, the Contractor desires to use an alternate mix design differing from the approved mix design in order to obtain a desired workability, density, strength, or uniformity, he shall submit to the Engineer for approval the information specified herein on the proposed alternate mix design prior to its use.

G. If, based on the results of laboratory or field tests conducted during concreting operations, concrete prepared according to an approved mix design fails to satisfy the requirements of this specification section, the Engineer shall have the right to require that the Contractor develop and submit in the manner specified an alternate mix design that will provide concrete conforming to the requirements of this section. The need for a change in mix design will be based on the Engineer's statistical analysis and interpretation of laboratory and field tests conducted during concreting operations. Statistical methods and interpretation of test results will be as described in ACI 214 and ACI 318, latest edition.

H. Any increased material costs resulting from changes in mix designs during construction shall be paid for by the Contractor and no separate payment will be made.

I. The cost of all materials, labor, equipment and all sampling and testing services required for the preliminary mix designs or for alternate mix designs during construction shall be paid for by the Contractor and no separate or additional payment will be made.

1.5 QUALITY CONTROL DURING CONSTRUCTION

A. Certification of Material Compliance
   1. During concreting operations, the Contractor shall furnish the Engineer written evidence that clearly indicates that the cement and aggregate used in each batch of concrete delivered to or mixed at the job site conforms in all respects to the applicable material requirements of this specification section. Satisfactory certified mill test reports from the cement or aggregate suppliers may be considered as evidence of compliance provided that such testing is performed in accordance with the specified ASTM standards by experienced, competent personnel on a regular basis. In case of doubt as to

the adequacy or accuracy of mill tests, the Engineer may require that the Contractor furnish, at no additional cost to the Owner, test reports on the cement and aggregate from an independent testing laboratory acceptable to the Engineer.

2. Certified reports or certificates indicating compliance of cement and aggregate shall be submitted to the Engineer before such materials are incorporated into the work. The Contractor shall be responsible for any delays in the progress of the work due to delays in testing and reporting.
3. Certified reports submitted to the Engineer for laboratory or mill tests on cement and aggregate shall be based on tests conducted not earlier than 90 days prior to incorporation of these materials into the work.
4. The cost of all sampling and testing of cement and aggregate necessary to furnish satisfactory evidence of compliance shall be borne by the Contractor and no separate payment will be made.

B. Field Sampling and Testing

1. During concreting operations, the Engineer will periodically require additional field inspection, sampling, and testing of cement, aggregate, and/or concrete by an independent testing laboratory in order to determine if the requirements of this specification section are being satisfied.
   a. Field sampling and testing of cement, aggregate, and concrete will be performed according to the following ASTM standards at a frequency determined by the Engineer:

   b. Aggregate
      1) Sampling ASTM D 75
      2) Testing Any Test Specified in ASTM C 33

   c. Cement
      1) Sampling ASTM C 183
      2) Testing Any Test Specified in ASTM C 150

   d. Concrete
      1) Sampling ASTM C 172
      2) Slump Test ASTM C 143
      3) Air Content Test ASTM C 231
      4) Making and Curing Test Cylinders ASTM C 31
      5) Compression Strength Tests ASTM C 39
2. Compressive strength testing will consist of making, curing, and testing cylinders of concrete. A total of six test cylinders will be prepared from each sample of concrete to be tested. Two test cylinders will be broken at an age of 7 days, three test cylinders will be broken at an age of 28 days, and the remaining test cylinders will be held in reserve. The minimum number of samples and test cylinders to be taken is as follows:

Concrete Class	Total Size of Pour	Number of Samples	Number of Cylinders
Class A or C	1-16 cy	1	6
Class A or B or C	17-100 cy	2	12
Class A or B or C	101-200 cy	3	18
Class A or B or C	201-300 cy	4	24
Class A or B or C	Over 300 cy	1/100 cy	(6/100 cy + 6)

3. Test cylinders will normally be laboratory-cured. However, the Engineer may require tests on field-cured specimens to check the adequacy of curing operations.

4. A slump test and an air content test will be performed on each concrete truck and on each sample of concrete tested for compressive strength. All field, tests, sampling, and the making of test cylinders will be provided by the independent testing firm.
5. Cement and aggregate will be subject to inspection, sampling, and field testing at the batching plant. Concrete will be subject to inspection, sampling, and field testing at the place of concrete placement.
6. All field sampling, field testing, making and curing of field test cylinders, and laboratory testing performed during concreting operations for the purpose of determining if the requirements of this specification section are being satisfied shall be conducted by an independent testing laboratory selected by the Owner and paid for directly by the Owner and not as a part of this Contract.
7. The Contractor shall furnish the testing laboratory representative satisfactory samples of cement, aggregate, and concrete for inspection and testing purposes. The Contractor shall furnish any barrows, shovels, mixing boards, shaded areas for preparing test cylinders, protected holding/curing areas, and similar equipment required by the testing laboratory representative for securing samples, making test cylinders, and conducting field tests.
8. No materials or concrete that fail to conform to the requirements of this specification section shall be incorporated into the work.

1.6 SHOP DRAWINGS AND ENGINEERING DATA

Complete engineering and product data shall be submitted to the Engineer on all admixtures, curing compounds, hardeners, sealers, and waterstops in accordance with the requirements of the Section 01300, “Submittals” of these Specifications.

1.7 GUARANTEE

Provide a guarantee against defective or deficient workmanship and materials in accordance with the requirements of the Section 01730, “Guarantees and Warranties” of these Specifications.

PART 2 PRODUCTS

2.1 GENERAL

A. Concrete shall be composed of Portland cement, fine aggregate, coarse aggregate, admixtures as specified herein, and water, so proportioned and mixed as to produce a plastic, workable mixture meeting the requirements of this specification section.

B. Materials and concrete not conforming to the requirements specified herein shall not be incorporated in the work.

2.2 MATERIALS

A. Cement

1. All cement used in cast-in-place concrete shall be Portland cement conforming to the requirements of ASTM C 150, and, unless otherwise approved by the Engineer, shall be Type 1. No cement of dark color shall be used. No re-sacked, lumpy or partially set cement shall be used.
2. Each sack of cement shall contain not less than 94 pounds (net) of cement, and each sack of cement shall be deemed to have a volume of 1 cubic foot; and each 94 pounds, if weighed or measured in bulk, shall be deemed to have a volume of 1 cubic foot.

B. Fine Aggregate

1. Fine aggregate shall be natural siliceous river sand, consisting of hard, clean, sharp, strong, durable and uncoated particles, conforming to the requirements of ASTM C 33. The mortar strength developed in such test shall be 90 percent of that developed by standard Ottawa sand tested under identical conditions.
2. Fine aggregate shall be graded in conformance with the requirements of ASTM C 33, except that it shall have a fineness modulus of 2.40 minimum and 3.00 maximum and the material passing the No. 200 sieve shall not exceed 3.0 percent by weight of the total sample. Coal and lignite shall not exceed 0.5 percent by weight of the total sample for all concrete. The fineness modulus of fine aggregate incorporated in the work shall not vary more than 0.10 plus or minus from the fineness modulus of the fine aggregate in the appropriate preliminary mix design approved by the Engineer.
3. If the locally available sources of fine aggregate will not yield the required grading, the Engineer may approve alternate gradations if such deviations do not adversely affect the work. However, the amount retained on any individual sieve size shall not exceed 35 percent of the sample and the amount passing the No. 50 sieve shall not be less than 15 percent of the sample.

C. Coarse Aggregate

1. Coarse aggregate shall consist of clean, natural, washed gravel or crushed stone suitably processed and conforming to the requirements of ASTM C 33, Class Designation 3S.
2. Coarse aggregate as delivered to the mixing plant shall be graded, or individual sizes shall be so combined as to fall within the grading requirements corresponding to the following grading size numbers, as contained in Table 2 of ASTM C 33:

Maximum Aggregate Grading

Sizes, Inches	Size No.
3/4	67
1	57
1-1/2	467
2	357

3. The maximum size of aggregate shall be no larger than one-fifth of the narrowest dimension between sides of forms within which concrete is to be cast nor larger than three-fourths of the minimum clear spacing between reinforcing bars, or between bars and forms. Coarse aggregate shall be limited to $^3/_4$-inch maximum size for pumped concrete.

D. Water: Water used in mixing concrete shall be fresh, clean, potable water free from injurious amount of oil, acid, alkali, vegetable, sewage and/or organic matter. Water shall be considered as weighing 8.33 pounds per gallon.

E. Admixtures

1. All concrete shall contain an air entraining admixture conforming to ASTM C 260 in order to provide an entrained air content of 5:1 percent by volume. Air entraining admixtures shall be W.R. Grace “Darex AEA,” Master Builders “MB-VR,” Sika “AER,” or equal.
2. All concrete shall contain a chloride-free, water reducing admixture or plasticizer conforming to ASTM C 494, Type A. Water reducing admixtures shall be W. R. Grace “WRDA-64,” Sika “Plastocrete,” Master Builders “Pozzolith Normal,” or equal.

3. Accelerators and retarders may be used under adverse placement conditions when authorized in writing by the Engineer. Accelerators shall be calcium chloride conforming to ASTM D 98, dispensed as a solution. Calcium chloride content shall not exceed 1 percent of the cement content by weight. Retarders shall be chloride-free water reducing and retarding admixtures conforming to ASTM C494, Type D. Retarders shall be W. R. Grace "Daratard-37," Sika "Plastiment," Master Builders "Pozzolith 122R," or equal.
4. The admixture content, batching method, and time of introduction into the mix shall be in strict accordance with the manufacturer's recommendations.

2.3 MEMBRANE CURING COMPOUND

A. Membrane curing compound shall have a 100 percent resin base and shall be of the colorless type with a fugitive dye added conforming to ASTM C 309, Type 1, Class B. The membrane curing compound shall contain sufficient dye to produce a definite, distinguishing color. Curing compound shall be compatible with liquid hardeners and epoxy sealers.

B. Membrane curing compound shall be Sonneborn "Hydrocide-309," Tamms "Horncure 30D," L&M "Cure DR," W. R. Meadows "CS309," or equal.

2.4 POLYETHYLENE FILM

Polyethylene film shall conform to Product Standard PS 17 and, unless otherwise specified or shown on the Drawings, shall have a thickness of 6 mils.

2.5 EPOXY BONDING AGENT

Epoxy bonding agents shall be specially formulated to bond fresh concrete to existing concrete. Epoxy bonding agents shall be two-component polysulfide or polyamide epoxies containing 100 percent solids. Epoxy bonding agents shall be insensitive to moisture during cure. When cured at a temperature of 63 °F, neat epoxy bonding agent shall have a one-day compressive strength of not less than 5,000 psi and a 28-day compressive strength of not less than 12,000 psi, when tested in accordance with ASTM D 695, and shall have a 28-day tensile strength of not less than 3,500 psi, when tested in accordance with ASTM D 638.

2.6 WATERSTOPS

Unless noted otherwise, waterstops shall be manufactured of PVC and shall be of the ribbed type with center bulb, minimum thickness shall be 3/8 inch. Waterstops shall have a nominal width of 6 inches for concrete members 15 inches or less in thickness and a nominal width of 9 inches for member thickness exceeding 15 inches. Waterstops shall be as manufactured by Greenstreak, W. R. Meadows, Vulcan Products, Tamms, or equal. Waterstops placed in concrete shall be continuous. Lapped joints shall not be permitted.

Where indicated on the drawings, bentonite waterstops will be provided. All bentonite waterstops shall be installed on clean dry surfaces per manufacturers' instructions, and shall not be dampened, hydrated, or allowed to swell prior to concrete placement. Should dampening, hydration, or swelling occur, all bentonite waterstops shall be removed and surfaces cleaned before installing new bentonite waterstops.

Bentonite waterstops shall be bitumen based CETCO "Waterstop-RX," or Synkoflex Products "Hydroflex Waterstop."

On non-horizontal surfaces, bentonite waterstop shall be installed by mechanical means at 18-inch centers in addition to the manufacturer's method of attachment.

2.7 CHEMICAL HARDENER

Unless otherwise specified, all interior concrete floors of shops, garages, and vehicle service areas shall be treated with a liquid hardener composed of magnesium and zinc fluorosilicates combined with an anionic surfactant for improved wetting penetration. Liquid hardener shall be colorless, nontoxic, nonflammable, and compatible with and providing good adhesion for subsequent toppings and/or coatings. Liquid hardener shall be suitable for use on new or old concrete floors and shall comply with Corps of Engineer Specification 204. Liquid hardener shall be Sonneborn "Lapidolith," Masterbulders "Mastertop CST," L&M "Fluo Hard," or equal.

2.8 EPOXY FLOOR SEALER

Epoxy floor sealer shall be a two-component, 100 percent solids, epoxy coating that provides a smooth, tough, flexible, wear abrasion, and chemical resistant surface. Sealer shall be USDA approved for use in food processing plants. Epoxy floor sealer shall be applied only where indicated on the Drawings. Unless otherwise specified, sealer shall be colored gray. Epoxy sealer shall be Chem-Masters "Durakote," Masterbuilders "Masterseal GP," Sonneborn "Sonoplex," L&M "Dynaflor," or equal.

2.9 VAPOR BARRIER

Unless otherwise specified, all interior concrete slabs on grade in buildings shall be furnished with an FHA approved vapor barrier under the concrete slab. Vapor barrier shall be constructed of a multi-ply lamination of polyethylene film and glass scrim reinforced paper to form a moisture, scuff, and puncture resistant membrane. Moisture permeance shall not exceed 0.10 perms in accordance with ASTM E96, Procedure A.

2.10 STRENGTH

A. Concrete ingredients shall be selected, proportioned, and mixed in such a manner as will produce a watertight, durable concrete that will develop the following minimum compressive strengths at an age of 28 days when sampled, cured, and tested in accordance with the procedures specified in ASTM C 31 and C 39:

Average Class of Concrete	Age	Three Consecutive Specimens	Minimum Any One Specimen
A	28 days	4,000 psi	5,000 psi
B	28 days	2,500 psi	2,000 psi
C	28 days	5,000 psi	4,500 psi

As per Florida Building Code 2004, Table 1904.202(1), 5,000-psi concrete (Class C) shall be used for all concrete. All elevated (above EL. +10.0) concrete shall be 5,000 psi (Class C). Special care shall be taken in mixing, handling, placing, finishing, and curing of the 5,000-psi (Class C) concrete due to heat related concerns. **Provisions for "Hot Weather Concreting" found in ACI 305 shall be strictly enforced.**

B. Should the average compressive strength of three consecutive specimens or the compressive strength of any single specimen fall below the minimum strengths specified above, the Engineer shall have the right to order a change in the mix design for the remaining portion of the work. The Engineer shall also have the right to order additional curing of the affected concrete followed by cores taken in accordance with ASTM C 42 and ACI 318, all at the expense of the Contractor. If the additional curing does not bring the average compressive strength of three cores taken in the affected area to at least the minimum strength specified, the Engineer may require that the Contractor strengthen the structure by means of additional concrete and steel or he may require that the Contractor replace the affected portions. The cost of all such changes in mix designs and any modifications to or replacement of deficient concrete shall be borne by the Contractor at no additional cost to the Owner.

2.11 CONSISTENCY

A. Concrete shall be of such consistency and composition that it can be worked readily into the

corners and angles of the forms and around the reinforcement without excessive spading and without permitting the materials to segregate or free water to collect on the surface. When dropped from the discharge chute, the concrete mass should flatten out at the center and spread out slowly at the edges.

B. The proportions shall be adjusted to secure the lowest water-cement ratio which is consistent with good workability, a plastic cohesive mixture, and one which is within the following slump range as determined in accordance with ASTM C143:

Concrete Use	Slump (inches)
Walls	$2^1/_2$ - 4
Floors and Slabs	2 - 3
Beams	2 - 3
Blocks and Footings	2 - 4

C. Concrete having a slump greater than one inch over the specified maximum shall be rejected.

D. In pumped concrete the maximum slump of the concrete at the suction of the pump may be increased above the maximum specified slump by the amount of slump loss in the pumping system up to a maximum of one inch. The amount of slump loss shall be the difference between slump tests made at both ends of pumping system, and shall be limited to a total loss of one inch. If tests indicate a loss greater than one inch, the Contractor shall take corrective measures acceptable to the Engineer.

E. For thin sections and construction with limited clearance between reinforcing steel and when placement conditions preclude the use of vibrators, the Engineer may authorize the use of concrete having a slump of 5 inches.

PART 3 EXECUTION

3.1 STORAGE OF MATERIALS

A. Cement shall be shipped to the site of the mixer plant in bulk or in paper or cloth bags, at the option of the Contractor. Upon arrival it shall be stored immediately in a thoroughly dry, weathertight and properly ventilated building or enclosure with adequate provisions for the prevention of absorption of moisture. It shall be stored in a manner that will permit easy access for inspection and identification of each shipment. If cement is to be stored at the job site, storage facilities shall be provided by and at the expense of the Contractor and approved

by the Engineer prior to arrival of the first shipment. Cement that has become caked or lumpy shall not be used.

B. Sand and coarse aggregates shall be stored in separate stockpiles at points selected to provide maximum drainage and to prevent the inclusion of any foreign material during rehandling. Stockpiles of coarse aggregates shall be built in horizontal layers to avoid segregation and breakage. Where concrete volumes require batching of various aggregate sizes, a separate stockpile for each size shall be maintained. The bottom 6 inches of aggregate piles shall not be used.

3.2 PROPORTIONING

A. Concrete materials shall be accurately proportioned and mixed to produce a homogeneous and workable mixture having the consistency and minimum compressive strength specified herein.

B. Concrete materials shall be proportioned by weight. The types of equipment and methods used for measuring ingredients shall be acceptable to the Engineer.

C. The amount of water and cement used shall be the minimum amount necessary to produce a concrete mixture of the required strength and consistency, but in no case shall the water-to-cement ratio exceed that specified herein nor shall the cement content be less than that specified herein.

D. Compressive strength may not necessarily be the most critical factor in proportioning concrete mixes since other factors, such as durability and watertightness, may impose lower water-cement ratios than are required to meet strength requirements. In such cases compressive strength will, of necessity, be in excess of that specified.

E. Minimum cement contents and maximum water-to-cement ratios shall be as follows:

Factor	Class of Concrete	**Maximum Aggregate Size** 2”	1-1/2“	1”	3/4“
Minimum Cement Factor Sacks/cy	A or C	5.3	5.8	6.2	6.6
	B	5.0	5.5	5.9	6.3
Maximum Water-to-Cement Ratio, lb./lb.	A or C	0.40	0.40	0.40	0.40
	B	0.62	0.62	0.62	0.62
Maximum Water-to-Cement Ratio, Gal/Sack	A or C	5.5	5.5	5.5	5.5
	B	7.0	7.0	7.0	7.0

F. The water content of the mix shall be based on the total amount of water in the mixture, including any free water in the aggregate or adhering to the surface of the aggregate, but not including water absorbed by the aggregate.

G. The total volume of aggregate to be used in each cubic yard of concrete shall be determined by recognized standards for designing concrete mixes, utilizing the actual screen analysis of the aggregates.

H. The proportion of fine and coarse aggregate shall be such that the ratio of the coarse to the fine based on weight shall not be less than 1.0 nor more than 2.0, or shall the amount of coarse

material be such as to produce harshness in placing or honeycombing in the structure.

3.3 MIXING CONCRETE

A. The mixing equipment used by the Contractor shall be capable of combining the aggregates, cement, admixtures, and water within the time specified into a thoroughly mixed and uniform mass.

B. Concrete shall be mixed by one of the three following methods:
   1. By the operation of one or more batch-type mixing plants, each with a rated capacity of 1/2 cubic yard or more, installed at the site of the work;
   2. By the operation or a proportioning plant installed in the vicinity of the work and the use of transit mixers for mixing concrete and transporting it to the forms; or
   3. By the use of ready-mixed concrete from a central mixing and proportioning plant. The method selected by the Contractor shall be subject to the approval of the Engineer.

C. The mixing and proportioning plants shall be provided with adequate equipment and facilities for accurate measurement and control of the quantities of material and water used in the concrete and for readily changing the proportions to conform to the varying conditions and requirements of the work.
   1. Stationary Mixed Concrete
      a. Stationary mixing shall be done in a batch mixer of approved type which will ensure a uniform distribution of the materials throughout the mass. The equipment at the mixing plant shall be so constructed that all materials including the water entering the drum can be accurately proportioned and be under control. The cement and aggregate shall be proportioned by weight. No volumetric batch shall be allowed. The mixer shall be equipped with an automatic timing device made to lock the discharge level before aggregate and cement enters the drum, and to release such level only after the specified mixing time has elapsed. Stationary mixers shall be in accordance with the "Concrete Mixer Standards" adopted by the Mixer Manufacturer's of the Associated General Contractors of America and shall bear a plate giving the manufacturer's rated capacity of the mixer.
      b. The entire batch shall be discharged before recharging. The volume of the mixed material per batch shall not exceed the manufacturer's rated capacity of the mixer. Mixing of each batch shall continue for the period indicated herein, during which time the drums shall rotate at a peripheral speed as recommended by manufacturer.
      c. The mixing time shall be as follows:

Capacity of Mixer	**Mixing Time (minutes)**
1/2 cubic yard	1 1/4
1/2 to 1 1/2 cubic yards	1 1/2
Larger than 1 1/2 cubic yards	2

The mixing time shall be measured from the time that all cement and aggregates and most of the water are in the mixer. Excessive overmixing, requiring additional water to preserve the required consistency will not be permitted. All of the mixing water shall be introduced before one-fourth of the total mixing time has elapsed.

2. Transit Mixed Concrete
   a. The type, capacity, and manner of operation of the mixing and transporting equipment for transit ready-mixed concrete shall conform to the current *Standards for Operation of Truck Mixers and Agitators* of the National Ready-Mixed Concrete Association, the *Truck Mixer and Agitator Standards* of the Truck Mixer Manufacturers Bureau, and ASTM C94. Transit mix concrete trucks shall be equipped with an automatic device for recording the number of revolutions of the drum during the mixing period. Each mixer and agitator shall have attached thereto in a prominent place, a metal plate or plates, installed by the manufacturer, on which is plainly marked the capacity of the drum in terms of the volume of mixed concrete and the speed of rotation for the agitating and mixing speeds of the mixing drum or blades. Each mixer shall have an identification number painted on the truck in such a location that it can be easily read from the batching platform.
   b. The total volume of materials introduced into the mixer shall not exceed the manufacturer's guaranteed mixing capacity. If the concrete so mixed does not meet the uniformity requirements of this subsection, the amount of materials charged into the mixer shall be reduced.
   c. The drum of the mixer shall be completely emptied of any previously mixed load. The proper proportions of aggregate, cement, and water for each load of concrete shall be placed in the mixer and shall be mixed therein for not less than 70 or more than 100 revolutions of the drum or blades at the speed designated by the manufacturer of the equipment as the mixing speed. Additional revolutions of the drum shall be at the speed designated by the manufacturer of the equipment as the agitating speed; however, immediately prior to discharging the concrete, the drum shall be revolved at the mixing speed for a minimum of three minutes. The revolving of the drum shall be continuous until the concrete is completely emptied from the drum.
   d. When Class A concrete is being placed, all wash water shall be emptied from the mixer before any portion of the succeeding load is placed therein. For Class B concrete the mixer shall be empty or may carry no more than 10 gallons of water in the drum.
   e. Water added at the point of discharge shall only take place with the approval and in the presence of the Engineer. Water so added shall be mixed into the load for a minimum mixing time of three minutes. Water shall not be added to the load during transit.
   f. The total elapsed time between the addition of water to the cement and aggregate or the addition of cement to the water and aggregate and the placement of the concrete in the forms shall not exceed 90 minutes. During hot weather or conditions contributing to quick setting, the total elapsed time permitted may be reduced at the direction of the Engineer to 45 minutes. When the concrete cannot be delivered to the forms within the time period specified, a water-reducing and retarding admixture may be used subject to the approval of the Engineer. Such use of a water-reducing retarder will be permitted only as necessary to supplement (not to replace) other

acceptable hot weather procedures. The retarding admixture used shall not interfere with strength development and other properties of the concrete and its use shall be carefully controlled by the concrete supplier. Before any such admixture is permitted it shall be tested with job site materials under job conditions to determine its compatibility with the other materials and its ability under these conditions to produce the desired properties.

g. Addition of water at the job site to offset evaporation of mixing water shall be done with the Engineer's approval and in his presence using water in the form of a cement paste having the same water-to-cement ratio as the batch in the transit mixer. Following addition of the cement paste, the mixer drum or blades shall be rotated a minimum of 70 revolutions. Addition of water during transit to offset evaporation losses shall not be permitted.

h. Prolonged mixing, even at agitating speed, shall be avoided where feasible by stopping the mixer and then agitating intermittently.

3. Ready-Mixed Concrete

a. A legible certified weighmaster's certificate shall be prepared for each load of ready-
mixed concrete. A legible copy of the certified weighmaster's certificate shall be submitted to the Engineer by the truck operator at the time of delivery. The weighmaster's certificate shall contain the following information:

1) Name of Vendor
2) Name of Contractor\
3) Number of cubic yards in the load
4) Actual weights of cement and of each size of aggregate in the load
5) Amount of water added at the plant
6) Amount of free water in the aggregate
7) Brand and type of cement
8) Brand and amount of admixture
9) Time and date of batching

b. When mix proportions have been approved for a project and are identified by a mix number, the Engineer may waive the foregoing and accept a legible certified weighmaster's certificate which shall contain the following information:

1) Name of Vendor
2) Name of Contractor
3) Number of cubic yards in the load
4) Mix designation number
5) Amount of water added at the plant (including free water in aggregate)
6) Time and date of batching

c. Space shall be provided on the certificate so that amount of water and cement added
on the job may be indicated.

3.4 CONVEYING CONCRETE

A. Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent separation or loss of the materials. Equipment for chuting, pumping, and pneumatically conveying concrete shall be of such size and design as to ensure a practically continuous flow of concrete at the delivery end without separation of the materials.

B. If the concrete is to be transported more than fifty feet in carts or buggies, they shall be equipped with pneumatic tires. Concrete delivered to the carts, buggies or conveyors from spouts, troughs, or mixer trucks shall not have a free fall of more than three feet. Separation or loss of ingredients shall be prevented while transporting the concrete. Delivery carts, buggies, conveyor trucks or barrows shall be kept on temporary runways built over the floor system; runway supports shall not bear upon reinforcing steel or fresh concrete.

3.5 PREPARATION

A. Concrete pre-placement meeting: A meeting shall be held at the job site at least seven days prior to the initial placement of any project concrete. This meeting will require attendance by:
1. General Contractor's Job Superintendent
2. General Contractor's Project Manager
3. Rebar Foreman
4. Concrete Floor Subcontractor
5. Concrete Supplier Representative
6. Admixture Representative
7. Mix Design Representative
8. Concrete Testing Representative
9. Concrete Forms Foreman
10. Client Representative
11. Architect/Engineer Representative

B. Specific items to be discussed will be:
1. Interaction Between Various Parties
2. Establish Schedule and Construction Processes
3. Assure Availability and Suitability of Materials and Construction Practices
4. Review Procedures for Inspection, Testing, Placement, Finishing, and Curing.

3.6 PLACING CONCRETE

A. General

The Contractor shall verify his concrete supplier's ability to supply the quality and quantity of concrete for this project. Failure to supply quality or quantity of concrete shall not be allowed to affect the project's cost or schedule.

1. Prior to placing concrete, the Contractor shall ensure that all reinforcement is securely and properly fastened in position and protected against displacement, that all items to be embedded in the concrete are in place and securely anchored in position, that all forms have been thoroughly coated or wetted, that all form ties at construction joints have been retightened, that concrete surfaces to be covered have had all free water, form coating, loose concrete, and debris removed, and that all conveyances, buggies, and barrows are clean and wetted.
2. Prior to placement of any concrete, a Concrete Placement Card (CPC) will be completed. Failure to complete a CPC prior to concrete placement will, at the Owners or the Architect/Engineer's direction require the removal and reinstallation of the concrete at the Contractor's expense. The following individual will sign the CPC in the order given below acknowledging the following agrees with plans and specifications.

Individual	**Responsibility**
Construction Layout	Contractor's surveyor responsible for layout of construction including location of centerlines, walls, etc.
Rebar Foreman	Responsible for the proper installation of concrete reinforcing

	steel including size, placement, and location prior to placing concrete.
Concrete Forms Foreman	Responsible for the proper installation of the forms (embedded items, elevation, alignment, etc.), strength of formwork, and this individual also insures that all formed areas are clean and prepared for proper concrete placement.
Concrete Placing Foreman	Responsible for placing and finishing concrete. Verifies forms and placement conditions (including atmospheric) are acceptable. Verifies all materials and equipment needed for placing and finishing are available in sufficient quantity and equipment is in good working order. Verifies areas to receive concrete have been reviewed for settlement and approved for concrete placement. Notifies the independent testing firm in advance.
Architect/Engineer	Reviews the CPC and verifies it has been completed properly and has received the appropriate signatures.
Resident Project Representative (RPR)	Once satisfied with the CPC, the RPR initials the CPC signaling the work is ready for concrete construction. Copies of the CPC are sent to the General Contractor.

Once satisfied with the CPC, the RPR initials the CPC signaling the work is ready for concrete construction. Copies of the CPC are sent to the General Contractor.

3. The Contractor shall inform the testing firm and Engineer at least 24 hours in advance of the times and places at which he intends to place concrete. The Engineer will make a final inspection of forms, reinforcing steel, screeds, construction joints, openings, anchors, pipe sleeves, conduit, and inserts. No concrete pour shall be started until the condition of the forms and place of pouring has been inspected and approved by the Engineer.
4. Concrete shall not be placed when unusually extreme weather conditions prevent proper placement and consolidation.
5. No water or cement shall be added to the mix without the Engineer's approval or in his absence. No partially hardened concrete shall be deposited.

B. Placing Concrete
   1. Unless otherwise specified, all concrete shall be placed upon clean, damp surfaces, free from water, and never upon soft mud, dry absorbent earth or rock, or upon fills that have not been subjected to approved tamping to provide ultimate settlement.
   2. Groundwater shall be kept below subgrade until the concrete has set. When subgrade is dry earth, it shall be thoroughly dampened with water to ensure that no moisture will be absorbed from fresh concrete.
   3. Where concrete is placed against gravel or crushed rock which does not contain at least 25 percent of the material passing a No. 4 sieve or where shown on the Drawings or directed by the Engineer, surfaces against which concrete is cast shall be covered with

polyethylene film to protect the concrete from loss of water. Joints in the film shall be lapped at least 12 inches and taped. The polyethylene film shall be protected against puncture from the underlying crushed rock by a cushion of natural or imported sand meeting the requirements of ASTM D 1073 placed on top of the crushed rock. Where concrete is placed against rock, all loose pieces of rock shall be removed and the exposed surface cleaned with a high pressure hose.

4. Place vapor barrier under designated interior concrete slabs on grade. Sheeting shall extend the full area of the slab and shall be turned up or down to footings as indicated. Lap all seams at least 12 inches and seal per manufacturer's instructions. Install reinforcement with care so as not to puncture vapor barrier. Tape all cuts, tears, punctures, and pipe penetrations before pouring concrete.
5. To prevent segregation of the mix, concrete shall be deposited in its final position in batches without being moved laterally in the forms more than 5 feet. A crane and a bottom dump concrete bucket shall be used wherever possible. Unless authorized by the Engineer, no concrete shall be dropped freely into place from a height of greater than 5 feet. Concrete shall be deposited in walls by means of prefabricated, rectangular tremies, constructed in short sections and spaced laterally not over 5 feet apart. Special care shall be observed to avoid slopping concrete over forms when placing.
6. The limits of each concrete pour shall be predetermined by the Contractor and shall be acceptable to the Engineer. All concrete within such limits shall be placed in one continuous operation.
7. After the concrete has been deposited it shall be distributed over the entire area within the forms in approximately horizontal layers of not more than 18 inches in depth and shall be brought up evenly in all parts of the form. Each layer of concrete shall be plastic when covered with the following layer and the forms shall be filled at a rate of vertical rise of not less than 2 feet per hour or more than 6 feet per hour.
8. Should a layer of concrete reach its initial set before the next lift can be placed, or should more than 60 minutes elapse between placement of successive concrete lifts, the Contractor shall cease placement of concrete until the surface of the previous lift is prepared in accordance with the procedures specified in Part 3.08, Construction Joints, of this specification section.
9. Workmen shall not walk on concrete during placing or finishing with any earth or foreign matter on footgear. Hand spreading shall be done with forks and shovels, not rakes.
10. Concrete shall be placed and compacted in wall or column forms before any reinforcing steel is placed in the structural system to be supported by such walls or columns. The portion of any wall or column placed monolithically with a floor or roof slab shall not exceed 6 feet of vertical height. Concrete in walls or columns shall have set at least two hours before concrete is placed in the structural systems to be supported by such walls or columns. Brackets, haunches and fillets shall be poured monolithic with the floor or roof slab system.

C. Compaction

1. During and immediately after placement, concrete shall be thoroughly compacted and worked into all corners and angles and around reinforcement and embedded fixtures in a manner to fill all voids, prevent honeycombing against the forms and avoid segregation of coarse aggregate. This operation shall be performed by the use of spades or forks and internal vibrators.

2. Vibration shall be transmitted directly to the concrete and in no case shall it be transmitted through the forms. Vibrator driving mechanisms shall revolve at not less than 7,000 rpm. The vibration shall be sufficiently intense to cause the concrete to flow and settle readily into place and to visibly affect the concrete over a radius of at least 18 inches. Vibration

shall be supplemented by manual forking or spading adjacent to the forms on exposed faces in order to secure smooth, dense surfaces. Special care shall be taken to ensure consolidation around reinforcement, pipes and other shapes built into the work. Vibrators shall not be used to transport concrete within the forms. Vibrators shall be kept in motion at all times to prevent excessive vibration in one spot. The operation shall be continuous and all concrete shall be in final position before initial set has started.

3. In addition to the vibrators in actual use while concrete is being placed, the Contractor shall have on hand at least one operable vibrator as a spare in case of equipment failure. No concrete shall be placed until all vibrating equipment, including spares, is at the placement site.
4. Concrete shall be thoroughly compacted prior to top finishing. All laitance, debris, and surplus water shall be removed from concrete surfaces at tops of forms by screeding, scraping, or other effective means. Wherever the top of a wall will be exposed to weathering, the forms shall be overfilled and after the concrete has been compacted, the excess shall be screeded off.

D. Placement Sequence: Unless otherwise indicated on the Drawings or directed by the Engineer, the following placement sequence shall be followed to reduce the effect of shrinkage in producing cracking:

1. Bottom Slab: A center section (as outlined by the construction joints shown on the Drawings) shall be placed first. Not less than 72 hours after the center section has been placed, the Contractor may proceed with the placement of an adjoining section. Sections shall be placed alternately, first on one side and then on the other side of previously placed sections. Pours shall be scheduled so that two adjacent sides of each section are free, except at closures.
2. Walls: Walls shall be divided into sections by the construction joints shown on the Drawings. A section near the center of each wall shall be placed first. Sections shall be placed alternately, first on one side and then on the other side of the previously placed section. Pours shall be scheduled so that one end of each section is free, except at corner closures.
3. Footings: Footings, except for wall footings, shall be poured in one operation with no joints.

E. Requirements Due to Adverse Weather Conditions

1. No concrete shall be placed during rain. No concrete shall be placed if rain is forecast unless there is sufficient time to complete the placement and finishing. All concrete placed prior to rain shall be protected by whatever means necessary to prevent damage to finish or water entering the mix. Protection equipment and materials shall be on hand prior to placement operations. Freshly placed concrete shall be protected from scour by flowing water and from mud deposits or other injurious conditions.
2. Except as modified herein, cold weather concreting shall comply with ACI 306. The temperature of concrete at the time of placing shall be not less than that shown in the following table for the corresponding ambient outdoor air temperature (in shade) existing at the time of placement:

Ambient Outdoor Air Temperature	Minimum Concrete Temperature
Below 35 °F	70 °F
Between 35 °F and 45 °F	60 °F
Above 45 °F	45 °F

3. Placing of concrete when the ambient air temperature at the time of placement is 45°F or less shall be done only when specifically authorized by the Engineer using concrete heated in a manner acceptable to the Engineer. If the use of heated concrete is authorized, the temperature of the concrete at the time of placement shall not exceed 80°F.
4. Adequate means shall be provided for maintaining the temperature of the air surrounding the concrete at 70°F for three days, or 50°F for five days, or for as long as is necessary to ensure proper curing of the concrete. Rapid cooling of the concrete shall be prevented. Housing or covering or other protection used in connection with heating shall remain in place and intact at least 24 hours after the artificial heat is discontinued. Heating shall not produce carbon dioxide, such heaters shall not be utilized. The use of calcium chloride or other chemicals to prevent freezing shall not be permitted.
5. Except as modified herein, hot weather concreting shall comply with the requirements of ACI 305. Hot weather precautions shall be taken whenever the maximum ambient outdoor air temperature (in shade) during the day exceeds 85°F. When rapid mixing water evaporation in transit causes the concrete to be delivered in an unworkable condition, initial correction may be made at the job site, provided that water added is in the form of a cement paste having the same water-to-cement ratio as the batch in the truck, and provided that the drum or mixer blades be operated at mixing speed for at least 70 revolutions after the paste addition. Once need for water has been observed, subsequent additions shall be at the batching plant until the need has passed. Correction shall consist of a simultaneous and proportionate increase of water and cement, up to 10 percent of the stated quantity of each material in the batch. Such increases in cement shall not constitute grounds for an increase in the contract price.
6. The temperature of concrete at the time of placement shall not exceed 85°F.
7. During hot weather, extra caution shall be taken to prevent rapid evaporation of water. Forms shall be kept cool by frequent wettings. Flat work shall be protected from drying winds, direct sun, and high temperatures whenever conditions of temperature and humidity are such as to cause plastic shrinkage cracking.
8. In order to prevent plastic shrinkage cracking due to rapid evaporation of moisture, no concrete shall be placed when the rate of evaporation, determined by using Figure 2.1.4 in ACI 305, equals or exceeds 0.2 pound per square foot per hour.

3.7 FINISHING

A. Finishing Formed Surfaces: All permanently exposed surfaces shall be expected to be smooth and of uniform texture and appearance. Surfaces to be rubbed shall include all submerged concrete surfaces that can be seen when water is drained. Rubbing may be omitted for minor blemishes on buried surfaces or on exposed surfaces that cannot normally be seen, such as inside covered tanks. Final determination for which surfaces are to be rubbed is to be the decision of the Engineer. All holes, pits or imperfections in the surface of the concrete shall be cleaned with a wire brush, thoroughly wetted and completely filled with damp cement mortar

composed of 1 part Portland cement to 2 parts fine aggregate. The entire surface shall be left smooth and all lines or markings shall be smoothed over to obtain uniform appearance. In the event the Contractor fails to obtain a satisfactory appearance of the concrete in the opinion of the Engineer, the entire surface shall be thoroughly wetted down, kept wet continuously and rubbed with a No. 20 carborundum stone until all lines, markings and surplus materials have been removed from the surface and until the surface shows a uniform smooth finish. After rubbing is completed the concrete surface shall be washed clean with water. Rubbing may be done either by hand or with power tools.

B. Finishing Unformed Surfaces: No surface treatment will be required for buried or permanently submerged concrete not forming an integral part of a structure except that required to obtain the surface elevations or contours and surfaces free of laitance. The unformed surfaces of all other concrete shall be screeded and given an initial float finish followed by additional floating followed by troweling where required. Care shall be taken that no excess water is present when the finish is made. No special concrete or cement mortar topping course shall be used unless so shown on the Drawings.

1. Screeding
    a. All slabs shall be screeded to an even surface by the use of a straight edge and screeding strips accurately and securely set to the proper level. Screeds shall be such type and so arranged so as not to interfere with the top bar reinforcement.
    b. Screeding shall provide a concrete surface conforming to the proper elevation and contour with all aggregates completely embedded in mortar. All screeded surfaces shall be free of surface irregularities with a height or depth in excess of 1/4 inch as measured from a 10-foot straight edge.
2. Floating
    a. Screeded surfaces shall be given an initial float finish as soon as the concrete has stiffened sufficiently for proper working. Any piece of coarse aggregate which is disturbed by the float or which causes a surface irregularity shall be removed and replaced with mortar. Initial floating shall produce a surface of uniform texture and appearance with no unnecessary working of the surface.
    b. Initial floating shall be followed by a second floating at the time of initial set. The second floating shall produce a finish of uniform texture and color. Unless additional finishing is specifically required, the completed finish for unformed surfaces shall be the float finish produced by the second floating.
    c. Floating shall be performed with hand floats or suitable mechanical compactor floats.
3. Brooming: Surfaces of equipment bases and curbs and sidewalks shall be given a light broom finish providing a nonslip surface. Brooming shall be done after the second floating and for traffic areas shall be at right angles to the normal traffic direction.
4. Troweling: Surfaces to be covered with resilient floor coverings and other surfaces designated on the Drawings to be trowelled shall be steel trowel finished. Trowel finishing will not be required for floors which are normally submerged. Troweling shall be performed after the second floating when the surface has hardened sufficiently to prevent an excess of fines being drawn to the surface. Troweling shall produce a dense, smooth, uniform surface free from blemishes and trowel marks.
5. Edging: All permanently exposed edges of unformed surfaces shall be chamfered with a $^{3}/_{4}$-inch approved edging tool unless other edge treatment is indicated on the Drawings.

3.8 CURING

A. All concrete shall be protected from loss of moisture by curing for at least 14 days following placement. Curing operations shall take place immediately after concrete finishing is complete or forms are removed. Breaking of form ties or otherwise breaking the seal between the concrete surface and the form shall be considered form removal.

B. Curing shall be accomplished by water curing, membrane curing, film curing, or any other curing method acceptable to the Engineer which does not injure or discolor exposed surfaces nor destroy the bond on surfaces to receive subsequent concrete pours or protective coatings.

C. Water Curing

1. Concrete surfaces being water-cured shall be kept constantly and visibly wet for a period of not less than 14 days. Water saturation of concrete surfaces shall begin as quickly as possible after the initial set of the concrete. The rate of water application shall be regulated to provide complete surface saturation with a minimum of runoff.
2. Slabs poured on grade and decks may be water-cured by ponding or by covering with wet burlap sacks, sand, or sawdust and keeping this covering continually and visibly wet during this period. Standard canvas seep hose placed in parallel runs on 8-foot centers is recommended for ponding.
3. Walls may be cured by leaving the forms tied in place and keeping the forms and all exposed surfaces of the concrete continually and visibly wet for the duration of the curing period.

D. Membrane Curing

1. Membrane-curing compound may be used in lieu of water curing on Class B concrete and on concrete which will not be covered later with mortar, liquid hardener, or additional concrete. Except as modified herein, membrane-curing compounds shall be applied in strict accordance with the manufacturer's recommendations. Membrane curing compounds shall conform to the requirements of Part 2.4, Membrane Curing Compound, of this specification section.
2. Membrane-curing compound shall be spray applied in two separate coats, each having a surface coverage of not more than 300 square feet per gallon.
3. Unformed surfaces shall be covered with curing compound within 30 minutes after final finishing. If forms are removed before the end of the specified curing period, curing compound shall be immediately applied to the formed surfaces before they dry out.
4. Curing compound shall be suitably protected against abrasion during the curing period. Whenever the membrane will be subject to damage from traffic or other cause, it shall be protected after drying for 24 hours by a layer of sand or fine earth not less than one inch thick or by other means acceptable to the Engineer.
5. Compound applied improperly or compound applied without sufficient dye to produce a distinguishing color shall be reapplied to the satisfaction of the Engineer.

E. Film Curing

1. Film curing with polyethylene sheeting may be used in lieu of water curing on concrete which will be covered later with mortar or additional concrete or will otherwise be covered or hidden from view.

2. Film curing shall begin as quickly as possible after initial set of the concrete. Polyethylene sheeting shall completely cover the surfaces. Sheeting shall overlap the edges sufficiently for proper sealing and anchorage. Joints between sheets shall be overlapped a minimum of 12 inches and sealed. All tears, holes, and other damage shall be promptly repaired. Covering shall be anchored continuously at edges and shall be anchored on the surface as necessary to prevent billowing.

3.9 CONSTRUCTION JOINTS

A. Construction joints shall be made only at locations indicated on the Drawings or specified herein. Construction joints shall not be made at other locations without the concurrence of the Engineer. No vertical construction joints shall be used in walls unless specifically approved by the Engineer. The work shall be laid out and conducted so as to minimize the number of construction joints. Shop drawings shall show construction joint dimensions for location.

B. All construction joints shall be keyed. Keys shall be continuous and shall have a width equal to 1/3 of the thickness of the wall and a depth equal to 1/6 of the thickness of the wall. Unless indicated otherwise on the Drawings no keys smaller than 3 inches in width and $1^1/_2$ inches in depth shall be used.

C. Waterstops, of the type specified, shall be installed where indicated on the Drawings and in all construction joints in concrete walls and slabs having one face exposed in a dry pit or room and having the other face in contact with backfill, subgrade, ground water, or other liquid. Keyway dimensions shall be modified to allow waterstop clearance of steel reinforcing as approved by the engineer.

D. Immediately prior to placing the next lift, the horizontal surface shall be thoroughly cleaned using water or air as required. The surface of the concrete shall then be covered by a uniform, evenly distributed layer of cement-sand mortar to a thickness of 1 inch. The cement-sand mortar shall be composed of a mixture of 1.3 parts by volume Portland cement and 1 part by volume fine aggregate and shall have a water-to-cement ratio equal to that of the concrete to follow.

3.10 EXPANSION JOINTS

Expansion joints shall be provided as shown on the Drawings. Details of the expansion joints and materials of construction shall be as shown on the Drawings and specified in these Contract Documents. If not shown on the Drawings, expansion joints shall consist of full-depth, preformed, 1/2-inch asphalt plank material conforming to ASTM D 994.

3.11 BONDING NEW CONCRETE TO EXISTING CONCRETE

A. Where new concrete is to be cast against and permanently bonded to an existing concrete surface, the existing concrete shall be chipped or cut back from the surface a minimum distance of $1^1/_2$ inches or as necessary to expose sound concrete, remove loose or weathered concrete and provide a roughened surface for bonding to the new concrete. Edges shall be cut square and feathered edges will not be permitted. All loose material remaining after chipping or cutting operations shall be removed by sandblasting and/or stiff wire brushing.

B. Where chipping back of existing concrete is not possible and where approved by the Engineer, the surface of existing concrete may be prepared by sandblasting or acid etching. If sandblasting or etching is used, the surface of the existing concrete shall be bare, clean, dry, and structurally sound. All grease, oil, wax, or other residue shall be removed by scraping followed by washing with a nonionic detergent or a suitable solvent compatible with the epoxy bonding agent to be used. Animal fats may be removed by scrubbing with a 10 percent solution of caustic soda to saponify them.

C. After all loose material, grease, etc., have been removed, the surface of the existing concrete shall be etched by either sandblasting or scrubbing with a 10 to 20 percent solution of hydrochloric acid in water applied at a rate of 1 quart per square yard followed by a thorough rinsing with clean water. The surface shall then be allowed to dry completely before application of the epoxy bonding agent. Goggles, rubber boots, and rubber gloves shall be worn by workmen when applying caustic soda or acids.

D. When the surface is dry and just prior to placing the new concrete, an epoxy bonding agent shall be applied to the surface of the existing concrete with a whitewash brush or stiff broom. The epoxy bonding agent shall be spread evenly over the surface to be bonded, avoiding skips and holidays, to wet film thickness of 40 to 60 mils. The new concrete shall be placed as soon as the epoxy bonding agent becomes tacky. In the event that the epoxy bonding agent is allowed to dry before placement of the new concrete the surface shall be recoated with epoxy.

E. The epoxy bonding agent shall comply with the material requirements of Part 2.5, Epoxy Bonding Agent, of this specification section and shall be applied in strict conformance to the manufacturer's recommendations. Adequate safety precautions shall be taken during the handling and use of the epoxy bonding agent.

3.12 EMBEDDED ITEMS

A. Wherever steel, wrought or cast iron piping, fittings, valves, collars, sleeves, structural steel, electrical conduits, appurtenances and fixtures, equipment anchorages or castings are shown or required for embedment in the concrete, such items must be on hand before concrete is poured. They shall be set in place accurately and firmly braced before concrete is poured around them. No cutouts for future installation of these items shall be permitted.

B. Before placing concrete the Contractor shall see that all embedded parts are accurately positioned and firmly and securely fastened in place. They shall be thoroughly clean and free from any coating, rust, scale, oil or other foreign matter. The embedding of wood in concrete shall be avoided whenever possible. If wood is to be embedded it shall be thoroughly wetted before the concrete is placed. After placement, surfaces not in contact with concrete shall be cleaned of concrete spatter and other foreign substances.

C. Conduit shall be installed between the reinforcing steel in walls or slabs that have reinforcement in both faces. In slabs that have only a single layer of reinforcing steel, conduit shall be placed under the reinforcement.

D. Unless installed in pipe sleeves, anchor bolts shall have sufficient threads to permit a nut and washer to be installed on the concrete side of the form or template. A second nut and washer

shall be installed on the other side of the form or template and the two nuts shall be adjusted so that the bolt will be held rigidly in proper position.

E. The Contractor shall be responsible for coordinating all work and ensuring that all embedded items or openings to be built into the concrete are placed in the forms before concrete is placed. The Contractor shall be responsible for conferring with his subcontractors and suppliers regarding their requirements for embedments and openings.

F. Forms, sleeves, and inserts shall be set, and concrete shall be cast to the lines and grades indicated on the Drawings and as detailed in these Contract Documents. The maximum deviation from true line and grade shall not exceed the tolerances listed below. Deviation in alignment of slabs or walls shall not exceed a rate of 1/8 inch in 10 feet within the tolerances specified.

Item	**Maximum Tolerance**	
Sleeves and inserts	+1/8"	-1/8"
Projected ends of anchor bolts	+1/4"	-0.0"
Anchor bolt setting	+1/16"	-1/16"
Concrete forms	+1/8"	-1/8"

G. All slabs shall be carefully finished true to grade such that the surface is free draining and contains no depressions which can hold or collect water.

H. Regardless of the tolerances listed herein, it shall be the responsibility of the Contractor to limit deviations in line and grade to tolerances which will permit proper installation and operation of mechanical equipment and piping.

3.13 WATERTIGHTNESS

A. It is the intention of this specification section to provide impervious concrete. All pits below groundwater level and all structures for holding or carrying water shall be watertight. A loss of not more than $^1/_4$-inch depth in 24 hours will be permitted when water-holding structures are filled. All exposed surfaces of water-holding structures and interior surfaces of pits below groundwater level shall be free from visible damp spots or seepage before acceptance. Repeated tests and repairs may be required by the Engineer to obtain watertight structures. All structures shall be drained at the completion of tests unless otherwise directed by the Engineer. The cost and expense of all testing for watertightness and of providing a watertight structure shall be borne by the Contractor. Methods of repair shall be acceptable to the Engineer.

B. The use of special admixtures or integral waterproofing compounds in concrete required to be watertight is not required but may be permitted, provided the materials and methods are approved in writing by the Engineer.

3.14 CONCRETE EMBEDMENT AND ENCASEMENT OF PIPE

A. Concrete for embedment and encasement shall be installed where and as indicated on the Drawings and at such locations where installation conditions require such pipe reinforcement because of unforeseen conditions encountered in the work, as determined by the Engineer.

B. Embedment and encasement of pipe shall be preceded by the following preliminary steps:
   1. All loose material shall be removed from the trench prior to placing concrete. All concrete shall have a continuous contact with undisturbed soil on sides and bottom of trench.
   2. A base course of concrete shall be accurately screeded to such grade and elevation that the pipe will be at specified grade when pipe bells are supported on, and in contact with, the top surface of such base course.
   3. Each length of pipe shall be rigidly held in alignment and anchored, to prevent flotation, in a manner acceptable to the Engineer.

3.15 PILE DRIVING AND CONCRETE WORK

The Contractor shall not drive foundation piling which may damage freshly placed or existing concrete structures. Minimum distance between concrete less than seven days old and pile driving operations shall be 100 feet. Any damage made to concrete structures from pile driving operations, regardless of distance, shall be repaired by the Contractor at his expense.

3.16 DEFECTIVE WORK AND METHODS OF REPAIR

A. All defective or damaged work shall be removed and replaced or repaired as directed by the Engineer. Any work which has not been constructed in accordance with these Contract Documents shall be considered defective. No defective or damaged work shall be patched, repaired or covered without prior inspection and approval of the Engineer.

B. Defects in formed concrete surfaces shall be repaired within 24 hours of placement, to the satisfaction of the Engineer, and defective concrete shall be replaced within 48 hours after the adjacent forms have been removed. All concrete which is honeycombed or otherwise defective shall be cut out and removed to sound concrete, with edges square cut to avoid feathering.

C. Except as modified herein, concrete repair work shall conform to Chapter 9 of ACI 301 and shall be performed in a manner that will not interfere with thorough curing of surrounding concrete. All repair work shall be adequately cured.

D. Where authorized by the Engineer, repair may be accomplished by patching conducted as specified herein. However, permission to patch shall not waive the Engineer's right to have the defective work completely removed if the patch or repairs do not, in the Engineer's opinion, satisfactorily restore the quality and appearance of the work. Patching shall be conducted as follows:
   1. Chip away defective areas at least $1^{1}/_{2}$ inch deep perpendicular to the surface, wet the area and 6 inches around it to prevent absorption of water from patching mortar, and brush a sand-cement grout consisting of one part fine aggregate to one part Portland cement into the surface, following with patching mortar.
   2. Patching mortar shall be no richer than one part Portland cement to three parts fine aggregate using white Portland cement to replace a portion of the gray cement as determined by a trial patch and shall contain only the minimum mixing water required for placing.
   3. Mortar shall be compacted into place and screeded to leave the patch higher than the surrounding surface, then left undisturbed for one or two hours to permit initial shrinkage

before being finally finished to match the adjoining surface. Cure patch in accordance with the requirements of Part 3.8, Curing, of this specification section.

3.17 LOADS APPLIED TO NEW CONCRETE

A. Loads including, but not limited to, earth loads, loads exerted from bracing or shoring, wind loads, hydrostatic or hydraulic loads, equipment or vehicle loads, or loads exerted by stacked materials, shall not be permitted until the concrete has reached its specified 28-day strength.

B. Concrete which has cracked due to overloading, loading before required strength has developed, or otherwise damaged shall be repaired or replaced as determined by the Engineer at no expense to the Owner.

END OF SECTION

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DIVISION 5: METALS

SECTION 05120

STRUCTURAL AND MISCELLANEOUS METALS

PART 1 GENERAL

1.1 SCOPE

A. This section covers all items fabricated from metal shapes, plates, sheets, rods, bars, or castings and all other wrought or cast metal except component parts of equipment and items covered by other sections.

B. Fabricated metal items which are detailed on the Drawings but not mentioned specifically therein shall be fabricated in accordance with the applicable requirements of this section.

1.2 SUBMITTALS

A. Detailed shop drawings, product data sheets, and erection and installation details for miscellaneous metal items shall be submitted in accordance with the section entitled "Shop Drawings, Product Data and Samples" of these specifications. Submittals shall indicate thickness, type, grade, class of metal, and dimensions, and shall show construction details, reinforcement, anchorage, welds and fasteners, and installation with relation to other construction.

B. Shop drawings shall be made to conform to the design drawings. Contract drawings shall take precedence over shop drawings unless otherwise authorized in writing. Review of the shop drawings by the Engineer does not constitute a change to the contract.

C. The Contractor shall be responsible for all dimensions. He shall coordinate all dimensions with the requirements of the Contract Drawings and notify the Engineer of any discrepancy.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Store miscellaneous metals above ground on platforms or other supports and protect from weather with suitable covering. Do not permit water ponding or moisture collection on stored items.

B. Handle steelwork to prevent damage to members and to shop paint coat and to prevent accumulation of mud, dirt, or other foreign materials capable of interfering with field paint application.

PART 2 PRODUCTS

2.1 BASIC MATERIALS

A. All materials shall be new and undamaged and shall conform to pertinent AISC, ANSI, ASTM or other industry standards. Unless specified otherwise in other specification sections, all materials in fabricated metal items shall conform to the following requirements:
   1. Structural steel shapes, plates, and bars shall conform to Specifications for Structural Steel ASTM A36.
   2. Structural steel tubing shall conform to ASTM A501.
   3. Stainless steel shall conform to the following AISI Type 304 for sheets and plates; AISI Type 316 for bolts and stainless steel items in corrosive areas.
   4. Galvanizing shall be hot dipped in accordance with Specifications for Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plate, Bars and Strip ASTM A123.
   5. Gray cast iron shall conform to ASTM Specifications A48, Class 30B.
   6. Ductile iron shall conform to ASTM Specifications A536 Grade 60-40-18.
   7. Aluminum alloy shall conform to the following Aluminum Association Specifications and designations:
      - 6061-T6 - Structural shapes, tubes and pipes in corrosive areas, sheets, plates, wire, rods, bars, bolts, and screws.
      - 6063-T6 - Tubes and pipes in non-corrosive areas.
      - 6066-T6 - Welding and extrusions.
      - 6151-T6 - Forgings and forging stock.
   8. High strength steel bolts, nuts and washers shall conform to ASTM A325.
   9. All embedded anchor bolts or anchor bolt materials shall be ASTM A193, Grade B8; ASTM A276, Type 304; or IFI-104, Grade 304 stainless steel, threaded per ANSI B1.1. Nuts shall be heavy hex nuts, ANSI B18.2, semifinished pattern, and shall be ASTM A194, Grade 8 or IFI-104, Grade 304 stainless steel. Flat washers shall be 18-8 stainless steel and shall conform to ANSI B27.2.
   10. Expansion anchors shall be stainless steel, Type 303 or 305, and shall be of the cinch anchor, wedge, or self-drilling type. Expansion anchors shall conform to the applicable requirements of Federal Specifications FF-S-325. Installation methods shall be in conformance with the manufacturer's recommendations for maximum pullout and shear strength, but in no case shall the depth of the hole be less than four bolt diameters. The minimum distance between the center of the expansion anchor and an edge or exterior corner shall not be less than $4^1/_2$ times the diameter of the hole in which it is installed. Expansion anchors shall be "Phillips Red Head" by Phillips Drill Company, "Wej-It" by Expansion Products, "Kwik-Bolt" by Hilti, Inc., or equal.

2.2 GENERAL REQUIREMENTS

A. General - Except as otherwise specifically noted on the Drawings, or specified herein, all materials and work for structural steel and miscellaneous metal work shall be in conformity with applicable provisions of the latest edition of the AISC *Steel Construction Manual* and AISC *Specification for the Design, Fabrication and Erection of Structural Steel for Buildings*.

B. Connections

1. Connections not specifically detailed on the Drawings shall be as defined in Tables I and III, "Framed Beam Connections," in the latest edition of the AISC manual. The shop fabricated portion of structural connections may be bolted, welded, or riveted. Except for connections detailed on the Drawings or specified otherwise, field connections shall be made with ASTM A 325 high-strength bolts.
2. Connections for miscellaneous metal work not included in the AISC definition of structural steel may be made with unfinished bolts. All unfinished bolts shall be equipped with self-locking nuts or lock washers.
3. High strength bolts shall be installed using turn-of-nut tightening as described in "Specifications for Structural Joints Using ASTM A 325 or A 490 Bolts" as set forth in the AISC manual. Beveled washers shall be used when the bearing faces of bolted parts have a slope of 1:20 or greater with respect to a plane perpendicular to the bolt axis. A platform or other means of access shall be provided at each field connection and shall be left in place until the connection has been inspected by the Engineer.
4. Field welded connections will not be acceptable for structural steel unless shown on the Drawings or specifically permitted by the Engineer. Where structural or miscellaneous steel connections are welded, all butt and miter welds shall be continuous and where exposed to view shall be ground smooth. In addition, intermittent welds shall have an effective length of at least 2 inches and shall be spaced not more than 6 inches apart.

C. Shop Fabrication

1. Structural steel and miscellaneous metal shall be fabricated in conformity with dimensions, arrangement, sizes, and weights or thicknesses shown on the Drawings or stipulated in the Specifications.
2. All members and parts, as delivered and erected, shall be free of winds, warps, local deformations, or unauthorized bends. Holes and other provisions for field connections shall be accurate and shop checked, so that proper fit will result when the units are assembled in the field. Erection drawings shall be prepared by the Contractor and reviewed by the Engineer in conformance with the "Supplementary General Provisions." Each separate piece shall be marked as indicated on the erection drawings. All field connection materials shall be furnished by the Contractor.
3. All steel shall be secured in position by temporary means until all final connections are completed. It shall be the responsibility of the Contractor to secure all steel against the displacement during erection and to maintain it against displacement until the structure, both concrete and steel, have been completed.
4. All bolts, including anchor bolts, shall have enough projection to expose not less than 12 threads (not inches) after nut is tightened.
5. Holes for expansion bolts shall be made by first securing the steel item in place then drilling the holes through the holes in the steel using the steel as a template. Drilling of the holes by center measurement will not be permitted. Reaming or burning of the holes in the steel will not be permitted. The drill size shall be of the same diameter as the bolt.

D. Responsibility for Errors - The Contractor shall be responsible for all errors of detailing, fabrication, and for the correct fitting of the structural members. The Contractor shall make all measurements in the field to verify or supplement dimensions shown on shop drawings are coordinated with the dimensions and requirements of the plans, elevations, and sections.

2.3 STRUCTURAL ALUMINUM

A. General - Except as specifically noted on the Drawings, or specified herein, all materials and work for structural aluminum shall conform with the applicable provisions of the latest edition of *Specifications for Aluminum Structures*, published by the Aluminum Association, Inc., New York, New York.

B. Layout Out - Hole centers may be center punched and cutoff lines may be punched or scribed. Center punching and scribing shall not be used where such marks would remain on fabricated material. A temperature correction shall be applied where necessary in the layout of critical dimensions. The coefficient of expansion shall be taken as 0.000013 per degree F.

C. Cutting - Material 1/2-inch thick or less may be sheared, sawed, or cut with a router. Material more than $^1/_2$-inch thick shall be sawed or routed. Cut edges shall be true and smooth, and free from excessive burrs or ragged breaks. Edges of plates carrying calculated stresses shall be planed to a depth of 1/4 inch, except in the case of sawed or routed edges of a quality equivalent to a planed edge. Reentrant cuts shall be avoided wherever possible. If used, they shall be filleted by drilling prior to cutting. Flame cutting of aluminum alloys is not permitted.

D. Heating - Structural material shall not be heated except as provided herein. Material may be heated to a temperature not exceeding 400°F for a period not exceeding 30 minutes to facilitate bending. Such heating shall be done only when proper temperature controls and supervision are provided to ensure that the limitations on temperature and time are carefully observed. The Engineer shall be so informed if this method is to be used.

E. Punching, Drilling, and Reaming - Rivet or bolt holes may be punched or drilled to finished size before assembly. The finished diameter of holes for unfinished bolts shall be not more than 1/16 inch larger than the nominal bolt diameter. All holes shall be cylindrical and perpendicular to the principal surface. Holes shall not be drifted in such a manner as to distort the metal. All chips lodged between contacting surfaces shall be removed before assembly.

F. Bolting - All bolts for bolting aluminum shall be Type 304 or Type 316 stainless steel, as specified herein.

G. Welding
   1. Dirt, grease, forming or machining lubricants, or any organic materials shall be removed from the areas to be welded by cleaning with a suitable solvent or by vapor degreasing. Additional operations to remove the oxide coating just prior to welding are required when the inert gas tungsten arc welding method is used. This may be done by etching or by scratch brushing. The oxide coating may not need to be removed if the welding is done with the automatic or semi-automatic inert gas shielded metal arc. Suitable edge preparation to assure 100 percent penetration in butt welds shall be used. Oxygen cutting shall not be used. Sawing, chipping, machining or shearing may be used.
   2. Any welding of aluminum shall be done using a non-consumable tungsten electrode with filler metal in an inert gas atmosphere (TIG) or using a consumable filler metal electrode in an inert gas atmosphere (MIG). No welding process that requires the use of a welding flux shall be used unless prior approval has been obtained from the Engineer. Preheating for welding is permissible provided the temperature does not exceed 400°F for a total

time of 30 minutes. Welding of any structure which is to be anodized shall be done using filler alloy rods which will not discolor when anodized.

3. The welding process and welding operators shall both meet a qualification test conforming to the qualification methods described in the ASME *Boiler and Pressure Vessel Code*, Section IX, "Welding Qualifications."

H. Corrosion Protection

1. Before installation, aluminum surfaces to be placed in contact with wood, concrete, or masonry construction shall be given a solvent cleaning followed by two (2) coats of Glidden "Glid-Guard Top Service Thick Black," Tnemec "46-449 Heavy Duty Black," Indurall "J-1135 Coal Tar Coating," or equal applied to a minimum dry film thickness of 10.0 mils per coat. The paint shall be applied as it is received from the manufacturer without addition of any thinner. Where aluminum surfaces come in contact with dissimilar metals, except stainless steel, the aluminum surfaces shall be kept from direct contact with said metal by the use of neoprene gaskets, 10 mil polyethylene film, or insulating washers. Paint or galvanizing will not be considered as adequate protection.
2. Unpainted aluminum surfaces shall be cleaned of all fabrication markings, grease, dirt, and oil. Anodized surfaces shall be cleaned with a mild soap and water solution, and no acid, caustic, or abrasive cleaning agents shall be used.

2.4 CHECKERED FLOOR PLATES

A. Unless otherwise shown, checkered floor plates shall be 6061-T6 aluminum alloy with raised diamond pattern on the upper surface. Floor plate shall have a minimum thickness of $^1/_4$ inch and shall be designed for an extreme fiber stress in bending of not more than 10,000 psi and a deflection of not more than 1/300 of span under a uniform load of 200 pounds per square foot. However, in no case shall the thickness of the floor plates be less than that shown on the Drawings for the specified clear span.

B. Warped or bent checkered plates shall be shop-straightened so they will lie perfectly flat. Members which support checkered plates shall be aluminum or stainless steel.

2.5 TESTING AND INSPECTION

A. Prior to delivery all basic materials specified herein shall be tested and inspected by an approved independent commercial testing laboratory. Payment for such services will be made by the Contractor. If approved by the Engineer, certified tests performed by the manufacturer's testing laboratory at no cost to the Owner will be acceptable.

B. If so desired by the Engineer, inspection of the fabrication shall be made at the place of manufacture. Access shall be permitted to all places where the work is being done.

C. Materials or workmanship not conforming to the provisions of these Specifications shall be rejected at anytime defects are found during the progress of the work.

END OF SECTION

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SECTION 05500

METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pipe and tube railings.
   2. Shop coatings.
   3. Sheet metal.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance Requirements: Where complete sizes or dimensions of structural members, connections, or fasteners of any item are not indicated, design the item to produce strength appropriate to the use intended.

B. Handrails: Design to resist the loads specified by the Florida Building Code, NFPA 101, and all local and applicable building codes.

C. Guardrails: Design to resist loads specified by the Florida Building Code, NFPA 101, and all local and applicable building codes.

1.3 SUBMITTALS

A. Shop Drawings.

B. Product Data.

1.4 QUALITY ASSURANCE

Where fabrications are specified to comply with specific structural performance requirements, provide design sealed by a professional engineer registered in the State of Florida

PART 2 PRODUCTS

2.1 MATERIALS - METALS

A. Steel Shapes:
   1. Plates, bars, angles, channels, and H-sections: ASTM A 36.
   2. Galvanizing: Hot-dip galvanizing after fabrication in accordance with ASTM A 123.
   3. Tube:
      a. Hot-rolled: ASTM A 501.
      b. Cold-formed: ASTM A 500.
      c. Galvanizing: Hot-dip galvanizing after fabrication in accordance with ASTM A 123.

4. Pipe: ASTM A 53 (black steel and hot-dip galvanized).
    a. Galvanizing: ASTM A 53, (G185 nominal).

B. Gray Iron Castings: ASTM A 48.

C. Malleable Iron Castings: ASTM A 47.

D. Aluminum Sheet: ASTM B 209; alloy and temper suitable for application and finish. Finishes: As indicated on drawings.

E. Aluminum Shapes: Alloy and temper suitable for application, strength required, and finish. Plate: ASTM B 209.

F. Stainless Steel: Type 302/304, satin finish (No. 4).

2.2 MATERIALS - MISCELLANEOUS

A. Grout: Non-shrink, factory blended and packaged; complying with ASTM C 1107.

B. Concrete: Normal weight ready-mix concrete as specified in Division 3. Compressive strength: 2500 pounds per square inch, minimum, at 28 days, unless otherwise indicated.

C. Concrete Inserts: Style as required for application.

D. Fasteners: Use fasteners suitable for the material being fastened and for the type of connection required.
    1. For exterior use or built into exterior walls: Nonferrous stainless steel, zinc coated or cadmium plated.
    2. Use fasteners of same material as items being fastened unless otherwise indicated.
    3. Bolts and studs: ASTM A 307.
    4. Nuts: ASTM A 563.
    5. Lag bolts: FS FF-B-561.
    6. Machine screws: FS FF-S-92.
    7. Wood screws: FS FF-S-111.
    8. Plain washers: FS FF-W-92.
    9. Lock washers: FS FF-W-84.
    10. Expansion shields: FS FF-S-325.
    11. Toggle bolts: FS FF-B-588.

E. Bituminous Mastic: SSPC-Paint 12.

F. Galvanizing Repair Paint: Zinc dust paint complying with SSPC-Paint 20 or DOD P-21035.

G. Shop Primer: Rust-inhibitive, lead and chromate free, low VOC primer, complying with FS TT-P-664, or equivalent.

2.3 FABRICATION - GENERAL

A. Fabricate and shop-assemble in largest practical sections for delivery to site.
   1. Prepare and reinforce fabrications as required to receive applied items.
   2. Fabricate items with joints tightly fitted and secured.
   3. Make exposed joints tight, flush, and hairline.

B. Fasteners: Use concealed fasteners if possible.
   Exposed fasteners: Flathead, countersunk type unless otherwise indicated.

C. Anchors: Fabricate to suit conditions indicated; use anchors of same material and finish as item except where specifically indicated otherwise.

D. Welding:
   1. Welding of steel: Comply with AWS D1.1 recommendations.
   2. Provide continuous welds at welded corners and seams.
   3. Exposed welds: Grind flush and smooth.

E. Joints Exposed to Weather: Fabricate to keep water out, or provide adequate drainage of water that penetrates.

2.4 FABRICATION - SHEET METAL

A. Comply with general fabrication requirements.

B. Bend sheet metal corners to smallest possible radius.

2.5 FABRICATION - RAILINGS

A. Railings - General: Construct as indicated.
   1. Preassemble in shop to maximum extent practicable.
   2. Bending of members: Use jigs to make each similar configuration the same; make neat bends without other deformation.
   3. Close exposed open ends of members using same material as used in member.
   4. Provide all components necessary for assembly of railings and for attachment to other work.
      a. For attachment to concrete or masonry: Provide inserts for installation into concrete or masonry, or provide other type of anchorage.
      b. For anchoring to steel: Use fittings bolted to structure unless otherwise indicated.
      c. For anchoring to solid masonry: Use fittings fastened to masonry with bolts and expansion shields unless otherwise indicated.
      d. For anchoring to hollow masonry: Use fittings fastened to masonry with toggle bolts unless otherwise indicated.
      e. Fasten fittings to railings in same manner as railing connections.
   5. Exterior railings:
      Provide weep holes or other means for evacuation of water trapped in hollow members.
   6. Wall mounted handrails: Return railing to wall at ends except where otherwise indicated.

B. Steel Pipe/Tube Railings:
   1. Black steel pipe, Schedule 40, standard weight.
   2. Shop prime.
   3. Connections: Welded and ground.
   4. Welding: Fill joints completely and grind off flush.
   5. Elbows: Mitered, only.
   6. Tee and cross intersections: Coped and welded.
   7. Exposed ends: Close with prefabricated fittings or with 3/16-inch-thick steel plate fully welded.

C. Removable Railing Sections: Provide sockets to receive posts; provide removable tamperproof socket covers.

2.6 FABRICATION - SHOP COATINGS

A. Hot-dip galvanize steel and iron assemblies set in concrete and masonry.

B. Shop prime all iron and steel fabrications.

C. Prepare surfaces to be coated as follows:
   1. Solvent-clean in accordance with SSPC-SP 1.
   2. .Exterior fabrications: Clean in accordance with SSPC-SP 5, SSPC-SP 6, SSPC-SP 8, or SSPC-SP 10.
   3. Interior fabrications: Clean in accordance with SSPC-SP 3, SSPC-SP 5, SSPC-SP 6, SSPC-SP 8, or SSPC-SP 10.

D. Shop Priming: Comply with SSPC-PA 1.
   1. Apply primer immediately following surface preparation.
   2. Do not prime surfaces to be welded.
   3. Do not prime surfaces in direct contact bond with concrete.
   4. Apply extra coat to corners, welds, edges, and fasteners.

E. Shop Painting: Comply with SSPC-PA 1.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Anchor metal fabrications to substrates indicated; provide all fasteners required.

B. Perform all field fabrication required for installation.
   1. Fit joints tightly.
   2. Weld joints as indicated.
      a. Weld in accordance with AWS code.
      b. Exposed welds: Grind flush and smooth.

C. Do not cut or weld items galvanized after fabrication that are indicated for bolted or screwed connections.

D. Install items in correct location, plumb and level, without rack or warp.

E. Coat aluminum surfaces in contact with concrete and masonry with bituminous mastic.

F. Cut cored holes for posts.

3.2 CLEANING AND TOUCHUP

A. Touch up damage to galvanized surfaces using galvanizing repair paint in accordance with ASTM A 780.

B. Touch up shop paint immediately after erection.

END OF SECTION

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SECTION 05520

ALUMINUM HANDRAIL

PART 1 GENERAL

1.1 SCOPE

A. The work covered by this section includes furnishing all labor, equipment, and materials required to furnish and install aluminum handrail for walkways, stairs, and openings, including all fittings, anchors, sleeves, and accessories, as shown on the Drawings or specified herein.

B. Unless specifically designated otherwise on the Drawings, all handrails shall be aluminum pipe handrail.

C. Handrails shall be furnished and installed where shown on the Drawings and at the edge of all walking or working surfaces where the distance from the surface to the adjacent floor, ground, or slab exceeds 4 feet.

D. Handrails located on surfaces below which persons or moving equipment can pass shall be furnished with a 4-inch aluminum toeboard, unless a toeboard is furnished with the grating support angles.

1.2 DESIGN CRITERIA

A. Railings shall be designed and constructed in strict compliance with the requirements of OSHA, NFPA 101, Florida Building Code, and all local and applicable building codes.

B. Aluminum handrail shall be designed for a minimum safe working load of 50 pounds per linear foot applied horizontally to the top rail or a concentrated load of 200 pounds applied in any direction at any point on the railing, whichever is greater. All handrail sections and components shall withstand the design loads with a minimum factor of safety of 1.5 based on the ultimate strength of the alloy used.

C. The Contractor shall submit to the Engineer written evidence that the aluminum handrail and accessories are in conformance with the material and mechanical requirements specified herein. Certified copies of independent laboratory test results or mill test results from the aluminum handrail supplier may be considered evidence of compliance provided such tests are performed in accordance with the appropriate ASTM testing standards by experienced, competent personnel. In case of doubt as to the accuracy or adequacy of mill tests, the Engineer may require that the Contractor furnish test reports from an independent testing laboratory on certified samples of handrail stock.

1.3 SHOP DRAWINGS AND ENGINEERING DATA

Submit complete shop drawings and engineering data in accordance with the requirements of the section entitled "Submittals" of these Specifications.

1.4 OPERATION AND MAINTENANCE DATA

Submit in accordance with the requirements of the section entitled "Operation and Maintenance Data" supplier's recommendations and procedures for maintaining and repairing handrail; including methods, cleaning materials, refinishing materials, and precautions as to the use of materials which may be detrimental to handrail finish.

1.5 GUARANTEE

Provide a guarantee against defective products and workmanship in accordance with the requirements of the section entitled "Guarantees and Warranties" of these Specifications.

1.6 STORAGE AND PROTECTION

A. Provide storage and protection for aluminum handrail in accordance with the requirements of these Specifications.

B. Keep handling to a minimum and maintain protective covering on handrail until work is complete.

PART 2 PRODUCTS

2.1 ALUMINUM HANDRAIL

A. Aluminum handrail for vertical and horizontal members shall be seamless, 1-1/2 inch (ips), Schedule 40, 6063-T832 or 6063-T6 aluminum alloy pipe. Aluminum fittings shall be of wrought material of the same composition as rails and posts or cast aluminum of Aluminum Alloy No. 214. Aluminum fittings shall have a minimum thickness of 1/4-inch. All screw connectors and bolts shall be of stainless steel or 2024-T4 aluminum alloy.

B. Aluminum handrails and exposed fittings shall have a clear anodized finish (204 R-1). Minimum coating thickness shall be 0.4 mils.

C. Aluminum pipe railings shall be of all welded construction or they may be assembled with flush type fittings and concealed or non-projecting pins and fasteners.

D. Welded joints shall be made by inert-gas welding (MIG) using aluminum welding rods of aluminum alloy X5356. All welded joints shall be cleaned of flux and weld spatter and the weld bead shall be ground smooth, rubbed, and polished to provide a flush and neat uniform appearance.

E. Slip joints to facilitate removal of pipe railing shall be provided at all intersections, changes in direction, or at intervals not to exceed 25 feet in straight runs of railing. The slip joint shall be designed and constructed to provide strength equivalent to a straight section of pipe.

F. All handrail installations shall provide for draining of entrapped water from the railing system by minimum 15/64-inch-diameter weep holes or other approved means.

G. Stainless steel eye bolts shall be furnished and installed on stanchions where guard chains will be attached.

H. Guard chains shall be provided across all pipe railing openings where shown, specified, or required. Chain links shall be 1/4-inch galvanized steel of welded construction, 12 links to the foot. One end shall be connected to a 1/4-inch stainless steel eye bolt in the stanchion and the other end shall be connected by means of a heavy, bronze, swivel eye, snap hook to a similar eye bolt in the opposite stanchion.

PART 3 EXECUTION

3.1 INSTALLATION

A. Aluminum railings shall be erected plumb, straight, and true at the locations and elevations shown on the Drawings. Prefabricated aluminum handrail shall be assembled and installed in strict compliance with the manufacturer's instructions.

B. Horizontal members of aluminum railings shall be fastened into concrete or masonry walls with flush type flange fitting anchors with a minimum diameter of 3-1/2 inches. Anchor screws shall be flat-head stainless steel screws with a minimum length of 3 inches.

C. Vertical members of aluminum railings shall be embedded in aluminum pipe sleeves either set in concrete or welded to a fascia flange for bolted anchorage as shown on the Drawings. Aluminum pipe sleeves shall be fabricated from 2-1/2-inch (ips), Schedule 40, 6061-T6 aluminum alloy pipe. Pipe sleeves for removable sections of handrail shall be fabricated from 2-inch (ips), Schedule 40, aluminum alloy pipe. A 1/4-inch-thick aluminum alloy plate having a diameter the same as the outside diameter of the pipe shall be welded to the bottom of each pipe sleeve. Aluminum pipe sleeves shall be set or anchored with the top flush with the top of the finished concrete surface. Aluminum pipe sleeves to be embedded shall be set in concrete a minimum of 6 inches. Spacing of vertical members shall not exceed 6 feet.

D. Aluminum pipe sleeves to be embedded in concrete shall be given one shop coat of zinc chromate primer and one heavy coat of alkali-resistant bituminous paint on all surfaces. Aluminum pipe sleeves designed for fascia mounting shall be given one shop coat of zinc chromate primer and one heavy coat of bituminous paint on all interior surfaces. That portion of vertical handrail members to be embedded in pipe sleeves shall be given one shop coat of zinc chromate primer and one heavy coat of bituminous paint.

E. Pipe sleeves shall be thoroughly cleaned of all dust and foreign material prior to placing handrails. Vertical railing members shall be centered in the pipe sleeves and the annular space filled to overflowing with a handrail setting cement, "Leadite," "Basolite," "Hydrotite," or equal. Excess setting shall be cleaned off, leaving a 1/8-inch buildup sloping away from the post.

F. Following installation, aluminum handrail shall be cleaned using soap and clean water. Acid solutions, steel wool, or harsh abrasives shall not be used. If stains remain after cleaning, remove finish and restore in accordance with the manufacturer's recommendations.

G. Surfaces of aluminum materials to be in contact with concrete or dissimilar metals shall be given one shop coat of zinc chromate primer followed by one heavy coat of alkali-resistant bituminous paint.

H. All defective, damaged, or otherwise improperly installed handrails shall be removed and replaced with material that satisfies the requirements of this section.

END OF SECTION

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SECTION 05530

ALUMINUM GRATINGS, TREADS, AND STAIR SYSTEMS

PART 1 GENERAL

1.1 SCOPE

A. The work covered by this section includes furnishing all labor, equipment, and materials required to furnish and install all aluminum gratings, stairways, and stairway treads, including all supporting angles, channels, beams, anchors, and incidental fastenings where shown or implied on the Drawings or specified herein.

B. Unless specifically designated otherwise on the Drawings, all stairs, gratings and treads shall be aluminum.

1.2 DESIGN CRITERIA

A. Aluminum stairs and grating shall be designed for an extreme fiber stress in bending of not more than 10,000 psi and a deflection of not more than 1/300 of the span length or 0.25 inch, whichever is smaller, under a uniform live load of 100 pounds per square foot.

B. The depth and thickness of the main bearing bars, beams, stringers, and channels shall not be less than that shown or implied on the Drawings. The clear spacing between main bearing bars shall not exceed 1-1/8 inches for grates.

1.3 SHOP DRAWINGS AND ENGINEERING DATA

A. Complete shop drawings and engineering data shall be submitted in accordance with the requirements of the section entitled “Submittals” of these Specifications.

B. The Contractor shall submit to the Engineer written evidence that the aluminum stairs, grating and treads are in conformance with the material and mechanical requirements specified herein. Certified copies of independent laboratory test results or mill test results from the grating, stair, or tread supplier may be considered evidence of compliance provided such tests are performed in accordance with the appropriate ASTM testing standards by experienced, competent personnel. In case of doubt as to the accuracy or adequacy of mill tests, the Engineer may require that the Contractor furnish test reports from an independent testing laboratory on certified samples of aluminum bar stock.

1.4 STORAGE AND PROTECTION

Aluminum gratings and treads shall be stored and protected in accordance with the requirements of the section entitled “Storage and Protection” of these Specifications.

1.5 GUARANTEE

Provide a guarantee against defective equipment and workmanship in accordance with the requirements of the section entitled "Guarantees and Warranties" of these Specifications.

PART 2 PRODUCTS

2.1 ALUMINUM GRATINGS

A. Aluminum gratings shall be fabricated of I-shaped or rectangular 6061-T6 or 6063-T6 aluminum alloy bars welded or pressure locked together into rigid panels. Grating and banding bars shall be machine cut. Top surfaces of main bearing bars shall be grooved or serrated to provide a nonslip surface.

B. Grating panels shall be simply supported by shelf angles on two sides of the opening and shall be reversible. The gratings shall be of the type that can be made in panels of the widths and lengths appropriate to the openings shown on the Drawings, and no gratings will be accepted which require individual panels to be made up by binding narrow panels together with end or intermediate binding strips welded thereto. The ends of all grating panels and the edges of all openings shall be provided with banding strips of the same depth and thickness of the main bars, welded thereto, and neatly finished at the intersections with the bars. After installation, there shall not be more than $^{1}/_{4}$-inch clearance between sides of adjacent panels. Panels shall be furnished in sizes that are easily handled.

C. The top surface of all bars shall be flush and all gratings shall lie flat with no tendency to rock when installed. Cross bars and edge bars of adjacent panels shall align for neatness. All main bearing bars shall be parallel. Cross bars shall be cut off flush with outside face of side bars.

D. Grating panels shall be securely anchored in place with stainless steel "J" bolts or aluminum saddle or hook clamps. Galvanized hardware shall not be acceptable.

E. Main bearing bars shall be supported by aluminum shelf angles of the size and thickness as shown on the Drawings. There shall not be more than 1/4-inch clearance between the ends of the grating panels and the inside vertical face of the shelf angle.

F. Grating panels shall be within 3/16-inch plus or minus of authorized length and width and shall have a maximum difference in length of opposite diagonals of 3/16-inch. Spacing of bearing bars shall be within 1/32-inch of authorized spacing.

G. All surfaces shall be sound, smooth, clean, and free from defects. Completed sections shall be level and true so as to rest firmly on the bearing angles along the entire contact surface. Openings, where required, shall be neatly and accurately made to the dimensions required as shown on the Drawings. Poorly fitted or damaged grating shall be replaced. All angular, circular, or reentrant cuts shall be made by sawing or shearing. Flame cutting will not be permitted.

H. Unless otherwise shown, openings to be covered with grating shall be bound on all four sides with a continuous shelf angle frame having welded corners and sufficient strap anchors for anchorage into the concrete.

I. Aluminum surfaces to be embedded in concrete or otherwise placed in contact with masonry construction shall be given a heavy shop coat of an alkali resistant bituminous paint. The paint shall be applied as received from the manufacturer without the addition of any thinner.

J. Where changes in channel direction, openings for gates, ends of grating runs, etc., prohibit adequate support for grating, additional cross angles shall be furnished to provide a seating surface.

K. Gratings shall be laid out so that openings in the grating are centered on a joint between adjacent panels. Where joints occur normal to the direction of span, they shall be centered on structural support with not more than 1/8 inch between ends of adjoining panels.

2.2 ALUMINUM STAIR TREADS

A. Aluminum stair treads shall be grating type treads fabricated from 6061-T6 aluminum alloy grating having $1^{1}/_{2}$-inch by 3/16-inch bearing bars. Treads shall be not less than 9-5/8 inches in width.

B. Stair treads shall be furnished with an extruded or cast aluminum nosing. Nosings shall have internal anchors and an anti-slip filler of abrasive grit.

C. Aluminum carrier plates shall be welded to the ends of stair treads. Carrier plates shall have slotted holes so as to be adjustable. Carrier plates shall be fastened to steel stair stringers with stainless steel bolts.

D. Outside faces of carrier plates to be in contact with steel shall be given a heavy shop coat of bituminous paint to prevent direct contact between the dissimilar metals.

2.3 ALUMINUM STAIR SYSTEMS

A. Aluminum stair systems shall be 6061-T6 or 6063-T6 aluminum alloy stock and shop welded where feasible prior to shipping.

B. Field welding and bolting shall be permitted, as needed.

C. Finished appearance shall be clean and smooth with minimal visual clutter.

D. Aluminum stair systems shall be as provided by Jomy Products, Inc., or approved equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Gratings, stair systems, and treads shall be installed in accordance with the manufacturer's recommendations and instructions.

B. Gratings, stair systems, and treads shall have no tendency to shift, rock, wobble, or rattle and shall not exhibit excessive deflection under normal foot traffic.

C. Stair treads shall be installed at the proper spacing and alignment and shall be level. Stairs shall not sway or vibrate under ordinary foot traffic. Additional bracing or supports shall be provided, if necessary.

END OF SECTION

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SECTION 09900

PROTECTIVE COATINGS

PART 1 GENERAL

1.01 WORK INCLUDED

A. This Section covers the work required to provide all labor, materials, equipment and incidentals to perform all of the necessary surface preparation and painting required to complete this contract in its entirety.

B. It is the intent of this specification to paint all concrete exposed miscellaneous ferrous metals, pipes, fittings, valves, equipment and all other work obviously required to be painted unless otherwise specified. Minor items omitted in the schedule of Work shall be included in the Work of this Section where they come within the general intent of the Specifications as stated herein.

C. The following surfaces or items are <u>not</u> required to be painted:
   i. Aluminum: gratings, checkered plates, hatches, handrails, toeboards, stairways and walkways (except as required for electrolytic protection).
   ii. Stainless Steel, brass and bronze.
   iii. Piping buried in the ground or embedded in concrete.
   iv. Ducts, pipes and other miscellaneous items covered with insulation or plastic coated.
   v. Concealed surfaces of pipe and crawl spaces.
   vi. Finish hardware.
   vii. Nonferrous architectural metals, unless specifically noted otherwise.
   viii. Packing glands and other adjustable parts and nameplates of mechanical equipment.
   ix. Concrete slabs and equipment pads.
   x. All manufactured painted electrical equipment (switchgear, transformers, motor control centers, control panels, etc.).

1.02 ABBREVIATIONS

A. The abbreviations and definitions listed below, when used in this Section shall have the following meanings:
   i. ANSI - American National Standards Institute
   ii. ASTM - American Society of Testing Materials
   iii. AWWA - American Water Works Association
   iv. DFT - Dry Film Thickness
   v. FRP - Fiberglass Reinforced Plastic
   vi. HCL - Hydrochloric Acid
   vii. MDFT - Minimum Dry Film Thickness
   viii. MDFTPC - Minimum Dry Film Thickness Per Coat
   ix. mil - Thousandths of an Inch
   x. MIL-P - Military Specification – Paint
   xi. NACE - National Association of Corrosion Engineers

xii. NSF - National Sanitary Foundation
xiii. OSHA - Occupational Safety and Health Act
xiv. SFPG - Square Feet Per Gallon
xv. SFPGPC - Square Feet Per Gallon Per Coat
xvi. SP - Surface Preparation
xvii. SSPC - The Society for Protective Coatings

1.03 SUBMITTALS

A. Submittals shall be made in accordance with the requirements specified in Section 01300 – "Submittals."

B. The following shall be submitted for each proposed coating system: manufacturer's specifications, surface preparation details, application procedures, technical data sheets, and dry film thickness or coverage.

C. Schedule of Painting Operations: The CONTRACTOR shall include a complete Schedule of Painting Operations with the overall project schedule.

1.04 QUALITY ASSURANCE

A. The paint manufacturer shall provide a representative to visit the jobsite at intervals during surface preparation and painting as may be required for product application quality assurance and to determine compliance with Manufacturer's instructions and these Specifications, and as may be necessary to resolve field problems attributable to, or associated with, the manufacturer's products furnished under this Contract.

1.05 INSPECTION

A. The CONTRACTOR shall give the ENGINEER a minimum of three (3) days advance notice of the completion of any surface preparation work or start of coating application work.
B. Before application of the base (prime) coat and each succeeding coat, all surfaces to be painted shall be inspected by ENGINEER. Any and all defects or deficiencies shall be corrected by the CONTRACTOR before application of any subsequent coating.
C. Coating applications shall be checked for required MDFT as per these specifications. All coated surfaces failing to meet the MDFT requirements shall be rejected.
D. For all coatings subject to immersion, consult the coatings manufacturer's written instructions for time required after system application before immersion.
E. Inspection by the ENGINEER or the waiver of inspection of any particular portion of the Work shall not be construed to relieve the CONTRACTOR of his responsibility to perform the Work in accordance with these Specifications.
F. All equipment required for discontinuity (Holiday) testing of steel substrates and continuity verification of concrete substrates shall be furnished and operated by the painting contractor.

1.06 PAINT DELIVERY AND STORAGE

A. All materials shall be new and shall be delivered to the project site in unopened containers that plainly show, at the time of use, the designated name, date of manufacture, color, and name of manufacturer. Paints shall be stored in a suitable protected area that is heated or cooled as required to maintain temperatures within the range recommended by the paint manufacturer.

1.07 PROJECT SITE CONDITIONS

A. The location of this project requires observance and conformance with EPA Volatile Organic Compound (VOC) restrictions. EPA limits the content of VOCs in painting materials to 3.5 lbs./gallon. Information regarding the VOC content of proposed paints will be required during submittals.

1.08 WARRANTY

A. The CONTRACTOR shall warrant to the OWNER and guarantee the work under this Section against defective workmanship and materials for a period of two (2) years commencing on the final contract date of Final Completion of the Work.

B. Warranties shall be submitted in accordance with Section 00700 General Conditions, 00800 Supplementary Conditions and the conditions of the Contract Documents.

PART 2 PRODUCTS

2.01 GENERAL

A. All products used in immersion service or in contact with potable water shall be certified by NSF for use in contact with potable water.

B. Products containing lead will not be allowed. Oil shall be pure boiled linseed oil.

2.02 PAINT MATERIALS

A. Products shall be manufactured by Tnemec Company, Inc., Xypex Chemical Corporation. Alternate coatings of other manufacturers will be considered, but MUST be equal or better. The Painting Contractor must submit alternate coatings at least 10 days prior to the bid opening date, for the Owner and/or Engineer of Record to review. Potential alternates MUST include side-by-side comparisons or equality including the coating generic description, volume of solids, cure times, ASTM Performance Testing, etc…

B. The following paint products are by Tnemec Company, Inc. or Xypex Chemical Corporation, and are used for the basis of establishing the desired quality expected for the project.

2.03 PRODUCT TYPE

A. Polyamine Epoxy (Concrete Primer)

B. Polyamide Epoxy (Non-Potable)

C. Aliphatic Acrylic Polyurethane

D. Acrylic Emulsion (Flat)

E. Acrylic Emulsion (Semi-Gloss)

F. Polyamide Epoxy Coal Tar

G. Polyamine Novolac Epoxy

H. Waterborne Cementitious Acrylic

I. Water Base Acrylic Epoxy

J. MIO/ZINC Moisture Cured Aromatic Urethane

K. Hydrophobic Aromatic Urethane

L. Modified Repair Mortar

M. Modified Cementitious Epoxy

N. Cycloaliphatic Epoxy

O. Modified Epoxy Mortar

P. Modified Polyamine Epoxy

Q. Polyester Aliphatic Polyurethane

2.04 TNEMEC COMPANY. INC. PRODUCT NAME

A. Series 201 Epoxoprime

B. Series 66 Hi-Build Epoxoline

C. Series 1095 Endura-Shield

D. Series 1026 Enduratone

E. Series 1029 Enduratone

F. Series 46H-413 Tneme-Tar

G. Series 282 Tneme-Glaze

H. Series 1254 EpoxoBlock
WB I

I. Series 114 Tneme-Tufcoat

J. Series 1 Omnithane

K. Series 446 PermaShield MCU

L. Series 217 MortarCrete

M. Series 218 MortarClad

N. Series 104 HS Epoxy

O. Series 434 PermaShield H2S

P. Series 435 PermaGlaze

Q. Series 290 CRU

2.05 PRODUCT TYPE XYPEX CHEMICAL CORP. PRODUCT NAME

A. Crystalline Waterproofing Concentrate

B. Crystalline Waterproofing Modified

C. Curing Agent Gammacure

2.06 EXTRA PAINT

A. Furnish one (1) unopened container of each type and each color of paint used, properly marked for future use by OWNER. Minimum size of one (1) gallon.

PART 3 EXECUTION

3.01 PROTECTION OF SURFACES NOT TO BE PAINTED

A. Mask or otherwise protect hardware, lighting fixtures, switch plates, aluminum surfaces, machined surfaces, couplings, shafts, bearings, nameplates and all other surfaces not intended to be painted which cannot be removed.

B. Provide drop cloths to prevent paint materials from falling on or marring adjacent surfaces.

C. Protect working parts of mechanical and electrical equipment from damage during surface preparation and painting processes. Openings in motors shall be masked to prevent paint and other materials from entering motors.

3.02 ENVIRONMENTAL CONDITIONS

A. Paint shall not be applied in temperatures exceeding the manufacturer's recommended maximum and minimum allowable, nor under adverse conditions such as dust, smoke- laden atmosphere, damp or humid weather

3.03 SAFETY

A. Painting shall be performed in strict accordance with the safety recommendations of the paint manufacturer; with the safety recommendations of the National Association of Corrosion Engineers contained in the publication, Manual for Painter Safety; Federal, State, and local agencies having jurisdiction.

B. Ultimate responsibility for safety is the CONTRACTOR's.

3.04 PREPARATION OF FERROUS METAL SURFACES

A. All surfaces to be coated shall be prepared as specified herein and shall be dry and clean before coating. Specific surface preparation shall be specified for the individual coating systems.

B. Standards for Ferrous Metal Surfaces Preparation
   i. SSPC-SP- 1 Chemical and/or Solvent Cleaning
      1) Remove all grease, oil, salt, acid, alkali, dirt, dust, wax, fat, foreign matter and contaminates, etc. by one of the following methods: steam cleaning, alkaline cleaning, or volatile solvent cleaning.
   ii. SSPC-SP-2 Hand Tool Cleaning
      1) Removal of loose rust, loose mill scale and loose paint to a clean sound substrate by hand chipping, scraping, sanding and wire brushing.
   iii. SSPC-SP-3 Power Tool Cleaning
      1) Removal of loose rust, loose mill scale and loose paint to a clean sound substrate by power tool chipping, descaling, sanding, wire brushing and grinding.
   iv. SSPC-SP-4 Flame Cleaning
      1) Dehydrating and removal of rust, loose mill scale and some light mill scale by use of flame, followed by wire brushing.
   v. SSPC-SP-5 (NACE-1) White Metal Blast Cleaning
      1) Complete removal of all mill scale, rust scale, previous coating, etc., leaving the surface a uniform gray-white color.
   vi. SSPC-SP-6 (NACE-3) Commercial Grade Blast Cleaning
      1) Complete removal of all dirt, rust scale, mill scale, foreign matter and previous coating, etc., leaving only shadows and/or streaks caused by rust stain and mill scale oxides. At least 66% of each square inch of surface area is to be free of all visible residues, except slight discoloration.
   vii. SSPC-SP-7 (NACE-4) Brush-Off Blast Cleaning
      1) Removal of rust scale, loose mill scale, loose rust and loose coatings, leaving tightly-bonded mill scale, rust and previous coatings. On concrete surfaces, brush-off blast cleaning shall remove all laitance, form oils and solid contaminates. Blasting should be performed sufficiently close to the surface so as to open up surface voids, bugholes, air pockets and other subsurface irregularities, but so as not to expose underlying aggregate.
   viii. SSPC-SP-8 Pickling
      1) Complete removal of rust and mill scale by acid pickling, duplex pickling or electrolytic pickling (may reduce the resistance of the surface to corrosion, if not to be primed immediately).
   ix. SSPC-SP-10 (NACE-2) Near-White Metal Blast Cleaning
      1) Removal of all rust scale, mill scale, previous coating, etc., leaving only light stains from rust, mill scale and small specks of previous coating. At least 95% of each square inch of surface area is to be free of all visible residues, and the remainder shall be limited to slight discoloration.
   x. SSPC-SP-1 1-87 Power Tool Cleaning to Bare Metal
      1) Complete removal of rust, rust scale, mill scale, foreign matter and previous coatings, etc. to a standard as specified on a Commercial Grade Blast Cleaning (SSPC-SP-6, NACE-3) by

means of power tools that will provide the proper degree of cleaning and surface profile.

xi. SSPC-SP-13 (NACE-6) the Surface Preparation of Concrete

1) Concrete must cure a minimum of 28 days. Abrasive Blast, shot-blast, water jet or mechanically abrade concrete surfaces to remove laitance, curing compounds, hardeners, sealers, and other contaminants.

C. Ferrous metal shall be blasted unless otherwise specified. Blasting shall be done with a centrifugal wheel or compressed air blasting equipment, using proper abrasives to attain an average profile depth of 1.5 mils. Do not reuse sand or flint abrasives. Shot abrasives must be thoroughly clean of contamination before reuse. Blow dust and grit from surface with clean, dry air. Coat within 8 hours or before rust contamination occurs.

D. Shop-Finished Surfaces: All shop-coated surfaces shall be protected from damage and corrosion before and after installation by treating damaged areas immediately upon detection. Abraded or corroded spots on shop-coated surfaces shall be prepared in accordance with SSPC-SP2 (Hand Tool Cleaning) and then touched up with the same materials as the shop coat. All shop coated surfaces which are faded, discolored, or which require more than minor touch-up in the opinion of the ENGINEER shall be repainted. Cut edges of galvanized sheets and exposed threads and cut ends of galvanized piping, electrical conduit, and metal pipe sleeves, not to be finished painted, shall be cleaned in accordance with SSPC-SP1 (Solvent Cleaned) and primed with zinc dust-zinc oxide metal primer.

E. Pre-Blast Cleaning Requirements

i. All oil, grease, welding fluxes, and other surface contaminants shall be removed prior to blast cleaning. Preblast cleaning methods shall use steam, open flame, hot water, or cold water with appropriate detergent additives followed with clean water rinsing.

ii. Small isolated areas shall be cleaned as above or solvent cleaned with suitable solvents and clean cloths.

iii. All sharp edges shall be rounded or chamfered and all burrs, jagged edges, and surface defects shall be ground smooth.

iv. Welds and adjacent areas shall be prepared such that there is: (1) no undercutting or reverse ridges on the weld bead, (2) no weld spatter on or adjacent to the weld or any other area to be painted and (3) no sharp peaks or ridges along the weld bead. All embedded pieces of electrode or wire shall be ground flush with the adjacent surface of the weld bead.

3.05 PREPARATION OF CONCRETE AND MASONRY SURFACES

A. All surfaces to be coated shall be prepared as specified herein and shall be dry and clean before coating. Specific surface preparation shall be specified for the individual coating systems.

B. Standards for concrete/masonry surface preparation shall be as defined and specified by guideline No. 03732 (latest revision) as published by the International Concrete Repair Institute.

C. Concrete and masonry surfaces shall be prepared in accordance with the International Concrete Repair Institute Guideline No. 03732 to provide the specified Concrete Surface Profile CSP 1 - CSP 10, and the recommendations of the repair, coating, and lining manufacturer. According to ICRI, surface preparation methods that may result in a CSP 1 - CSP 10, include detergent scrubbing, abrasive (sand) blasting, and high and ultra high pressure water jetting.

D. Concrete and masonry surface preparation method shall be as selected by CONTRACTOR to meet the specified concrete surface profile requirement and the other specified surface preparation requirements. Refer to the product data sheets for ICRI-CSP requirements.

E. Shop finish coats may be the standard finish as ordinarily applied by the manufacturer if it can be demonstrated to the ENGINEER that the paint system is equal to and compatible with the paint system specified. However, all pumps, motors, valves, pipe and other equipment shall receive at least one field applied finish coat after installation.

3.06 COATING SYSTEM INDEX

A. The following is a general index to the Coating System descriptions contained herein:

SYSTEM NUMBER	TITLE
1	Below Grade Waterproofing
2	Exposed Metal - Highly Corrosive
3	Interior Metal - Highly Corrosive
4	Chemical Resistant Wall (Concrete masonry)
5	Exposed FRP, PVC
6	Interior FRP, PVC
7	Aluminum and Dissimilar Metal Insulation
8	Exterior Wood Trim
9	Stucco-Cementitious Coating (Matte)
10	Concrete in Immersion – Moderate/Highly Corrosive
11	Concrete Floor – Chemical and UV Resistant Non-Skid

3.07 COATING SYSTEMS

A. System No. 1 - Below Grade Waterproofing

i. Surface Preparation: All curing oils, form oils, laitance, soluble salts, and loose concrete must be removed. Concrete must be dry and thoroughly clean before coating.

First Coat: Crystalline Waterproofing (Concentrate) at 1.5 lbs/sy.

Second Coat: Crystalline Waterproofing (modified) at 1.5 lbs/sy.

Curing Agent: Curing agent at 800 SFPGPC.

Color: Gray.

B. System No. 2 - Exposed Metal - Highly Corrosive.

i. Surface Preparation: Sweep Abrasive Blast Clean all sound, tightly-adhered coatings to create a minimum 1.5 mil angular surface profile in accordance with Brush Off Blast Cleaning (SSPC-SP7 / NACE No.4).
ii. Spot Abrasive Blast Clean to remove all loose coatings, mill scale, rust, corrosion, and other contaminants in accordance with Near White Metal Blast Cleaning (SSPC-SP10 / NACE No.2). A minimum angular surface profile of 2.0 mils must be achieved. ONLY WHERE REQUIRED.
iii. Spot Prime: Tnemec Series N69 @ a rate 4.0 – 6.0 mils DFT.
iv. Prime Coat: Tnemec Series N69 @ a rate of 5.0 - 6.0 mils DFT.
v. Sealant: Apply Tnemec Series 215 as specified by the manufacturer, at locations where two pieces of steel overlap, between flanges, etc.
    a. Top Coat: Tnemec Series 1075U @ 3.0 – 4.0 mils DFT.
    b. MDFT: 8.0 Mils minimum for the two (2) coat system.
    c. Color: To match color of Filters/CCCs

C. System No. 3 - Interior Metal - Highly Corrosive (Interior of CCCs).
i. Surface Preparation: Sweep Abrasive Blast Clean all sound, tightly-adhered coatings to create a minimum 2.0 mil angular surface profile in accordance with Brush Off Blast Cleaning (SSPC-SP7 / NACE No.4).
ii. Spot Abrasive Blast Clean to remove all loose coatings, mill scale, rust, corrosion, and other contaminants in accordance with Near White Metal Blast Cleaning (SSPC-SP10 / NACE No.2). A minimum angular surface profile of 2.0 mils must be achieved. ONLY WHERE REQUIRED.
iii. Spot Prime Coat: Apply (1) one coat of Tnemec Series 104-78GN Cumulus HS Epoxy @ a rate of 5.0 – 7.0 mils DFT.
iv. Pitt Filler: Fill corrosion pits with Tnemec Series 215 Surfacing Epoxy as needed.
v. Prime Coat: Tnemec Series 104 @ a rate of 4.0 - 6.0 mils DFT.
vi. Finish Coat: Apply (1) one coat of Tnemec Series 104-78GN Cumulus HS Epoxy @ a rate of 6.0 – 8.0 mils DFT.
    a. MDFT: 10.0 Mils minimum for the two (2) coat system. For areas where spot primer is applied, MDFT is 15 minimum.
    b. Color: To match color of Filters/CCCs

D. System No. 4 - Chemical Resistant Wall (Concrete Masonry)

i. Surface Preparation: Surface shall be clean, dry, free of dust, oil, curing compounds and other foreign materials. Other requirements for existing surfaces as specified herein.

ii. Prime Coat: One (1) coat of Tnemec Series 1254 EpoxoBlock WB at 80- 100 SFPGPC.

iii. Top Coat: Two (2) coats of Tnemec Series 114 H.B. Tneme-Tufcoat (Semi-Gloss) at 4.0 - 6.0 rnils DFT per coat.

iv. Color: As scheduled on Drawings.

E. System No. 5 - Exposed FRP, PVC.

i. Surface Preparation: Solvent cleaning, SSPC-SP1, to remove soluble contaminants. Remove all insoluble contaminants or foreign materials by hand, SSPC-SP2, or Power Tool Cleaning, SSPC-5P3

ii. Prime Coat: Tnemec Series 66 HI Build Epoxoline (non-potable) at 3.0 - 5.0 Mils DFT.

iii. Top Coat: Tnemec Series 1095 EnduraShield @ a rate of 2.0 - 4.0 Mils DFT.

iv. MDFT: 9.0 Mils for two (2) coat system.

v. Color: As scheduled on Drawings.

F. System No. 6 - Interior FRP, PVC.

i. Surface Preparation: As specified herein and/or manufacturer's recommendations.

ii. Prime Coat: Tnemec Series 66 HI Build Epoxoline (Non-Potable) @ a rate of 2.0 - 3.0 Mils DFT.

iii. Top Coat: Tnemec Series 66 HI Build Epoxoline (Non-Potable) @ a rate of 2.0 - 3.0 Mils DFT.

iv. MDFT: 4.0 Mils for the two (2) coat system.

v. Color: As scheduled on Drawings.

G. System No. 7 - Aluminum and Dissimilar Metal Insulation

i. Surface Preparation: Roughened surface.

ii. Top Coat: Tnemec Series 46H-413 Tneme-Tar @ a rate of 10.0 – 16.0 mils DFT.

iii. MDFT: 10.0 mils for one (1) coat system.

iv. Color: Black.

H. System No. 8 - Exterior Wood Trim

i. Surface Preparation: Surface must be clean, dry and free of oil, grease and other contaminants. Remove all loose existing coatings and sand rough areas. Seal all knots and pitch pockets.

ii. Top Coat: Three (3) coats acrylic emulsion (matte) at 2.0 – 3.0 mils DFT, per coat.

iii. MDFT: 6.0 mils DFT for three (3) coat system.

iv. Color: As scheduled on Drawings.

v. Caulking: Prepare and fill all cracks, nail holes, seams and joints with sealants as specified in Section 07900 – "Caulking"

I. System No. 9 - Stucco - Cementitious Coating (Flat)

i. Surface Preparation: Allow cementitious finish a minimum of 28 days drying/curing time. Surface shall be clean, dry, free of dust, oil, curing compounds and other foreign materials.

ii. Prime Coat: Tnemec Series 1026 Enduratone (matte) @ a rate of 2.0 – 3.0 mils DFT.

iii. Top Coat: Tnemec Series 1026 Enduratone (matte) @ a rate of 2.0 – 3.0 mils DFT.

iv. Color: As scheduled on Drawings.

J. System No.10 – Concrete in Immersion – Moderate/Highly Corrosive

i. Surface Preparation: Allow new concrete to cure a minimum of 28 days drying/curing time. Pressure washing with a minimum 3,500 psi w/ trisodium phosphate. Abrasive Blast Clean to remove all existing coatings and delaminated concrete in accordance with SSPC-SP13/NACE No.6 the Surface Preparation of Concrete to meet a minimum ICRI-CSP5 or greater.

ii. Rebar Repair: Remove deteriorated or loose concrete surrounding steel reinforcing bar(rebar), including ¾" around the entire circumference of rebar, in accordance with ICRI Guidelines No.310.1R. Near-White Abrasive Blast Clean in accordance with SSPC-SP10/NACE No.2 or Power Tool Clean to Bare Metal in accordance with SSPC-SP11. Apply 1 coat of Series 1, N69, 66, or 66HS. Avoid spillage or application onto the concrete.

iii. Concrete Repair: If needed, apply Tnemec Series 217 MortarCrete to around of ¼" – 4". Follow surface preparation and application protocols in the Series 217 Application Guide.

iv. Resurfacing: All areas to be coated must be resurfaced to fill voids, bugholes, and create a monolithic surface by applying Tnemec Series 218 MortarClad at a minimum 1/16".

v. Cold Joint Repair: Apply Tnemec Series 215 Surfacing Epoxy @ a minimum 1/16" to 3 inches on each side of the cold joint. Immediately imbed Tnemec Series 211-216 3/4oz chopped Fiberglas Mat. While wet, saturate the mat until it becomes translucent with Tnemec Series N69 HI Build Epoxoline II.

vi. Prime Coat: Tnemec Series N69 HI Build Epoxoline II @ a rate of 4.0 – 6.0 mils DFT.

vii. Intermediate Coat: Tnemec Series 435-5023 Beige Perma-Glaze @ a rate of 15.0 – 20.0 mils DFT.

viii. Top Coat: Tnemec Series 435-5020 Gray Perma-Glaze @ a rate of 15.0 – 20.0 mils DFT.

ix. UV Protectant: Tnemec Series 290 CRU @ a rate of 2.0 – 3.0 mils DFT. To all areas above the waterline and 6 inches below the waterline, including the interior baffle wall caps. Must be applied within 24 hours of the top coat. If time has elapsed, the coating must be scarified.

K. System No. 11 – Concrete Floor – Chemical and UV Resistance Non-Skid

i. Surface Preparation: Allow new concrete to cure 28 days. The Surface Preparation of Concrete, SSPC-SP13. Surface to be clean, dry and roughened prior to application of coating.

ii. Prime Coat: Tnemec Series 104 HS Epoxy @ a rate of 6.0 – 8.0 Mils DFT.

iii. Intermediate Coat: Tnemec Series 104 HS Epoxy @ a rate of 6.0 - 8.0 mils DFT.

iv. Top Coat: Tnemec Series 290CRU @ a rate of 2.0 - 3.0 mils DFT. Add Tnemec Series 211-213 Fine Glass Beads for Non-Skid.

v. MDFT: 14.0 – 19.0 mils DFT for three (3) coat system.

vi. Color: Color as scheduled on Drawings.

3.08 UNIDENTIFIED SURFACES

A. Any surfaces not specifically named in the Schedule and not specifically excluded or exempted shall be prepared, primed and painted in the manner and with materials consistent with these Specifications. The ENGINEER shall select which of the manufacturer's products, whether the type is indicated herein or not, shall be used for such unidentified surfaces. This painting shall be done within the Scope of the Contract.

3.09 WORKMANSHIP

A. On metal surfaces apply each coat of paint at the rate specified by the manufacturer to achieve the minimum dry mil thickness required. If material has thickened or must be diluted for application by spray gun, the coating shall be built up to the same film thickness achieved with undiluted material. One gallon of paint as originally furnished by the manufacturer shall not cover a greater area when applied by spray gun than when applied unthinned by the application of an additional coat(s). On masonry, application rates will vary according to surface texture, however, in no case shall the manufacturer's stated coverage rate be exceeded. On porous surfaces, it shall be the painter's responsibility to achieve a protective and decorative finish either by decreasing the coverage rate or by applying additional coats of paint.

B. All safety equipment shall be painted in accordance with OSHA Standards as approved.

C. Materials shall be mixed in proper containers of adequate capacity. All materials shall be thoroughly stirred before use and shall be kept stirred while using. No unauthorized thinners or other materials shall be added to any paint.

D. Only skilled painters shall be used on the Work and specialists shall be employed where required.

E. Steel members, metal castings, mechanical and electrical equipment and other metals which are shop primed before delivery at the site will not require a prime coat on the job. All piping and other bare metals to be painted shall receive one coat of primer before exposure to the weather, and this prime coat shall be the first coat as specified in the painting schedule.

F. Finish surfaces shall not show brush marks or other irregularities. Undercoats shall be thoroughly and uniformly sanded with No. 00 sandpaper or equal to remove defects and provide a smooth even surface. Top and bottom edges of doors shall be painted and all exterior trim shall be back-primed before installation.

G. Painting shall be continuous and shall be accomplished in an orderly manner so as to facilitate inspection. All exterior concrete and masonry painting shall be performed in one continuous manner structure by structure. Materials subject to weathering shall be prime coated as quickly as possible. Surfaces of exposed members that will by inaccessible after erection shall be cleaned and painted before erection.

H. Before final acceptance of the Work, all damaged surfaces of paint shall be cleaned and repainted as directed by the ENGINEER.

I. Thickness testing of the coatings shall be conducted by the CONTRACTOR or ENGINEER in witness of the other. Testing shall be in accordance with all applicable standards for such testing. With the exception of frequency which shall be tested in the following manner:

    i. DFT measurements shall be taken in approximately 1ft by 1ft grid.

    ii. When a reading is measured below the minimum required for the coating system, three (3) additional measurements shall be taken within a 1" radius of the initial low measurement and averaged. If the average is less than the minimum, then the area shall be marked for further evaluation.

iii. The surrounding area around the mark shall have additional measurements taken at a two inch (2") spacing in four (4) directions away from the marked area until measurements of sufficient DFT area are achieved.

iv. Once the area of low DFT is delineated, it shall be marked for correction by the CONTRACTOR.

3.10 APPLICATION SCHEDULE

A. System No. 1 - Below Grade Waterproofing. This system shall be used on the exterior of all below grade concrete walls.

B. System No. 2 - Exposed Metal - Highly Corrosive. This system shall be used on all metal surfaces exposed to weather including equipment, equipment frames, metal conduits, pipe, valves and piping supports.

C. System No. 3 - Interior Metal - Highly Corrosive. This system shall be used on the interior metal surfaces including pumps, piping, valves, equipment, and other miscellaneous metal surfaces.

D. System No. 4 - Chemical Resistant Wall (Concrete Masonry). This system shall be used on interior walls as scheduled on the drawings.

E. System No. 5 - Exposed FRP, PVC. This system shall be used for all PVC exposed to the elements. DO NOT PAINT FLEXIBLE CONDUITS.

F. System No. 6 - Interior FRP, PVC. This system shall be used on interior FRP, PVC piping for color coding.

G. System No. 7 - Aluminum and dissimilar metal insulation. This system shall be used on all aluminum in contact with concrete. Insulate all contacting dissimilar metals with this system. Neoprene pads may be substituted to insulate aluminum from concrete or aluminum from steel.

H. System No. 8 - Exterior Wood Trim. This system shall be used for the exterior wood trim of the repump station building.

I. System No. 9 - Stucco - Cementitious Coating (Flat). This system shall be used on exterior concrete and concrete masonry walls as scheduled on the Drawings.

J. System No. 10 – Concrete in Immersion – Moderate/High Corrosive. This system shall be used on the interior of the Chlorine Contact Chamber, including the Floor and Walls.

K. System No. 15ONS - Concrete Floor (Chemical Resistant) Non-Skid. This system shall be used for coating concrete floors as scheduled on the Drawings.

3.11 COLOR CODING FOR PIPES AND EQUIPMENT

A. All proposed piping, valves and equipment shall be color coded. When color coding is specified, it shall consist of color code painting and lettering identification of all exposed conduits, trough items and pipelines for the transport of gases, air, liquid and semi-liquids including all accessories such as valves, insulated pipe coverings, fittings, junction boxes, bus bars, connectors and all operating accessories which are integral to be whole function mechanical pipe and electrical conduit system.

B. All hangers and pipe support floor stands shall be painted. The system shall be painted up to but not including the flanges attached to the mechanical equipment nor the flexible conduit connected to electrical equipment. Colors shall be as noted in the Paint Color Schedule.

C. All systems which are an integral part of the equipment that is originating from the equipment and returning to the same piece of equipment, shall be painted between and up to but not including the fixed flanges or connections on the equipment.

D. Color coding requirements are as indicated in the Ten State Standards

E. CONTRACTOR shall submit proposed schedule for color coding pipes and equipment for approval by ENGINEER/OWNER.

3.12 CLEANUP

A. It shall be the responsibility of the Contractor to collect and dispose of properly, all waste materials from the site in accordance with all requirements of the Federal, State and local Environment Protection Agencies.

B. At completion of the Work, remove all paint where spilled, splashed, splattered, sprayed or smeared on all surfaces, including glass, light fixtures, hardware, equipment, painted and unpainted surfaces.

C. After completion of all painting, the Contractor shall remove from the job site all painting equipment, surplus materials and debris resulting from this Work.

END OF SECTION

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SECTION 12600

EBS ROTARY SCREW BLOWER PACKAGE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:

1. Rotary-Screw blower package with integrated controls including accessories as specified herein.
   a. Quantity: 3
   b. Blower Application: WWTP Aeration
   c. Blower ID Number: N/A
   d. All equipment specified in this section shall be designed and furnished by the blower manufacturer, who shall be responsible for the suitability and compatibility of all included equipment per this section.

1.2 SCOPE

A. Contractor:
   1. Furnish, unload, store and install rotary-screw blower equipment with accessories necessary to provide a complete operational system as shown on the plans and as specified.
   2. Shall be responsible for startup and training activities under the direction of the qualified manufacturer's representative.

1.3 QUALITY ASSURANCE

A. Manufacturers' Qualifications:
   1. All equipment furnished under this section shall be manufactured in a plant whose quality management system is certified / registered as being in conformity with ISO 9001 and who shall assume complete responsibility for the design and performance of the blower package.
   2. All equipment furnished under this section shall be new, unused, and shall be the standard product of the manufacturer, who shall have a minimum of 10 years' experience in producing blower packages.

B. Performance Guarantees:
   1. All cast parts to be manufactured in a plant whose quality management system is certified / registered as being in conformity with ISO 9001.
   2. All critical dimensions of the blower components provided by the manufacturer shall be verified and documented prior to assembly.
   3. Each Rotary-Screw VFD blower package provided by the manufacturer shall be guaranteed to provide performance to ISO 1217, Annex E.
   4. Each Rotary-Screw Constant Speed blower package provided by the manufacturer shall be guaranteed to provide performance to ISO 1217, Annex C.

C. Reference Standard:
   1. American Society of Testing and Materials (ASTM)
   2. National Electrical Manufacturers Association (NEMA)
   3. Occupational Safety and Health Administration (OSHA)
   4. National Electrical Code (NEC)
   5. Anti-Friction Bearing Manufacturers Association (AFBMA)

6. International Organization of Standardization (ISO)
7. International Electrotechnical Commission (IEC)
8. German Institute for Standardization (DIN)

1.4 SUBMITTALS

A. Manufacturer's standard submittal for establishing compliance to this Section shall include the following items; following submittal procedures in accordance with Section 01300
   1. Table of contents.
   2. A complete and detailed list of any and all variations to the specification.
   3. Descriptive literature, bulletins, and/or catalog cut sheets of the equipment.
   4. Scope of supply.
   5. Blower package performance data sheets showing at least the following:
      a. Package model name
      b. Bare blower model name
      c. Design conditions as listed in this section
      d. Air flow in ICFM and SCFM for design conditions listed
      e. Discharge pressure
      f. Motor size
      g. Package input power and Specific performance per ISO 1217 Annex C/E
      h. Process air connection size
      i. Operating Voltage required for the blower package
      j. Sound pressure and power levels
      k. Dimensions
      l. Package weight
      m. Discharge temperature
      n. Accessories being supplied
   6. Installation data sheets.
   7. Manufacturer's Selection data sheet showing design point plus five different speeds which include the minimum and maximum flows in SCFM. The Selection data sheet must also show graphs for the flow vs block speed, specific power vs block speed, motor shaft power/block shaft power/total power consumption vs block speed and pressure vs flow.
   8. Blower package drawing showing all important details required for installation including dimensions, anchor bolt locations, size and location of connections to other works and weight of equipment.
   9. Motor manufacturer's data sheet showing at least the following:
      a. Motor manufacturer's name and model number
      b. Efficiency class and %
      c. Efficiency at ½, ¾, and full load
      d. Amp draw
      e. Motor RPM
      f. Code letter
      g. Motor frame
   10. Wiring schematic of blower package.
   11. Process data map for controller bus connection.
   12. Inlet filter documentation conforming to EN 779, G4.
   13. Data sheets for supplied components and accessories.
   14. A list of recommended maintenance parts for one year of operation.
   15. Paint specification for blower package.
   16. Maintenance overview.
   17. Blower startup check list.
   18. Lubrication requirements.
   19. SDS sheet (oil).

20. Warranty information.
21. Manufacturer's standard for equipment standards.
22. Compliance with Machinery Standards for sound and performance certificate.

B. Manufacturer's standard Operation and Maintenance Manual shall include the following sections; following submittal procedures in accordance with Sections 01300 and 01740.
   1. Regarding this Document
   2. Technical Data for the blower package
   3. Safety and Responsibility
   4. Design and Function
   5. Installation and Operating Conditions
   6. Installation
   7. Initial Start-up
   8. Operation
   9. Fault Recognition and Rectification
   10. Maintenance
   11. Spare parts, Operating Materials, Service
   12. Decommissioning, Storage and Transport
   13. Annex with Drawings and Diagrams

1.5 PRODUCT DELIVEYR, HANDLING AND STORAGE

A. Delivery and Handling of Equipment:
   1. Manufacturer and Contractor shall coordinate the delivery schedule for just in time delivery to minimize the period the Blower package is on site before installation.
   2. Contractor shall unload and inspect all equipment and materials against reviewed shop drawings at the time of delivery. Any damage shall be noted on the carrier's Bill of Lading and be reported to the freight company immediately upon receipt.
   3. Equipment and materials damaged or not meeting the requirements of the reviewed shop drawings shall be immediately returned for replacement or repair.
   4. Each box or shipping crate shall be properly marked to show its net weight and its contents.

B. Storage:
   1. Contractor shall prepare for storage and label all equipment and materials after they have been inspected. The Contractor shall be responsible for the equipment and materials while in storage.
   2. Store materials to permit easy access for inspection and identification. Support all material off of the ground while protecting steel members and packaged material from corrosion and deterioration as per manufacturers' instructions.

1.6 SPARE PARTS

A. Furnish the following manufacturer's recommended routine maintenance spare parts for each blower package provided:
   1. Two (2) filter elements for integral inlet silencer
   2. Blower lubricants for first year of operation
   3. One (1) oil demister filter element
   4. Sets of filter mats for blower control cabinet (Rotary-Screw VFD blower package)
   5. One (1) tube of motor grease

B. All parts shall be furnished in clearly identified packaging.

1.7 WARRANTY

A. Blower packages shall be warranted to be free of defects in material and workmanship for a minimum period of twelve (12) months from date of start-up, not to exceed eighteen (18) months from the date of shipment from the manufacturer, whichever occurs first. The screw blower elements are warranted to be free of defects in material and workmanship for a period of twenty-four (24) months from the date of start-up not to exceed thirty (30) months from the date of shipment from the manufacturer, whichever occurs first. The manufacturer has offered a 5-year warranty on the blower package sound enclosure.

B. The contractor shall be responsible for proper storage of the equipment so as to remain in "as shipped" condition. If the equipment remains in storage at the job site for longer than six (6) months before installation, the contractor shall provide factory service personnel for a complete inspection of the equipment. Any work necessary to restore the equipment to "as shipped" condition shall be the responsibility of the contractor.

PART 2 PRODUCT

2.1 MANUFACTURER

A. The equipment specified herein is intended to be standard equipment for use in low pressure air systems and be supplied by a single manufacturer or authorized sales representative to assure uniform quality, ease of maintenance, and minimal parts storage.

B. Manufacturer List:
   1. Kaeser Compressors, Inc.
      a. Model – EBS410 (Owner Direct Purchase)

C. Plan layouts, weights, and pertinent specification language used in the design have been based upon Kaeser Compressors, Inc. equipment. Any changes required to accommodate equipment other than the basis of design shall be provided by the Contractor at no additional expense to the Owner. Furthermore, a complete and detailed deviation list from the specification shall be provided with proposal.

2.2 DESIGN CRITERIA

A. Standard Conditions for SCFM:
   1. Elevation: 14.7 PSIA (0' elevation)
   2. Temperature: 68 deg F.
   3. Relative Humidity: 36%

B. Design (site) Conditions for ICFM:
   1. Elevation: 14.7 PSIA (0' elevation)
   2. Blower Inlet Temperature Maximum: 104 deg F.
   3. Blower Inlet Temperature Minimum: 68 deg F.
   4. Relative Humidity*: 80%
      *Relative humidity at maximum blower inlet temperature.
   5. Blower Package Ambient Temperature Maximum: 202 deg F.
   6. Blower Package Ambient Temperature Minimum: 198 deg F.

C. Performance Data:
   1. Application: WWTP
   2. Quantity: 3
   3. Blower Packaged Controlled by a VFD: Yes

4. Flow required: 1200 SCFM
5. Blower Package Discharge Pressure: 21.7 PSIG
6. Blower airend: L-Low pressure
7. Motor Horsepower: 60 HP
8. Power supply voltage:
   a. Blower Package: 460v/ 3ph/ 60hz
   b. Incoming supply configuration: center grounded WYE
9. Blower Package Sound Level: 90 dB(A) at 3 feet

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D. Performance Guarantee:
1. Blower sound level shall be guaranteed by the manufacturer to be within the allowed tolerances of ISO 2151, +/- 3 dB(A) at 1m, free field conditions, with insulated piping.
2. The blower element performance provided by the manufacturer shall be guaranteed per ISO 1217, Annex B.
3. The specific performance (kw/100-cfm) of the complete Rotary-Screw blower package provided by the manufacturer shall be guaranteed to provide performance to ISO 1217, Annex C/E. For flows 50 to 500 CFM, the permissible tolerance on flow is +/- 5% and specific performance tolerance is +/- 6%. For flows greater than 500 CFM, the permissible tolerance on flow is +/-4% and specific performance tolerance is +/- 5%.

E. Plant System Communication:
1. Interface: Modbus RTU

2.3 BLOWER PACKAGE CONFIGURATION

A. Installation Location: Outside

B. Inlet Configuration: Ambient

C. All components and instrumentation are to be mounted and pre-piped; no field installation shall be required by the contractor. The manufacturer shall be responsible for all aspects of the engineering, from the blower package's air inlet to its discharge connection.

2.4 BARE BLOWER CONSTRUCTION

A. Blower type:
1. The bare blower shall be factory mounted for the package base frame, be of the oil-free, positive displacement, rotary-screw type, designed for air or other inert gas service, and directly coupled and gear driven by electric motor.
2. The bare blower assembly must operate at the effective value for vibration velocity in frequency range A and B, according to VDI 3836.

B. Material:
1. AISI, ASTM, GJL, GLS, DIN, etc…, numbers, types, and grades specified are typical of material composition and quality, equivalent materials will be considered.

C. Housing:
1. The casing shall be made of high strength, close grained, cast iron, and shall be adequately ribbed to prevent casing deflection and facilitate cooling. Casing shall be of EN GJL-200 material.
2. The casing shall be precision machined to allow for minimum clearances.
3. The casing shall allow for the thermal decoupling of the gearbox section allowing for low oil temperature. No additional oil cooler, oil pump or oil filter in the oil circuit is acceptable.

4. Reliable separation of compression chamber from oil chamber with no-wear air-side labyrinth sleeve oil sealing ring and oil-side spiral sealing ring, to include an atmospheric break between the air-side and oil-side.
5. Bearing fits shall be precision machined to ensure accurate positioning of the rotors in the casing.

D. Rotors:
1. The primary rotor shall be machined out of a one-piece casting made of EN GJL-250 material.
2. The secondary rotor and shaft shall be machined out of a one-piece casting made of EN GJS-500 material.
3. The shaft of the primary rotor shall be press fit and machined out of C45 shaft material.
4. The rotors shall be machined with precision tolerance to ensure consistent rotor clearance and stable volumetric efficiency.
5. The rotor assemblies shall be statically and dynamically balanced to ISO standard 1940/1- Q2.5 (turbine rotor).
6. The rotors shall have the energy-efficient Screw Profile for the maximum degree of delivery.
7. The rotors shall operate without rubbing, liquid seals or lubrication in the air chamber. No wear-prone surface coating shall be allowed.

E. Cover Plates:
1. The drive and gear-end cover plates shall be high strength, close-grained, cast-iron material. Aluminum end plates shall not be allowed.
2. The cover plates shall have a precision machined sealing face.
3. The drive end plate shall include at least two precision machined holes to allow for the use of fitting bolts to accurately align the opening for the input shaft seal.

F. Timing Gears:
1. The rotor timing gears shall be precision machined from case hardened, ground alloy steel to quality standard 5f 21. Each timing gear shall be straight cut, beveled, and precision ground to eliminate axial bearing loads and ensure long life as well as quiet operation.

G. Bearings:
1. All four rotor shaft support locations shall incorporate large, heavy-duty, full complement, cylindrical roller bearings with PEEK cages to absorb the radial gas forces which affect the rotors and change continuously.
2. An additional gear side ball bearing set loaded for axial forces only.
3. The bearings minimum acceptable L10 design life shall be as follows;
   a. At least 100,000 hours at design conditions.

H. Lubrication:
1. Both the gear-end and the drive-end of the blowers shall be oil splash lubricated via a disc slinger for minimal maintenance and long service life.
2. The lubrication design shall ensure adequate lubrication of the timing gears and bearings.
3. The drive-end and gear-end oil chambers shall not be interconnected. Each oil chamber shall have x1 drive-end and x2 gear-end domed designed sight glasses which will allow visual inspection of oil level and oil condition, viewable from the front of the blower. Recessed or flat sight glasses are not allowed.
4. Blower to be factory filled with a synthetic lubricating fluid that is rated for the design conditions specified.

I. Rotor Seal Assembly:
1. Each rotor shall include one seal assembly on each end, four assemblies in total per blower. Each seal assemble shall consists of the following;

a. Oil splash guard ring.
b. Shaft guide wear sleeve with vent holes located between the air and oil seals.
c. Replaceable wear sleeve to protect the blower casing.
d. Two piston ring type labyrinth seals made from heat treated GG/42CrMo4 material shall be located on the air side and two spiral sealing seals shall be located on the oil side of the rotor sleeve. The use of rubber lip seals shall not be allowed.
e. Seal assemblies shall not require an additional vacuum pump or electric oil mist separator for a sealing effect.

K. Input Shaft Seal Assembly:
1. The input drive shaft seal shall be a sliding ring type mechanical seal that will prevent oil leakage from where the input shaft goes thru the drive end cover plate.
2. The mechanical seal assembly shall consist of the following;
   a. Replaceable wear sleeve on the input drive shaft
   b. Cover plate with a machined sealing surface
   c. Mechanical sliding ring seal
3. The input shaft seal design must allow for the mechanical seal assembly to be replaced without removing the drive-end cover plate.

2.5 MOTORS

A. Drive Motor:
1. Motor shall be designed, manufactured, and tested in accordance with the latest revised editions of NEMA MG-1, IEC, DIN, ISO, IEEE, ANSI, and AFBMMA standards as applicable and shall be capable of continuous operation.
2. Motor must exceed Energy Independence and Security Act (EISA 2007) standards for NEMA Premium efficiency. It shall also be marked with a Department of Energy Certification Compliance Number to assure compliance, when to be connected to the grid (STC). VFD drive motors to reach IE5 per IEC 60034-2-3.
3. Motor shall comply with Low Voltage Directive 2006/95/EC or equivalent and be UL listed.
4. Motor must be inverter rated with impulse peak resistance in accordance with IEC 60034-17 or equivalent for operation with an IGBT frequency converter or equivalent.
5. The temperature rise of the motor windings shall not exceed IEC and NEMA standards when the motor is operated continuously at the rated horsepower, rated voltage, and frequency in ambient conditions at 104ºF / 40ºC.
6. Motor shall be suitable for Full Load/Direct On-line starting, Solid State Ramp starting, VFD, and/or Wye-Delta reduced current starting. SynRM motors are only capable of VFD operation.
7. Motor to be supplied, mounted and aligned by the blower package manufacturer.
8. VFD controlled motor (=>75HP) shall have an isolated non drive end “B-side” bearing.
9. Motor shall confirm to the following:
   a. Motor voltage: 460v/ 3ph/ 60hz
   b. Type: Asynchronous or Synchronous Reluctance
   c. Speed: Single
   d. Torque: Constant
   e. Enclosure: TEFC
   f. Mounting: Horizontal
   g. Speed: 0-100%
   h. Design: A
   i. Duty cycle: continuous (24 hours a day)
   j. Winding insulation: Class F
   k. Temperature rise: Limited to Class B
   l. Thermal motor protection: Pt100 resistance

m. Conduit box location: Left side from shaft end
n. Wiring Connection: Terminal strip inside conduit box. Use of wire nuts for connection of motor wiring to power source shall not be allowed.
o. Bearing L10 life: >60,000 hours
p. Bearing lubrication: Grease
q. Bearing type: Greaseable,
    1) Lubrication fittings must be located towards the front of the blower package so that both bearings can be safely lubricated while the blower package is running.
r. Bearing design: Ball type
s. Condensation winding 110v heater: No

10. Motor shall be as manufactured by Siemens or approved equal.

B. Sound enclosure ventilation fan motor:
1. Motor shall be UL listed.
2. Motor starter/overload protection shall be provided and wired.
3. Motor shall turn "on" when the main motor starts and turn "off" after a predetermined time after the main motor stops.
4. Ventilating fans mounted on the blower or motor shaft are not allowed.

2.6 BLOWER PACKAGE

A. Drive:
1. The blower shall be driven by direct coupled gear driven system.
2. A robust slip-free gear drive system, which requires no additional oil chambers, oil pumps, or additional bearings shall be utilized.
3. Drive gears shall be integrated into blower drive side oil chamber.
4. No additional oil pump, oil reservoir, or heat exchangers shall be used.
5. Drive motor with flanged direct mount face. Drive motor shall use grease-filled bearings.
6. Heavy duty mechanical blower/drive shaft seal with drain system towards motor face.
7. Low radial loads of the motors ball bearing design for long bearing lifetime.

B. Inlet Silencer:
1. An inlet silencer designed for the frequency range of the blower, shall be provided to reduce the noise of the blower package as specified.
    a. The inlet silencer shall be of carbon steel construction and be of the wear-free absorptive type, directly connected to the inlet port of the blower, and shall be mounted horizontally.
    b. The inlet silencer shall be lined with replaceable polyether absorptive material.
    c. The inlet silencer shall have an integral filter designed to protect the blower from particulates. It shall be located between the absorptive material and the blower inlet.
        1) The filter element shall be a washable and reusable polyester element for minimal pressure drop.
        2) The filter efficiency shall meet ASHRAE 52.2 MERV7 50-70%% @ 3-10 microns corresponding to EN779 G4.
        3) The filter element integral to the silencer shall be supplied no matter if the inlet configuration of the silencer is ambient or piped. If required on piped inlet configuration, any additional filtration or screening at the inlet location of the piped inlet air source is not the responsibility of the blower manufacturer.
        4) Filter element shall be removable without disconnecting the inlet duct.
    d. The filter maintenance cover and element must be removable by hand (without the use of tools).
    e. The pressure loss through the inlet silencer assembly shall be accounted for in the motor horsepower selection of the blower package.

f. If required on piped inlet configuration, any additional filtration or screening at the inlet location of the piped inlet air source is not the responsibility of the blower manufacturer.

C. Base frame:
1. Elevated base frame shall support the blower airend, valves, and silencers completely pre-mounted on elastic machine mounts.
2. Provisions for mounting of blower discharge silencer and accessories shall be included.

D. Discharge Silencer:
1. The discharge silencer is to be designed for the frequency range of the blower and is to reduce the noise of the blower package as specified.
2. Discharge silencer should mount to blower discharge port via flexible tube type connector.
3. The discharge silencer shall be of carbon steel construction.
4. Discharge silencer shall incorporate a solid outer shell and a perforated inner cylinder with absorptive material in between the cylinders.
5. Absorptive material shall be long, flexible, knotted polyester fibers to prevent fiber migration, to allow for lowering the noise and to reduce heat emissions inside the sound enclosure. The use of mineral wool or attenuating blankets will not be allowed.
6. The discharge silencer shall have a connection port for pressure relief valve, pressure and temperature probes, and unloaded starting valve. Unused ports should be capped or plugged.
7. The pressure loss through the discharge silencer assemble shall be accounted for in the motor horsepower selection of the blower package.

E. Blower Sound Enclosure:
1. A sound enclosure shall be provided which fully covers the blower, motor, drive assembly, inlet silencer, blower base frame, discharge silencer, and shall be shipped fully assembled.
   a. The sound enclosure shall be the product of the blower manufacturer to insure proper integration of blower package components.
   b. The sound enclosure shall meet the sound level specified.
   c. The sound enclosure shall be fitted with heavy foam, bulk density 120 kg/m^3.
   d. The sound enclosure assembly shall be of self-supporting bolted steel panel construction on a fabricated steel skid.
      1) All maintenance removable panels or doors shall be located in the front of the sound enclosure and must have a slotted key lock. A door key shall be provided. All maintenance panels shall meet OSHA weight requirements.
      2) The enclosure base shall be designed to enclose the full bottom of the sound enclosure and include fork lift guides for easy transportation and installation.
   e. The sound enclosure ventilation cooling air circuit shall be separate from the process air circuit. Mixing of the two air circuits within the enclosure shall not be allowed.
   f. The sound enclosure shall have a set of inlet louvers positioned on the blower-side of the enclosure to allow for the flow of ambient cooling air across the blower oil chambers.
   g. A screened inlet louver shall be located on the back of the enclosure and designed to provide a laminar flow of ambient cooling air across the blower drive motor.
   h. The sound enclosure ventilation air exhaust and the ventilation fan shall be located at the top of the sound enclosure.
      1) The ventilation fan shall be sized to provide adequate cooling of the blower package at all blower speeds. Shaft-mounted fans are not allowed.

F. Control Cabinet:
1. A control cabinet located on the side of the sound enclosure shall be preinstalled and wired on the sound enclosure skid.

2. The control cabinet shall be UL-508A approved and shall meet or exceed IP52 standards for environmental protection.
3. The back of the control cabinet shall have predrilled holes with grommets for easy pass through of electrical wiring.
4. The control cabinet's back plate shall be galvanized for improved grounding.
5. The Rotary-Screw VFD blower package's control cabinet shall have a lockable hinged door which allows access to the factory installed variable frequency drive, enclosure vent fan starter, terminals, relays, operator control panel, cabinet cooling fan and all interconnecting wiring.
    a. The control cabinet shall utilize a high cooling fan to remove heat from the cabinet and maintain proper operating temperatures.
6. The Rotary-Screw Constant Speed blower package's control cabinet shall have a lockable hinged door which allows access to the factory installed main motor starter, enclosure vent fan starter, terminals, relays, operator control panel and all interconnecting wiring.
    a. The main motor starter shall be a magnetic, Wye-Delta, reduced-current starter, to ensure low starting current and soft start.

G. Operator Control Panel
1. The operator control panel shall include a controller. The controller shall be suitable for use in an ambient temperature range of -4ºF to +140ºF.
2. The controller shall be suited for the specified conditions as previously listed and include an industrial PC with powerful processing software that will allow for the control, regulation, and monitoring of the blower package, along with allowing the display and modification of machine settings and external communication.
    a. The controller shall include a stabilized 24VDC power supply and a real time clock with a scheduling timer.
    b. A buffer battery with a ten-year lifetime shall be included for protection of system memory and internal clock.
    c. The controller shall include digital and analog inputs/outputs for controlling and/or monitoring the following:
        1) Main motor, sound enclosure ventilation fan motor and electrical cabinet ventilation fan motor (Rotary-Screw VFD blower package).
        2) Emergency stop push button
        3) Incoming power monitor relay for phase failure, undervoltage, overvoltage, and phase sequence
        4) Blower inlet and discharge temperature
        5) Blower inlet and discharge pressure
        6) Filter differential pressure
        7) Sound enclosure temperature
        8) Oil temperature and oil level
    d. The controller shall have the ability for the operator to be able to externally wire the following digital input/output signals.
        1) Remote on/off (DI)
        2) Remote reset of fault message (DI)
        3) Remote no external failure (DI)
        4) Blower running signal (DO)
        5) Blower on signal (DO)
        6) Group alarm signal (DO)
        7) Group warning signal (DO)
        8) Remote 4-20mA blower speed signal (Rotary-Screw VFD blower packages) (AI)
        9) 4-20mA speed output from inverter (Rotary-Screw VFD blower packages) (AO)
    e. The controller shall include touch key controls with LED indications on important functions.

f. The controller display shall be LED backlit with a plain text and graphical display capable of displaying the blower packages status in various languages.
g. The controller shall utilize “Radio Frequency Identification” (RFID) Technology, which ensures secure log-in for users and service personnel so service work and system changes can be performed only by authorized and qualified personnel.
h. The controller shall include an integrated web server.
i. The controller shall include an SD card slot for the manual loading of updates and recording of controller specific process data.
j. The controller shall include an expansion slot for communicating with various industrial protocols/plant monitoring systems.
k. The controller sensor connections shall be via a central I/O module with labelled connections.
l. The controller shall include displayable operating and maintenance hour counters for major components.
m. The controller shall have the ability to be timed controlled via up to 10 programmable timers.
n. The controller shall shut down the blower package in the event of a motor overload, high blower differential temperature, high blower differential pressure, high sound enclosure temperature, in-correct rotation, loss of drive or external failure signal.
o. The controller shall have a programmable and selectable auto re-start after loss of power.

3. The controller shall have the ability to communicate the status of the blower package in the following ways to the operator.
   a. Local control status at the controller display
   b. Remote machine status via the supplied Ethernet connection
   c. Emailing of operational, warning or alarm conditions to the operator via Ethernet port/connection.
      1) SMTP server required and not part of the blower manufacturer’s scope of supply.
   d. Operator’s systems plant communication via any one of EtherNet/IP, Profibus DP, Modbus TCP/RTU, Devicenet, or Profinet
      1) The process data map of the controller shall be supplied by the blower manufacturer when required. The interface programming to the systems plant controller is not included in the blower manufacturer’s scope of supply.
4. The controller shall enable the blower package to be controlled by the following ways.
   a. On and off directly at the blower package
   b. On and off remotely away from the blower package
   c. On and off from selectable timers in the controller
5. The Rotary-Screw VFD blower package’s controller shall enable the blower package to be controlled by the following control modes.
   a. Pressure regulation with a PID loop
      1) The controller automatically regulates the deviations between the setpoint and actual pressure by changing the speed of the drive motor. Customer selected value requires auxiliary 4-20mA input.
      2) The setpoint pressure shall be specified by setting a parameter in the controller. This shall be the default control mode when blower package ships.
   b. Speed setting with an external 4-20mA signal
      1) The motor speed must be capable of being controlled via an external analog signal within the programmed speed minimum and maximum speed range.
   c. Manual speed setting
      1) The motor speed shall be controlled manually by the operator changing the speed via the controller display.

H. The Rotary-Screw VFD blower package’s drive system shall be Variable Frequency Drive as follows:
1. The blower drive system shall use a 6-pulse, constant torque, AC variable frequency drive using pulse width modulation technology (PWM), integrally mounted and wired into the blower package control cabinet and designed specifically for use with Synchronous Reluctance motors.

2. The blower drive shall consist of the power module (frequency converter) and control unit. It shall be of Siemens SINAMICS converter family or approved equal.
3. VFD and motor combination to meet IES2 efficiency standard.
4. The blower drive shall "soft start" to allow for unlimited motor starts per hour.
5. The blower drive control and data input shall be via bus system from the blower controller as sole and central operating unit and communication interface.
6. The blower drive shall come completely programmed and parametrized. An SD card slot shall be provided for updates.
7. The blower drive shall have an integrated DC link reactor. The DC link reactor shall smooth voltage peaks, bridge commutation gaps and reduce the effects of harmonics on the inverter and line supply.
8. The blower drive shall include a class A noise suppression line (RFI) filter either integrated to the power module or preinstalled and wired between the power feed and power module.
9. The blower drive shall be protected from Electro Magnetic Interference by utilizing shielded motor connection cables.

I. Blower Package Accessories:
   1. Safety Relief Valve
      a. The relief valve(s) shall be factory installed within sound enclosure. Relief valve may not be shipped loose for field installation in the discharge piping.
      b. The relief valve(s) shall be spring type and must be sized for 100% of the design flow specified. Weighted relief valves shall not be used.
      c. The relief valve(s) shall be set to protect the blower from excessive differential pressure based on the design conditions specified. A seal shall be affixed that must be broken if set point is changed.
      d. The relief valve(s) exhaust shall be vented out of the sound enclosure. Exhaust vented into the sound enclosure shall not be allowed.
      e. The relief valve shall be ASME Section VIII, UV, CE, and PED certified.
      f. The relief valve shall be manufactured by Kunkle or an approved equal.
   2. Check Valve
      a. A check valve to prevent back flow through the blower shall be factory installed and not shipped loose for field installation in the discharge piping.
      b. The check valve flapper shall be swing type made from a steel disc embedded in a high temperature silicone elastomer. The valve shall be designed so that, in the event of failure, the valve element is retained in the valve housing. Split disc or center hinged designs shall not be used.
      c. The check valve capacity shall exceed the blower package's design flow at the maximum discharge pressure and temperature.
   3. Flexible Connector
      a. An elastomeric compensator/flex connector shall be provided to isolate the connection of the blower package to the self-supporting system piping. Control rods which may lead to nozzle loading shall not be used.
      b. The flexible connector capacity shall exceed the blower package's maximum discharge pressure and temperature.
      c. Discharge connection shall be provided with a web reinforced rubber sleeve with corrosion resistant clamps. (Size: 3" connection for CBS; 4" connection for DBS; or 6" connection for EBS) (FBS shall be provided with an 8" ANSI/DIN flanged arch-type EPDM web reinforced discharge).
      d. Piped Inlet connection – when required by this specification, shall be provided with a web reinforced silicone rubber sleeve with corrosion resistant clamps (Size: 3" for CBS, 4" for DBS, 6" for EBS, or 8" for FBS).
   4. Oil Drains

a. An oil drain from the blower drive-end and gear-end lubricating oil sumps shall be separately piped to the front of the blower base with flexible tubing. Common fill and drain shall not be allowed.
b. Each oil drain shall include a drain valve installed for ease of maintenance. The drain valves shall be 90° stainless steel ball valves and include a fully retained gasketed and threaded cap to prevent accidental discharge of the blower lubricant.

5. Vibration Isolators
   a. Vibration isolators shall be provided between the discharge silencer and sound enclosure skid to prevent transmission of vibration to the foundation.
   b. A ground wire shall be installed between the blower base and the sound enclosure base to allow for grounding of the complete blower package.
6. Inlet and Discharge Pressure Transducer
   a. Pressure transducers shall be installed on the inlet and discharge of the blower and shall be monitored by the controller and displayed on the controller operator panel.
   b. The transducers shall have the following range:
      1) 0 to -17.4 PSIG (inlet)
      2) 0 to 17.4 PSIG (discharge)
   c. The transducers shall have a sensor made of Ceramic aluminum oxide.
   d. The transducers shall have an output signal of 4…20mA.
7. Inlet and Discharge Temperature Sensor
   a. Temperature sensors shall be installed on the inlet and discharge of the blower and shall be monitored by the controller and displayed on the controller operator panel.
   b. The sensors shall have a temperature range of -58ºF to 392ºF.
   c. The sensors shall have a thermowell made of brass.
   d. The sensors shall have a measure element of Pt100.
8. Enclosure Temperature Sensor
   a. The blower package shall include an installed temperature sensor that measures the temperature inside of the blower package's enclosure and shall be monitored by the controller and displayed on the controller operator panel.
   b. The device shall monitor the enclosure of the blower package with a temperature setpoint of 140ºF.

9. Oil temperature sensor
   a. The blower shall include an installed oil temperature sensor in the gear side oil sump (or blower discharge side) that shall be monitored by the controller and be displayed on the controller operator panel.
   b. The oil temperature sensor shall have a temperature range of -58ºF to 482ºF.
   c. The sensors shall have a thermowell made of brass.
   d. The sensors shall have a measure element of Pt100.
10. Oil level switch
    a. The blower shall include installed oil level switches, one for each oil sump that shall be monitored by the controller and be displayed on the controller operator panel.
    b. The oil level switch shall be preset for low oil condition.
    c. The oil level switch shall be a SPST switch, Voltage rating up to 250v, .5 A
11. Gear Chamber Aeration Demister System:
    a. Each air chamber shall be vented to atmosphere through an aeration demister system.
    b. The demister system will discharge into cabinet 99.98% oil free air.
    c. Any oil collected by demister system shall be automatically drained back into gear side blower oil sump.

12. Unloaded start valve (not required on Rotary-Screw VFD blower packages)
    a. The blower package when started on a head of pressure shall include a diaphragm operated, solenoid activate, mechanical unloaded start valve that is mounted between the blower and the discharge check valve.
    b. The unloaded start valve shall allow the blower drive motor to accelerate unloaded up to full speed before the discharge check valve opens.

J. Nameplates:
    1. The blower package shall have at least two weather proof corrosion resistant type nameplates which includes the manufacturer name, model number, year, max pressure difference, equipment number, part number, serial number, voltage, phase, HP, motor rpm, and rated temperature attached on the outside and inside of the blower package.

K. Anchor bolts and hardware:
    1. Anchor bolts, washers, hex nuts, and all other fastening hardware shall be stainless steel and be supplied by the contractor.

L. Paint Specification:
    1. The blower manufacturer is responsible for surface preparation, priming and finish coating of the blower package and components requiring paint in accordance with the manufacture's standard procedures. Field painting of blower equipment or supplying components that are only prime painted is not acceptable.
        a. Cast parts are to be painted with a two-part gray epoxy primer and two-part top coat.
        b. Fabricated parts are to be painted with a two-part gray epoxy primer and two-part top coat.
        c. Sound enclosure parts are to be powder coated.
            1) Panels and base paint finish shall be pretreated by de-greasing and phosphate cleaning, then powder coated to a thickness of 70 µm -100 µm on both sides.
    2. The blower package to be painted the blower manufacturer's standard colors.

PART 3 EXECUTION

3.1 INSTALLATION

A. The blower package shall be handled and installed in accordance with the manufacturer's recommendations and instructions as shown in the location on the drawings.

B. Contractor shall field verify all dimensions and elevations. The engineer shall be notified of any specific differences.

C. The blower package shall arrive on site ready for installation. Aligning, adjusting and filling the blower with lubrication shall not be required by the contractor.

3.2 FIELD QUALITY CONTROL

A. Furnish the services of a manufacturer's authorized representative for proper installation to inspect and approve the installation, and to supervise a test run of the blower package.

B. After the installation and test run has been completed; the blower package shall be given a field test in the presence of the Engineer to verify that operation is satisfactory and in compliance with the Specification. If the blower package does not meet the Specification, corrective measures shall be taken or the package shall be removed and replaced with a package which satisfies the conditions of the Specifications.

3.3 TRAINING

A. Furnish the services of a manufacturer's authorized representative, who will instruct plant personnel in the operation and maintenance of the blower package. All procedures shall be covered including preventive maintenance, method of controlling the blower package and troubleshooting.

End of Section

SECTION 13400
INSTRUMENTATION AND CONTROL, GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 SCOPE

A. The Contractor shall provide, through the services of instrumentation and SCADA (Supervisory Control and Data Acquisition) system subcontractors, all components, system installation services, as well as all required and specified ancillary services in connection with the Instrumentation and Control System. The system includes but shall not be limited to all materials, labor, tools, fees, and documentation required to furnish, install, test and place in operation a complete and operable instrumentation and control system as shown and / or specified. The system shall include but shall not be limited to all measuring elements, signal converters, transmitters, local control panels, digital hardware and software, operator workstations, remote telemetry units, signal and data transmission systems, interconnecting wiring and such accessories as shown, specified, and/or required to provide the functions indicated. All signals from instrumentation, PLCs and equipment shall be integrated with the existing WWTP SCADA system and SBR control panel.

B. The subcontractors shall work together to provide a complete and functional instrumentation and control system. The instrumentation subcontractor shall furnish, install, test and place in operation all field equipment except for the PLC panels unless herein stated otherwise. The SCADA system subcontractor shall be responsible for all PLC control panels and SCADA system equipment (i.e. network, computers, man-machine interface software, etc.) unless herein stated otherwise. Overall system documentation (i.e. loop drawings, etc.) and testing (loop testing, etc.) shall be the responsibility of the SCADA subcontractor. Where the specifications refer to the instrumentation and control system supplier/subcontractor, it means that all contractors are referred to.

C. The listing of specific products in this specification in no way relieves the Contractor of furnishing equipment that shall meet the performance and quality criteria specified herein.

D. Contractor shall certify and ensure immediate selection of components to meet specifications, and assure the Owner that once Engineer and Owner approval is secured that said components and equipment are used uniformly and solely throughout project unless specific locations of applications of service dictate otherwise. Contractor shall advise in writing all manufacturers, subcontractors, and others concerned of selected or approved items.

E. The contractor shall be responsible for all patents, licenses, fees, or claims because of the design, equipment, or assemblies used, and because of any special provisions or requirements which are inherent for proper operation of the equipment specified or required under this item.

F. The contractor shall assume all costs of patent fees or licenses, and shall safeguard and indemnify the Owner from all damages, judgments, claims, and expenses arising from infringement of any letters of patent or patent right, or because of any

royalty, fee, or license for use of any devices furnished under this item, or for any features or arrangement specified or required under this Contract and occasioned by reason of the installation and use of a mechanism, including electrical circuits and/or devices furnished under this Contract, and all costs shall be included in the item under the lump sum bid proposal, the patent fees, licenses and royalties as mentioned herein.

G. Where specification Section 13400 is referenced elsewhere within the Contract Documents it shall mean a reference to all of the instrumentation and control specification sections 13400.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. The specifications provided within this section shall be applied to all of the Instrumentation and Control specifications. In addition, refer to individual product specifications within related specification sections for additional requirements specific to those devices.

1.3 CODES AND STANDARDS

A. The instrumentation and control system shall comply with the following codes and standards:

1. Applicable local and state code requirements.

2. Applicable standards of the National Fire Protection Association (NFPA)

3. National Electrical Code (NEC).

4. Applicable standards of the Underwriter's Laboratories, Inc. (U.L.)

5. UL 508 Industrial Control Equipment

6. Applicable standards of the Institute of Electrical and Electronics Engineers (IEEE)

7. Applicable standards of the National Electrical Manufacturers Association (NEMA)

a. NEMA 250 Enclosures for Electrical Equipment (1000 V Maximum)

b. NEMA ICS 1 Industrial Control and Systems: General Requirements

c. NEMA ICS 6 Enclosures for Industrial Control and Systems

8. Applicable standards of the Instrument Society of America (ISA)

a. S5.1 Instrumentation Symbols and Identification

b. S5.4 Instrument Loop Diagrams

1.4 SUBMITTALS

A. The contractor shall supply, for approval by the Engineer and Owner, loop diagrams, instrumentation system panel layout drawings, panel wiring diagrams, instrumentation system interconnection diagrams, and detailed instrumentation equipment specification sheets or bills of material.

B. Loop diagrams shall be based upon the Engineer's plans and Specifications and shall contain those refinements deemed necessary. Loop drawings shall be prepared in accordance with ISA standards.

C. Loop resistance calculations shall be included with each instrumentation signal loop. These calculations shall show that each signal loop is operated within the resistance load requirements of each analog output in the instrumentation system.

D. Panel layout drawings shall include, but shall not be limited to, for each panel, a front view, side view(s), rear view, base plan (where applicable and subpanel layout(s). The layout of devices on and within the panel shall be clearly shown with all devices identified. Panel mounting details shall be shown and overall dimensions shall be shown, plus all dimensions relative to mounting bolt locations, etc. Door swing arcs shall be shown on the panel base plans. Locations and sizing of cable and/or conduit entry areas shall be clearly shown.

E. Panel wiring diagrams may be schematic in nature provided they follow J.I.C. schematic diagram format and clearly show all wire numbers, terminal point numbers, and contain sufficient notes and information to facilitate checking of drawings, test and maintenance of the system and its equipment, etc. The function of each relay shall be identified near that relay's coil on the schematic diagram.

F. System interconnection diagrams shall include complete identification of all system interconnecting wires, cables, etc. This includes terminal numbers from the VFD cabinets, motor control centers, field control panels and field devices. System interconnection diagrams and panel wiring diagrams may be combined into one set of drawings, provided all details of both types of drawings are clearly and understandably incorporated and provided that field wiring may be easily distinguished from panel wiring.

G. The following information shall be included, preferably on the instrumentation schematic diagrams:

1. Identification of instrumentation signal types within each loop segment (4-20 mA, 1-5 V, pulse, etc.).

2. Identification of input impedance for each analog input to each instrumentation device.

3. For each device analog input, identification of the loading limits of that device output (example: 4-20 mA into 600 ohms).

4. Details of the connections and grounding of each instrumentation cable shield.

H. Instrumentation and control system supplier shall certify that all instrumentation system equipment and panels as built and installed conform to those parts of this specification dealing with shielding of signal circuits, grounding of shields and lightning protectors, EMI/RFI protection, etc.

I. All drawings shall be prepared in such detail as to enable plant technical personnel to maintain, trouble-shoot, and repair the system without assistance of the system supplier's field service personnel.

J. The contractor's attention is directed to requirements of the Contract Documents with regard to the following:

1. Each submittal for equipment covered under this Specification shall include:

a. A separate section entitled "Requested Deviations from Instrumentation System Specifications" which shall clearly define and clearly explain all requested deviations and exceptions of the instrumentation system to this Specification. Only those deviations requests listed in this section will be reviewed by the Engineer.

b. Component manufacturing data sheets indicating pertinent data and identifying each component by item number and nomenclature as indicated on the drawings and in the Specifications.

c. Component drawings showing dimensions, mounting and external connection details. The data sheet and component drawings shall be submitted in accordance with the distribution indicated in the Specifications.

d. Detailed loop diagrams showing both piping and wiring requirements for each instrument loop in the system.

e. A system piping schematic and wiring schematic, each on a single drawing, with a full description of operation. Component identification on the schematic shall be as indicated above

.f. Recommended on-site storage requirements for equipment supplied by the system supplier prior to installation.

2. In order to facilitate approval and review of the proposed system, submittal shall be made in two steps. The first submittal shall include all in-line devices such as flow meters, control valves, level probes, etc. The second submittal shall include complete details of the integration with the WWTP SCADA system. These submittals shall be reviewed by the Engineer and Owner in conjunction with representatives of the general contractor, the electrical subcontractor, and the instrumentation and control system suppliers. After this review, all comments shall be incorporated into the drawings and the required number of copies shall be forwarded for formal review and approval.

K. After all changes or corrections resulting from the Engineer's review of the system supplier's drawings have been made, panels may be built and instrumentation

devices may be supplied in accordance with the approved drawings. One set of "as shipped" prints shall be included in the panels when shipped from the system supplier's wiring and assembly shop.

L. After all field changes or corrections made during installation and field checkout have been completed, then all system supplier documentation shall be revised to reflect the "as installed, corrected, and accepted" condition of the system and final record copies of all system supplier's documentation including instrument specification sheets and/or bills of material for the system shall be provided to the Owner and Engineer.

M. Electronic copies, of all instrumentation system drawings shall be supplied with the O&M documentation in accordance with the Contract requirements after "as installed" revisions have been made.

N. Instruction manuals shall be supplied. Operating instructions shall also incorporate a functional description of the entire system including the system schematics which reflect as-built modifications. Special maintenance requirements particular to the system shall be clearly defined along with special calibration and test procedures.

O. Internal wiring diagrams are to be supplied for all components.

1.5 INSTRUMENTATION AND SCADA SUBCONTRACTORS

A. The Contractor shall provide for the services of the SCADA at no additional cost to the Owner. The Contractor shall be responsible for integrating with the existing SCADA system as specified. All equipment and services necessary to meet the requirements of the specifications, but not specifically detailed in the proposal, shall be the responsibility of the Contractor. The Contractor and the SCADA system integrator shall be responsible for full and complete coordination and control of all equipment and services necessary to meet the requirements of the specifications and the intent of the system operations and performance, whether specifically detailed herein. It shall be the sole responsibility of the Contractor’s SCADA integrator to coordinate final interface and proper operations of all equipment and systems indicated in the project documents.

B. All conduit and wiring between panels, all field-mounted devices between all instrumentation, and power sources except as noted shall be furnished and installed under the Section16000 electrical of this contract. This wire shall be tagged and the final wire termination preparation and connections to the instrumentation and control subcontractor as part of the overall system contract.

C. The Contractor's attention is directed to the fact that instrumentation is an integrated system. The instrumentation and control subcontractor shall be responsible to the Contractor for satisfactory operation of the entire system. Substitutions of functions specified will not be acceptable without prior approval.

D. The Contractor shall be responsible for proper functioning of the instrumentation and control systems to be furnished under these Specifications. The Contractor shall be responsible for preparation of required submittal data to be provided under these Specifications, including operation and maintenance manuals, complete documentation including "as built" drawings, and other documentation required under this and other

related specification sections. In addition, the Contractor's I&C subcontractor shall be responsible for conducting all tests including calibration and operational demonstrations either in the factory and/or the field, to demonstrate final compliance with these Specifications as required. The appropriate technical supervision for installation and connections to the existing and new equipment shall be provided during construction as well as during final termination verifications, testing, quality control, and field acceptance tests.

E. The Contractor shall provide all additional materials and work necessary to supplement the materials and work provided by the Contractor's I&C subcontractor as needed and thereby satisfy all requirements that are within the scope of this section.

F. The Contractor is also responsible for coordinating interfaces between instrumentation and control equipment provided under these sections and the equipment provided under other sections of the Specifications. The Contractor shall verify and coordinate process equipment power supply and voltage, process equipment control power supply and voltage, compatibility of control signals, details of equipment installation and interconnection. Coordination shall include distribution of approved shop drawings to all vendors, subcontractors, etc., involved in the control interface.

G. Likewise, the Contractor shall ensure that instrumentation devices provided under other sections of the Specifications are compatible and of the same quality and characteristics as similar devices specified under this section.

H. The Contractor shall also coordinate structural work, penetrations, painting, etc., as required for installation of a complete instrumentation and control system. In-line or integrally mounted items (such as flow elements, level sensors, etc.) shall be installed under supervision of the instrumentation and control subcontractor.

I. The Contractor shall be ultimately responsible for installation of the I&C system.

PART 2 PRODUCTS

2.1 GENERAL EQUIPMENT REQUIREMENTS

A. All equipment shall be the latest and proven design. Specifications and drawings call attention to certain features, but do not purport to cover all details entering into design of the instrumentation system. The completed system shall be compatible with functions required and the equipment furnished by the Contractor.

B. All electrical components of the system shall operate on 120-volt, single-phase, 60 Hz power source, except as otherwise noted in the Specifications. Drawings and Specifications indicate the energy sources that will be provided. Any other devices necessary to obtain proper operation of the instrumentation system from these energy sources shall be furnished with the instrumentation.

C. All necessary fuses or switches required by the instrumentation manufacturer for his equipment shall be provided with the equipment. All instruments requiring internal power supply shall have internal on-off switches.

D. Materials and equipment used shall be U.L. approved wherever such approved equipment and materials are available. All control panels shall be U.L. labeled.

2.2 TOOLS, SUPPLIES, AND SPARE PARTS

A. Provide special tools, other than those normally found in an electronic technician's tool box, required to test, diagnose, calibrate, install, wire, connect, disconnect, assemble and disassemble any digital equipment, instrument, panel, rack, cabinet or console mounted equipment for service and maintenance (i.e., connector pin insertion and removal tools, wire crimping tool, special wrenches, special instrument calibrators, indicator lamp insertion and removal tools, etc.).

B. Provide tools and test equipment together with items such as instruction manuals, carrying/storage cases, unit battery charger where applicable, special tools, calibration fixtures, cord extenders, patch cords and test leads, which are not specified but are necessary for checking field operation of equipment supplied under this Section. Provide any needed calibration equipment, communication devices, etc. as required for system validation. All devices should have valid NIST certifications as of the date of delivery, as applicable.

C. The Contractor shall provide supplies as needed or as required by the Owner during the specified warranty period. Supplies include items such as printer paper, fuses, ink, ribbon, etc. All fuses consumed during installation, testing, start-up, the system availability demonstration and the warranty period shall be replaced by the Contractor.

D. Provide spare parts for items of control and instrumentation equipment as recommended by the manufacturer and in accordance with the Contract Documents. The instrumentation and control system supplier shall furnish a spare parts list with item descriptions, model numbers, local distributors, and prices.

E. Furnish all spares in moisture-proof boxes designed to provide ample protection for their contents. Label all boxes to clearly identify contents and purpose.

F. Refer to individual product specifications for additional requirements specific to those devices.

G. Provide 3 of each type of power TVSS device used, 5 of each type of signal TVSS device used, and 3 of each type of communication TVSS device used.

2.3 SIGNAL COORDINATION

A. The Contractor shall be responsible for coordinating signal types and transmission requirements between the various parties providing equipment under this Contract. This shall include, but not be limited to, distribution of appropriate shop drawings among the equipment suppliers, the electrical subcontractor, the HVAC subcontractor, and the Instrumentation and Control Supplier.

B. The Contractor shall provide 24 V power supplies for signals and instruments where applicable and as required inside panels, controls, etc. Where two-wire instruments transmit directly to the instrumentation and control system, the Instrumentation and Control Supplier shall provide power supplies at the PLC-equipped control panels for

those instruments. Where four-wire instruments with on-board loop power supplies transmit directly to the instrumentation and control system, the instrumentation subcontractor shall provide necessary signal isolators or shall otherwise isolate the input from the Control and Information System loop power supply. Similar provisions shall be made when a third element such as a recorder, indicator or single loop controller with integral loop power supply is included in the loop.

C. Analog signal transmission between electric or electronic instruments, controllers, and all equipment and control devices shall be individually isolated, linear 4-20 milliamperes and shall operate at 24 volts D.C. Signal output from all transmitters and controllers shall be current regulated and shall not be affected by changes in load resistance within the unit's rating. All cable shields shall be grounded at one end only, at the control panel, with terminals bonded to the panel ground bus. Analog signal isolation and/or conversion shall be provided where necessary to interface with instrumentation, equipment controls, panels and appurtenances.

D. Non-standard analog transmission systems such as pulse duration, pulse rate, and voltage regulated shall not be permitted except where specifically noted in the Contract Documents. Where transmitters with nonstandard outputs do occur, their outputs shall be converted to an isolated, linear, 4-20 milliampere signal.

E. All discrete inputs to equipment and Control and Information System PLCs, from field devices, starters, panels, etc., shall be dry contacts in the field device or equipment, powered from the PLCs, unless specified otherwise. Sensing power (wetting voltage) supplied by the PLC shall be 24 VDC.

F. All discrete outputs from local control panels and Control and Information System PLCs to field devices, starters, panels, etc., shall be 120 VAC / 28 VDC 5A dry contacts powered from the field equipment unless specified or shown otherwise.

G. Discrete signals between starters, panels, etc. where 120 VAC is utilized shall be clearly identified in the starter, panel, etc. as being powered from a different power supply than other starter/panel components. Where applicable, warning signs shall be affixed inside the starter, panel, etc. stating that the panel is energized from multiple sources. Output contacts in the starter, panel, etc. which are powered from other locations shall be provided with special tags and/or color coding. Disconnecting terminal strips shall be provided for such contacts. The above requirements shall apply to all starters and panels, regardless of supplier.

2.4 CONTROL AND INTERPOSING RELAYS

A. In general, relays shall be din rail mounted plug in style relays supplied with 24 VDC coils and at a minimum, DPDT contacts rated at 5 A, 120 VAC or 28 VDC. Where required for a specific function, relays may be provided with 120 VAC coils. Relays with 24 VDC coils shall have different sockets than 120 VAC coil relays.

B. Relays shall be provided with clips for attachment to sockets and indicator lights, which glow when the relay coil is powered.

C. Relays shall be as manufactured by Square D, Allen Bradley, Potter and Brumfield, or equal.

2.5 TRANSIENT VOLTAGE SURGE SUPPRESSORS (TVSS's)

A. Transient voltage surge suppressors shall be provided at the following minimum locations:

1. At any connections between ac power and electrical and electronic equipment, including panels, assemblies, and field mounted analog transmitters.

2. At both ends of all analog signal circuits that have any portion of the circuit extending outside of a protecting building.

3. At both ends of all copper-based communications cables which extend outside of a building.

B. Panel-mounted signal circuit protectors shall be of the type that is made for mounting on a terminal block rail. Each TVSS shall include a moveable grounding link to allow each signal cable shield to be individually grounded to the panel via the mounting rail through the TVSS for that cable without the use of any additional grounding wire, or to be isolated from ground at the TVSS. Each such mounting rail shall be grounded to the panel by the use of rail mounting screws at approximately one-foot intervals. Protection shall be from line to line and from each line to ground. Protection shall also be from shield to ground where the shield is not grounded at the protector. Each TVSS shall have the ability to protect against surge currents greater than 10,000 amperes. Each TVSS shall add no more than 22 ohms per signal wire to the total signal loop resistance of the analog signal loop in which it is installed. TVSSs shall not introduce error-producing ground loop currents into the instrumentation signal circuits.

C. Signal circuit TVSS for field instruments shall also be the same as those described above for mounting in panels and shall be mounted within the field instrument enclosures or housings where practical. Where such mounting is not practical, then these TVSSs shall be mounted in NEMA 4X enclosures located at the field devices.

D. Signal circuit TVSS shall be Innovative Technology, Inc. Protector Data Model Series or approved equal.

E. AC line TVSSs shall be mounted inside of the equipment's enclosure where practical. In other locations, the TVSS shall be mounted immediately adjacent to the protected device in a NEMA 4X enclosure. Each TVSS shall have the capability to withstand repeated surge currents of at least 20,000 amps peak at 8 x 20 microsecond wave. Performance shall be equal and reliable for surges of either polarity.

F. AC line TVSSs shall be Innovative Technology, Inc. Protector Model HS single-phase, rated 120V, 60 hertz.

PART 3 EXECUTION

3.1 FACTORY TESTING

A. A system test on the instrumentation and control system panels shall be performed by the system supplier. This shall be a functional test and shall demonstrate that:

1. All analog indicators, recorders, controllers, arithmetic modules, signal converters, isolators, etc., are properly calibrated and that they function properly.

2. All panel equipment is connected to the proper terminals for connection to field equipment and to other panels and equipment.

B. A certified letter from the system supplier stating that the instrumentation and control system panels factory tests have been successfully completed must be received by the Owner/Engineer prior to shipment of the equipment to the job site.

3.2 INSTALLATION

A. The Instrumentation Subcontractor shall provide the Contractor a periodic written report detailing progress of startup. This report shall include specific tabulations of devices on which start-up has been completed.

B. No form of energy shall be turned on to any part of the instrumentation system prior to receipt by the Engineer of a certified statement of approval of the installation from the Contractor containing his system supplier's authorization for turning on energy to the system.

C. All wiring, tubing, controls, motors switches, alarms, components, analyzers, and accessories shall be of the size and installed per the manufacturer's recommendations.

D. Contractor shall coordinate work of the system manufacturer's service personnel during construction, testing, calibration, and acceptance of the instrumentation.

E. All components shall be tagged with the item number and nomenclature given in the Specifications and component tabulation lists.

F. Equipment shall be located so that it is accessible for operation and maintenance. The Instrumentation Subcontractor shall examine the Contract Drawings and Shop Drawings for various items of equipment in order to determine the best arrangement for the work as a whole, and shall supervise the installation of process instrumentation supplied under this Division.

G. Electrical work shall be performed in compliance with all applicable local codes and practices. Where these specifications and the Contract Drawings do not delineate precise installation procedures, API RP550 shall be used as a guide to installation procedures.

H. Field equipment shall be wall mounted or mounted on 2-inch-diameter aluminum pipe stands welded to a 10-inch square 1/2-inch-thick aluminum base plate unless shown adjacent to a wall or otherwise noted. Instruments attached directly to concrete shall be spaced out from the mounting surface not less than 1/2-inch by use of phenolic spacers. Expansion anchors in walls shall be used for securing equipment or wall supports to

concrete surfaces. Unless otherwise noted, field instruments shall be mounted between 48 and 60 inches above the floor or work platform.

1. Embedded pipe supports and sleeves shall be Schedule 40, Type 316 stainless steel pipe, ASA B-36.19, with stainless steel blind flange for equipment mounting as shown on the Contract Drawings.

2. Materials for miscellaneous mounting brackets and supports shall be 316 stainless steel construction.

3. Transmitters shall be oriented such that output indicators are readily visible.

I. Electrical, control and signal wiring connections to transmitters and elements mounted on process piping or equipment shall be made through liquid-tight flexible conduit. Conduit seals shall be provided where conduits enter all field instrument enclosures and all cabinetry housing electrical or electronic equipment.

3.3 WIRING AND GROUNDING

The following wiring practice guidelines shall be used in order to minimize ground loops, to minimize electromagnetic interference/radio frequency interference (EMI/RFI) to this equipment, and to provide maximum practical immunity from damage resulting from lightning-induced transients.

A. Common wires or conductors shall not be utilized (either within panels or external to panels or for grounding of field devices) for both signal shield or signal grounding and for safety grounds.

B. Exposed wire lengths extending from within shielded signal cables shall be minimized to reduce pick-up of EMI/RFI by signal circuits. Exposed lengths of less than one inch are preferred, and a maximum exposed length of two inches may be permitted where necessary. No splicing of signal wires is permitted.

C. All signal wiring shall be shielded, both within panels and external to panels. Unless otherwise specified, all signal wiring shall be No. 16 AWG stranded tinned two-conductor twisted pair, with 100 percent coverage aluminized Mylar or aluminized polyester shield and tinned copper drain wire.

D. Signal wiring within outdoor or indoor field device enclosures shall conform to the same requirements as panel wiring.

E. Each signal cable shield shall be grounded at only one point, as indicated on the instrumentation system drawings. In general, grounding of signal cable shields shall be done at the control panel end. The signal cable for no signal shall share a common cable shield grounding wire with the signal cable shield for any other signal, and shall not share a common grounding wire with any other circuit. The length of no signal cable shield grounding wire shall not exceed two inches, with less than one-inch maximum length preferred.

F. TVSS shall be mounted in control panels, field termination panels, or in outdoor instrument enclosures and shall be directly and individually grounded to the metal of the

cabinet or enclosure. Where outdoor instrument enclosures are not metal, a common ground shall be established within the enclosure for lightning protection and for safety grounding either by the use of a metal grounding plate or by a heavy wire.

G. All outdoor instruments and all outdoor enclosures shall be grounded using the practice defined in Section 800-31 of the National Electric Code.

3.4 CALIBRATION AND TESTING

A. The Instrumentation Subcontractor shall comply with the requirements of Section 13400 and all instrumentation and control system calibration, tests, and inspection requirements for all instrumentation and controls provided under this Contract and specified herein. The Engineer, or his designated representative(s), reserve the right to witness any test, inspection, calibration or start-up activity. Acceptance by the Engineer of any plan, report or documentation relating to any testing or commissioning activity specified herein shall not relieve the Contractor of his responsibility for meeting all specified requirements.

B. At least 7 days before the anticipated initiation of installation testing, the Contractor shall submit to the Engineer and Owner a detailed description, in duplicate, of the installation tests to be conducted to demonstrate the correct operation of the instrumentation supplied hereunder.

C. The Subcontractor shall provide the services of factory trained technicians, tools and equipment to field calibrate, test, inspect and adjust each instrument to its specified performance requirement in accordance with manufacturer's specifications and instructions. Any instrument which fails to meet any contract requirements, or any published manufacturer performance specification for functional and operational parameters, shall be repaired or replaced, at the discretion of the Engineer, at no cost to the Owner. The Contractor shall bear all costs and provide all personnel, equipment and materials necessary to implement all installation tests and inspection activities for equipment specified herein.

D. Each instrument shall be calibrated at 0, 25, 50, 75 and 100 percent of span using test instruments to simulate inputs and read outputs. Test instruments shall be rated to an accuracy of at least five (5) times greater than the specified accuracy of the instrument being calibrated. Where applicable, such test instruments shall have accuracies as set forth by the National Institute for Standards and Technology (NIST).

E. The Instrumentation Subcontractor shall provide a written calibration sheet to the Engineer for each instrument, certifying that it has been calibrated to its published specified accuracy. The Contractor shall submit proposed calibration sheets for various types of instruments for Engineer approval prior to the start of calibration. This sheet shall include but not be limited to date, instrument tag numbers, calibration data for the various procedures described herein, name of person performing the calibration, a listing of the published specified accuracy, tolerance, defect noted, corrective action required and corrections made.

F. If doubt exists as to the correct method for calibrating or checking the calibration of an instrument, the manufacturer's printed recommendations shall be used as an acceptable standard, subject to the approval of the Engineer.

G. Upon completion of calibration, devices calibrated hereunder shall not be subjected to sudden movements, accelerations, or shocks, and shall be installed in permanent protected positions not subject to moisture, dirt, and excessive temperature variations. Caution shall be exercised to prevent such devices from being subjected to overvoltages, incorrect voltages, overpressure or incorrect air. Damaged equipment shall be replaced and recalibrated at no cost to the Owner.

H. After completion of instrumentation installation and calibration, the Instrumentation Subcontractor shall perform a loop check. The Contractor shall submit final loop test results with all instruments listed in the loop. Loop test results shall be signed by all representatives involved for each loop test.

I. The entire system shall be field tested in the presence of a representative of the Owner to demonstrate that the system properly performs the functions defined in this Specification and in the Engineer's drawings. A check-off list shall be used on which each instrumentation loop is "signed off" by both the instrumentation and control system supplier and the authorized representative of the Owner as that loop is verified to be operating correctly as installed.

3.5 TRAINING

A. The instrumentation and control system supplier shall provide project specific classroom training with manuals for all attendees at the Owners site or designated location. The Owner shall be provided with a DVD of each training session for future viewing. Training manuals shall be provided on CD in Microsoft Word format.

B. Training shall be provided for the operation and maintenance of all equipment provided as well as site specific installation configuration training for the system as a whole.

1. Operator training shall be provided to familiarize operators with the system as a whole and to instruct on the function and operation of each component on the system. Training shall consist of the day-to-day operation of the system and all other operator site specific functions for this project. Instruction shall include a site walk-down of installed equipment. One course lasting a minimum of 1 day with 8 hours of instruction per day shall be provided by the instrumentation and the SCADA subcontractor.

2. Maintenance training shall be provided to maintenance personnel so that each component may be maintained without the assistance of outside organizations. The training shall be extensive so that after training personnel shall be able to identify component malfunctions and repair components to the board replacement level. One course lasting a minimum of 1 days with 8 hours of instruction per day shall be provided by the instrumentation and the SCADA subcontractor.

3. Refer to related specification sections for additional training requirements.

3.6 WARRANTY

A. The warranty period for this system shall be for 1 year and shall begin upon acceptance of the system by the Owner. During this warranty period, the system supplier shall provide, at no additional cost to the Owner, the services of a trained, competent field service engineer who shall arrive on site within 72 hours of notification by the Owner or Engineer, to repair and/or replace any faulty device or equipment supplied by the system supplier as part of this instrumentation system.

B. The system supplier shall be capable of providing, after the warranty period for this system, a 1-year, renewable service contract whereby a trained, competent field service engineer shall arrive on site within 72 hours of notification by the Owner. Information relative to charges for such service and availability of such service shall be provided to the Owner and the Engineer.

C. Components shall be furnished to the manufacturer's standard for service intended unless otherwise indicated in the Specifications or on the Contract Drawings.

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SECTION 13410

INSTRUMENTATION AND CONTROL FUNCTIONAL CONTROL DESCRIPTIONS

PART 1 GENERAL

1.1 SCOPE

A. The scope includes the integration of new blower systems and the proper incorporation of all existing instrumentation into the SCADA system to ensure a robust, fully functional, and user-friendly control environment.
B. The Contractor shall furnish, test, install, and place into satisfactory operation all equipment as specified herein and as shown on the Contract Drawings. The Contractor is responsible for providing complete, fully functioning systems that meet the functional requirements described herein and are consistent with the Contract Drawings.
C. The functional control descriptions herein detail the requirements for providing and installing all necessary labor and materials, even those that may not be explicitly detailed elsewhere in the contract documents. The goal is to achieve a more robust and user-friendly SCADA system that enhances operational efficiency and control.
D. All interconnected wiring between instruments, panels, controls, and other devices required to achieve the functions specified in these descriptions shall be provided by the Electrical Contractor under Division 16. The Electrical Contractor shall supply all necessary cable and conduit required to carry all signals specified in Section 13480, “Instrumentation and Control Schedules.” Special cables required for interconnection between sensors or probes and transmitters shall be provided with the instrumentation devices by the equipment supplier.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- Section 13400: “Instrumentation and Control General Requirements”
- Section 13420: “Instrumentation and Control Field Instruments”
- Section 13430: “Instrumentation and Control Enclosures and Control Panels”
- Section 13450: “Instrumentation and Control Supervisory Control and Data Acquisition Hardware”
- Section 13480: “Instrumentation and Control Schedules”

1.3 SUBMITTALS

A. The Contractor shall provide submittals as specified in Section 13400, “Instrumentation and Control General Requirements.” Additionally, the following specific submittals shall be provided:
    a. A comprehensive functional control description detailing how the Contractor plans to implement the functional requirements specified herein. The description shall be in a detailed narrative format that fully explains how the equipment provided functions and operates, including any additional functionalities not explicitly specified but necessary for complete system integration. This narrative should be clear and thorough enough to guide a plant operator in operating the equipment using the SCADA system and/or control panels provided under this section.

PART 2 PRODUCTS

2.1 DEFINITIONS

A. RUNNING Status Signals: Signals derived from auxiliary contacts provided with motor control equipment (e.g., starter, VFD, SCR).
B. AUTO Status Signals: Defined as the HAND-OFF-AUTO switch in the AUTO position or the process control system in AUTO mode.
C. FAIL Status Signals: Defined as motor overload conditions and/or any other shutdown mode such as over-torque, over-temperature, low oil pressure, high vibration, etc.
D. REMOTE Status Signals: Defined as the LOCAL-OFF-REMOTE switch in the REMOTE position.
E. Acronyms:

1. MCC: Motor Control Center
2. MOG: Motor Operated Gate
3. MOV: Motor Operated Valve
4. OIU: Operator Interface Unit
5. OWS: Operator Workstation
6. PID: Proportional Integral Derivative Control
7. PLC: Programmable Logic Controller
8. DCU: Distributive Control Unit
9. SCADA: Supervisory Control And Data Acquisition

2.2 CONVENTIONS

A. All Operator Workstation (OWS) graphics and indicator lights on MCCs, control panels, starter enclosures, etc., shall conform to the following color conventions:
    1. Running/On/Open: Green
    2. Auto/Ready: White
    3. Stopped/Off/Closed: Red
    4. Fail/Alarm: Amber
    5. Generic Status: Blue or White

2.3 PROCESS CONTROL

A. All setpoints, operating limits, and control settings specified in the functional control descriptions are initial settings only and shall be adjustable based on actual operating conditions. The instrumentation subcontractor shall make all necessary adjustments to provide smooth, stable operation without additional cost to the Owner.
B. The PLC logic shall include provisions to suppress nuisance alarms and control actions through adjustable time delays and deadbands:
    1. For alarms and control actions derived from analog input signals, use adjustable time delays and deadbands. Initial settings for time delays shall be 10 seconds (range 0-120 seconds). Initial settings for deadbands shall be 5% of span (range 0-100%).
    2. For alarms and control actions derived from discrete input signals, use adjustable time delays. Initial settings for delays shall be 10 seconds (range 0-120 seconds).
C. All setpoints, sequence times, sequence orders, deadbands, PID tuning parameters, PLC delay timers, variable speed operating range limits, and similar control constants shall be accessible and adjustable from the Operator Workstations.

D. All PLC-controlled equipment shall be provided with adjustable start and stop delays in the PLC control logic (range 0-300 seconds, initial: 15 seconds).
E. The PLC shall automatically restart after a power failure and return to normal control mode upon power restoration.

2.4 SCADA SYSTEM

A. The SCADA system shall consist of a new central SCADA server and existing PLCs, sensors, and LCPs currently integrated into the existing SCADA system. The new system shall communicate over a data highway network, utilizing a new fiber optic backbone to connect the North Plant Blower PLC, Filtration PLC, and SCADA systems.
B. The SCADA integrator shall be responsible for creating all new SCADA screens using the existing SCADA system as a data source. All functionality and control currently available in the existing SCADA system must be fully replicated and integrated into the new system to ensure a seamless transition.
C. Operator Workstations (OWS) shall be connected to the plant's existing local area network via Ethernet. All required network interfaces and devices shall be provided to ensure proper communication between OWSs and the SCADA server.

2.4.1 Screen Design Requirements:

The SCADA screens shall be designed to provide a clean, professional, and modern interface that allows operators to easily identify equipment and processes. The screens shall be organized to avoid clutter and ensure easy navigation. The following process overview screens shall be provided:

1. Electrical Distribution
    a) Generator
        - i. ATS 1 Status
        - ii. ATS 2 Status
        - iii. Grid Status
2. Liquid Process Overview
    a) Headworks Overview
        1. Plant Influent Flow East & West Train
        2. Plant Influent Flow North Train
        3. Influent Screens
        4. Pinch Valve and Operations
    b) EQ Tank Status and Overview
        1. East EQ Tank
        2. Pump Status & Controls
        3. Level
        4. West EQ Tank
        5. Pump Status & Controls
        6. Level
        7. North EQ Tank
        8. Pump Status & Controls
        9. Level
    c) East Tank Treatment Train
        1. EQ Tank Level

2. Aeration DO Level and Blower Assigned
3. Anoxic Zone with Mixer and ORP
4. Re-Aeration Zone
5. Clarifier with Drive Status
6. Digester

d) West Tank Treatment Train
1. EQ Tank Level
2. Aeration DO Level and Blower Assigned
3. Anoxic Zone with Mixer and ORP
4. Re-Aeration Zone
5. Clarifier with Drive Status
6. Digester

e) North Tank Treatment Train
1. EQ Tank Level
2. Aeration DO Level and Blower Assigned
3. Anoxic Zone with Mixer and ORP
4. Re-Aeration Zone
5. Clarifier with Drive Status
6. Digester

f) Filtration System
1. Shows All Filter Cells
2. Shows Backwash Pumps
3. Shows Backwash Cycle Valve Control as Currently Shown in Existing System
4. Shows Chlorine Contact System
5. Shows CL17 Chlorine Residual and is Settable

g) Injection Well & Reuse System Plant Effluent Overview
1. Injection Wells
2. Reuse Pump System Status
3. Shows CL17 Chlorine Residual and is Settable

h) Stand Alone Clarifier
1. Clarifier Drive System

i) Chemical Feed System
1. Shows All Chemical Pumps, Their Chemicals, and Their Status
2. Settable Dosing Rate for Each Pump
3. ORP Displayed Here for the 3 Tanks in Addition to On the Tanks
4. CL17 Data for Each CCC Displayed Here for Setting Dosage

j) Mudwell System
1. Pumps & Status

k) North Tank Blowers
1. Shows All Blowers and Set Points
2. Shows North Tank DO

l) East & West Blowers
1. Shows All Blowers and Set Points
2. Shows East Tank DO
3. Shows West Tank DO

3. SCADA System
a) Additional screens may be required to accommodate screen space constraints and ensure effective graphic organization.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. All control system work, including installation, programming, integration, and testing, shall be performed by a qualified SCADA integrator approved by the Owner prior to construction. The SCADA integrator must demonstrate experience with similar wastewater treatment projects and provide references upon request.
B. The SCADA integrator shall coordinate with the Owner and other contractors to ensure seamless integration of all new and existing systems.
C. The SCADA integrator shall attend two mandatory controls meetings prior to implementation:
    1. Initial Controls Meeting: To review project requirements, existing system capabilities, proposed control strategies, integration points, and responsibilities of all parties.
    2. Pre-Implementation Controls Meeting: To finalize the control strategy, review changes or updates, confirm installation procedures, discuss commissioning and start-up plans, and address any remaining questions or concerns.

3.2 INSTALLATION AND INTEGRATION

A. The SCADA integrator shall install all control panels, wiring, and related equipment in accordance with the approved drawings and specifications. All installations must comply with applicable codes and standards.
B. The integrator shall ensure all new equipment is properly interfaced with the SCADA system, including integration of all alarms, status indications, and control points as specified.
C. All programming and configuration shall be performed by certified personnel with specific experience in wastewater treatment processes and SCADA systems.
D. All testing and commissioning of control systems shall follow the procedures outlined in Section 13450, Part 3, Section 3.2 - Testing.

3.3 COMMISSIONING AND START-UP

A. The SCADA integrator shall develop a comprehensive commissioning plan for approval by the Owner prior to any commissioning activities. The plan shall include pre-functional checklists, functional performance tests, and integration tests.
B. Commissioning shall be performed in the presence of the Owner or Owner’s Representative, and all findings and corrective actions shall be documented in a commissioning report.
C. The integrator shall provide start-up assistance to ensure the system operates correctly under normal and emergency conditions.

3.4 DOCUMENTATION AND TRAINING

A. The SCADA integrator shall provide comprehensive documentation, including as-built drawings, control system schematics, equipment manuals, and programming documentation.
B. Training shall be provided for the Owner’s staff on all new systems and equipment, including operation, troubleshooting, and routine maintenance.

3.5 WARRANTY AND SUPPORT

A. The SCADA integrator shall provide a warranty on all equipment, materials, and workmanship for a period of one (1) year from the date of final acceptance by the Owner. During the warranty period, the integrator shall provide support to address any defects or issues related to the installation, programming, or integration of the control systems at no cost to the Owner
B. The integrator shall respond to any warranty-related issues within 24 hours of notification and provide a corrective action plan within 48 hours.
C. The SCADA integrator shall also provide a maintenance contract for a period of two (2) years, starting from the date of final completion, covering both existing and new systems. This maintenance contract shall include:
    1. A clause allowing for the extension of the contract beyond the initial two-year period, should the Owner request it. The terms, including pricing, may be renegotiated at the time of extension.
    2. A minimum of two (2) scheduled trips per year to the site to perform preventative maintenance, address any issues, and ensure the continued proper operation of all systems.
    3. An emergency response clause that entitles the Key West Resort Utilities (KWRU) to immediate assistance from the SCADA integrator in the event of a major system failure. The integrator shall provide a defined response time for emergency support and shall prioritize the restoration of system functionality in such cases.
D. The SCADA integrator shall provide options for ongoing support and maintenance services post-warranty, which may be contracted separately by the Owner.

3.6 HOUSEKEEPING AND SAFETY

A. The SCADA integrator shall maintain a clean and safe work environment at all times and comply with all OSHA standards and safety regulations.

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SECTION 13430

INSTRUMENTATION AND CONTROL, ENCLOSURES AND CONTROL PANELS

PART 1 GENERAL

1.1 SCOPE

The Contractor shall furnish, test, install and place in satisfactory operation all equipment required to provide a complete and operable instrumentation and control system as specified herein and as shown on the Contract Drawings, even if each needed item is not specifically specified or shown.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- Section 13400, “Instrumentation and Control, General Requirements.”
- Section 13410, “Instrumentation and Control, Functional Control Descriptions.”
- Section 13420, “Instrumentation and Control, Field Instrumentation.”
- Section 13450, “Instrumentation and Control, Supervisory Control and Data Acquisition.”
- Section 13480, “Instrumentation and Control, Schedules.”

1.3 SUBMITTALS

A. The Contractor shall provide submittals as specified in Section 13400, “Instrumentation and Control, General Requirements.” In addition, the following specific submittals items shall be provided.

B. Cabinet sizing in relation to heat dissipation and cooling / heating system sizing calculations shall be submitted for all cabinets containing SCRs, VFDs, PLCs, UPSs, and at the request of the Engineer for all cabinets containing sensitive electronic equipment or chemicals.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Enclosures and panels shall be formed or welded construction, reinforced with Unistrut, Powerstrut, or equal to facilitate mounting of internal components or equipment. Sufficient access plates and doors shall be provided to facilitate maintenance and testing of the supplier's equipment. Doors shall be removable. Cabinets and panels with any dimension 36 inches or greater shall be provided with removable lifting lugs designed to facilitate safe moving and lifting of the panel during installation.

B. Cabinets and panels shall be prefabricated cabinets and panels by Hoffman, Rittal, or Vynckier. The Contractor may optionally provide cabinets custom fabricated by the Contractor or by a reputable panel fabrication shop acceptable to the Engineer.

C. All cabinets and panels with any dimension 24 inches or larger shall be provided with drawing pockets for as-built panel drawings. One vellum copy of the appropriate panel as-built drawings shall be furnished and left in the pocket of each panel.

D. The cabinet itself and all interior and exterior equipment shall be identified with nameplates. The equipment shall be mounted such that service can occur without removal of other equipment. Panel mounted equipment shall be flush or semi-flush mounted with flat black escutcheons. All equipment shall be accessible such that adjustments can be made while the equipment is in service and operating. All enclosures shall fit within the allocated space as shown on the Contract Drawings.

E. Enclosures shall provide mounting for UPS, power supplies, control equipment, input / output subsystems, panel mounted equipment and appurtenances. Ample space shall be provided between equipment to facilitate servicing and cooling. Enclosures shall be sized to adequately dissipate heat generated by equipment mounted inside the panel. Louvered openings fitted with dust filters near the bottom and top of the cabinet shall be provided for NEMA 12 enclosures. If required, cabinets shall be provided with filtered fans, heat exchangers, or air conditioners. Only closed loop cooling systems shall be provided for NEMA 4X cabinets. Cooling systems shall be by the cabinet fabricator, McLean Midwest, or approved equal.

F. Terminal blocks shall be assembled on non-current carrying galvanized steel DIN mounting rails securely bolted to the cabinet subpanel. Terminals shall be of the screw down pressure plate type as manufactured by Phoenix Contact, Wieland, Square D, or equal. Power terminal blocks shall be single tier with a minimum rating of 600 volts, 30 amps. Signal terminal blocks shall be single tier with a minimum rating of 600 volts, 20 amps. Terminals shall be marked with a permanent, continuous marking strip. One side of each terminal shall be reserved exclusively for field incoming conductors. Common connections and jumpers required for internal wiring shall not be made on the field side of the terminal.

G. Wiring shall comply with accepted standard instrumentation and electrical practices. Power, control and signal wiring shall comply with Division 16 of the specifications. For each pair of parallel terminal blocks, the field wiring shall be between the blocks.

H. All wiring shall be bundled and run open or enclosed in vented plastic wireway as required. All conductors run open shall be bundled and bound at regular intervals, not exceeding 12 inches, with nylon cable ties. Care shall be taken to separate electronic signal, discrete signal, and power wiring. A copper ground bus shall be installed in each cabinet.
   1. Wires shall be color coded as follows:
      - Equipment Ground - GREEN
      - 120 VAC Power - BLACK
      - 120 VAC Power Neutral - WHITE
      - 120 VAC Control (Internally Powered) - RED
      - 120 VAC Control (Externally Powered) - YELLOW
      - 24 VAC Control - ORANGE
      - DC Power (+) - RED
      - DC Power (-) - BLACK
      - DC Control - BLUE
      - Analog Signal (+) - BLACK
      - Analog Signal (-) - WHITE

I. Enclosures shall be provided with a main circuit breaker and a circuit breaker on each individual branch circuit distributed from the panel. Main breaker and branch breaker sizes shall be coordinated such that an overload in a branch circuit will trip only the branch breaker but not the main breaker.

J. Enclosures with any dimension larger than 36 inches shall be provided with 120-volt duplex receptacles for service equipment and fluorescent service lights. If the cabinet is supplied with transient voltage surge suppression, receptacles and lighting shall be connected ahead of the TVSS device.

K. All steel enclosures shall be free from dirt, grease, and burrs and shall be treated with a phosphatizing metal conditioner before painting. All surfaces shall be filled, sanded, and finish coated by spraying a 1-2 mil epoxy prime coat and smooth, level, high grade textured finish between flat and semi-gloss shine. The colors shall be selected by the Owner from a minimum of six color samples provided.

L. Materials and equipment used shall be U.L. approved wherever such approved equipment and materials are available. All control panels shall be U.L. labeled.

2.2 TOOLS, SUPPLIES, AND SPARE PARTS

Tools, supplies and spare parts shall be provided as specified in Section 13400 - Instrumentation and Control, General Requirements and as specified for each equipment item. In addition, the following items shall be provided.

A. One of each type of panel mounted equipment (i.e., indicators, signal converters, etc.) provided under this Contract.

B. Five of each type of interposing relay provided under this Contract.

2.3 OUTDOOR ENCLOSURES

A. All outdoor enclosures shall be NEMA 4X constructed of stainless steel, unless specified otherwise. Outdoor enclosures shall have a hinged and gasketed door. Door latches shall be all stainless steel, fast operating clamp assemblies, which do not require bolts or screws to secure. Gaskets shall be polyurethane.

B. Outdoor panels shall be fitted with padlockable latch kits.

C. Outdoor enclosures with internal digital electronics, exterior indicators, or exterior indicator lights shall have external sun shields or sun shades constructed of the same materials as the associated enclosure, unless otherwise specified.

D. Outdoor enclosures shall be designed to for ambient conditions of -15 to 50° C and 20 to 95% relative humidity, unless otherwise specified. Outdoor enclosures shall be provided with thermostatically controlled space heaters to provide condensation protection.

2.4 INDOOR ENCLOSURES

A. Indoor enclosures located in the same area (i.e. room, etc.) as open process tanks, open process channels, closed process piping, or process equipment containing wet liquids or possible airborne powders shall be NEMA 4X stainless steel, unless specified otherwise. Enclosures shall have a hinged and gasketed door. Door latches shall be all stainless steel, fast operating clamp assemblies which do not require bolts or screws to secure. Gaskets shall be polyurethane. Non-potable water may be excluded from closed process piping when considering enclosure NEMA rating.

B. Indoor enclosures located in a dry area (i.e. electrical room, etc.) shall be NEMA 12, unless specified otherwise. Enclosures shall have a hinged and gasketed door. Door latches shall be 3 point door latch with handle for all enclosures with a dimension of 24" or larger or otherwise shall be fast operating clamp assemblies which do not require bolts or screws to secure. Gaskets shall be polyurethane.

C. Indoor enclosures in a non-air conditioned space shall be designed to for ambient conditions of 0 to 40° C and 20 to 95% relative humidity, unless otherwise specified. Indoor enclosures in an air conditioned space shall be designed to for ambient conditions of 50 to 30° C and 20 to 90% relative humidity, unless otherwise specified.

2.5 PLC, RTU, AND CONTROL PANEL ENCLOSURES

A. Enclosures shall be sized to provide a minimum of 20% spare subpanel mounting space for future equipment.

B. A minimum of 15% spare terminals shall be mounted within each panel.

C. Outdoor panels shall be provided with thermal insulation and thermostatically controlled space heaters to provide condensation protection.

D. Panels with any dimension greater than 36 inches which contain a programmable controller (PLC) shall be provided with a folding laptop programmer shelf on the inside of the door.

E. NEMA 12 enclosures shall be provided with filtered louvered openings at the top and bottom of the cabinet.

2.6 DIGITAL INDICATORS

Digital indicators shall be 3.5 or 6 digit, as appropriate, with 0.56-inch-high red LED display easily viewed under all types of lighting. Indicators shall be provided with nameplate and scale calibrated to match the calibration of the primary element. The unit shall be designed primarily for use with 4-20 mA current loop signal circuits. Where required, a regulated and isolated 24 V excitation power supply shall be provided. Indicators shall be Red Lion Model IMP or APLCL, or approved equal.

2.7 TOTALIZERS

A. Totalizing counters shall be provided for flush panel, spring-clip mounting. Totalizing counters shall contain eight digits. Height of the digits shall not be less than 5/32-inch. Numerals shall be shall be easily viewed under all types of lighting. The counter shall be rear panel resettable and shall be totally compatible for operation on the pulses supplied by the associated instrument or integrator. The totalizing counter shall be capable of a maximum count rate of 25 counts/second.

B. Legend plates shall be provided for each of the totalizing counters with white letters on a black background with legends as specified below.

C. Totalizing counters shall be manufactured by Kessler-Ellis, or equal.

2.8 ACCESSORIES

A. Control operators such as pushbuttons (PB), selector switches (SS), and pilot lights (PL) shall be Cutler-Hammer/Westinghouse Type E34, Square D Company Type SK, or equal. Control operators shall be 30.5 mm, round, heavy-duty, oil tight NEMA 4X corrosion resistant.

B. Pushbuttons and selector switches shall be non-illuminated, spring release type. Pushbuttons shall include a full guard. Panic stop/alarm pushbuttons shall be red mushroom type with manual-pull release. Pilot lights shall be of the proper control voltage, LED type (indoor) and lamp type (outdoor).

C. Control operators shall have legend plates as specified herein, indicated on the Contract Drawings, or otherwise directed by the Engineer. Legend plates shall be plastic, white field (background) with black lettering. Engraved nameplates shall be securely fastened above each control operator. If adequate space is not available, the nameplate shall be mounted below the operator.

D. Control operators for all equipment shall be as specified herein and of the same type and manufacturer unless otherwise specified or indicated on the Contract Drawings.

E. Alarm horns shall be general purpose type, flush panel mount, 115 VAC power supply or 24 VDC power supply, suitable for indoor or weatherproof service, as required. Volume shall be adjustable.

F. Where required to interface between motor control centers, equipment controls, and control panels, interposing relays and associated control wiring circuitry shall be furnished and installed to provide the monitoring and/or control functions specified herein. Interposing relays shall be miniature type, DPDT, minimum 10 amp, 120 VAC contact rating. Relay coils shall be 120/240 VAC or 24 VDC as required. Relays shall be as manufactured by Square D, Potter & Brumfield, Allen-Bradley, or equal.

PART 3 EXECUTION

3.1 REQUIREMENTS

In addition to the requirements specified in this section, refer to Section 13400 - Instrumentation and Control, General Requirements.

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SECTION 13450

INSTRUMENTATION AND CONTROL SUPERVISORY CONTROL AND DATA ACQUISITION HARDWARE

PART 1 GENERAL

1.1 SCOPE

A. The scope includes the integration of new blower systems and the proper incorporation of all existing instrumentation into the SCADA system to ensure a robust, fully functional, and user-friendly control environment.

B. The Contractor shall furnish, test, install, and place into satisfactory operation all SCADA hardware and software required to provide a complete and operable instrumentation and control system as specified herein and as shown on the Drawings, even if each needed item is not specifically specified or shown. The Contractor shall install a new DCU and Ethernet fiber optic network.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- Section 13400: “Instrumentation and Control General Requirements.”
- Section 13410: “Instrumentation and Control Functional Control Descriptions.”
- Section 13420: “Instrumentation and Control Field Instrumentation.”
- Section 13430: “Instrumentation and Control Enclosures and Control Panels.”
- Section 13480: “Instrumentation and Control Schedules.”

1.3 SUBMITTALS

A. The Contractor shall provide submittals as specified in Section 13400, “Instrumentation and Control General Requirements.” Additionally, the following specific submittals shall be provided:

- PLC/DCU discrete input/output lists and cross-references with multi-character alphanumeric functional identification printed above each respective input or output in the program listing. Each input or output shall be cross-referenced to each rung number where the input or output was used. Internal coils used for PLC ladder logic shall be cross-referenced in the same manner.
- PLC/DCU data register listing with program locations, values, and cross-references.
- PLC/DCU ladder diagram rung components shall be used to identify, annotate, and segment the program into subprograms.
- Annotated PLC/DCU ladder diagram listing with timers, counters, add and subtract, move, master control relay, and jump functions and their programmed values. Ladder diagrams software shall be grouped into suitable "control modules" to facilitate troubleshooting.

B. After all field changes or corrections made during installation and field checkout have been completed, the PLC documentation shall be revised to reflect the "as installed, corrected, and accepted" condition of the system, and final record copies of the PLC system shall be submitted.

PART 2 PRODUCTS

2.1 GENERAL EQUIPMENT REQUIREMENTS

A. The SCADA hardware configuration as specified herein, as specified in related sections, and as shown on the contract drawings depicts overall system configuration requirements. Unless otherwise specified, designs that vary from this concept will be rejected.
B. The Contractor shall include within their bid all services, fees, etc., required to purchase, install, configure, and warrant the equipment supplied under this project. Specifications for equipment to be provided under this project show minimum requirements and provide a guideline for design.
C. All discrete and analog data acquisition, pre-processing, storage, and process control functions shall be performed at the PLC/DCU level.
D. The local area network (LAN) shall be employed for communications between the programmable logic controllers and the operator workstations. A separate LAN (Ethernet) shall be employed for communications between the operator workstations to support inter-workstation communications and data transfer functions.

2.2 TOOLS, SUPPLIES, AND SPARE PARTS

A. Tools, supplies, and spare parts shall be provided as specified in Section 13400, "Instrumentation and Control General Requirements," and as specified for each equipment item. In addition, the following items shall be provided:

    1. One of each type of CPU and co-processor module for PLC/DCU equipment furnished under this Contract.

    2. One of each type of input/output module for PLC/DCU equipment furnished under this Contract.

    3. One of each type and size of PLC/DCU equipment power supply furnished under this Contract.

    4. One of each type of storage media drive or printed circuit board (except motherboard) and power supply used in operator workstations furnished under this Contract.

    5. Five 128GB flash drives for data storage.

    6. A full backup of system data onto external 2 TB SSD.

2.3 UNINTERRUPTABLE POWER SUPPLIES (UPS)

A. An uninterruptable power supply (UPS) shall be provided for each operator workstation and inside each DCU and control panel. UPS units shall be sized to provide a minimum of 30 minutes of full-load backup power for all control panel loads, excluding panel lighting and

utility receptacles. Each UPS shall consist of a free-standing UPS module and battery modules as required to meet backup runtime requirements.

B. Each UPS shall be sized to match the maximum power requirements of the associated digital equipment, control panel power supplies, and accessories. Under normal operation, the AC power shall be converted to DC. The DC power from the battery charger shall supply an inverter and maintain the battery module at full charge. The AC output from the inverter shall be fed to the associated digital equipment power supply unit and/or other equipment power supplies as appropriate. Upon loss of the AC supply, the inverter shall continue to supply normal power to the device, drawing DC from the batteries.

C. Each UPS shall meet the following requirements:

    a. Input Voltage: 120 VAC or 230 VAC single phase, 60 Hz.

    b. Voltage Regulation: +/-5 percent for line and load changes.

    c. Output Frequency: Phase-locked to the input AC line on AC operation; 60 hertz +/- 0.5 percent when on battery operation.

    d. Battery Type: Sealed lead-acid or lithium-ion with smart management technology for battery health monitoring.

    e. Enclosure: Sound-absorbing enclosure with EMI/RF noise filtering.

    f. Surge Protection: Integrated surge protection on the AC input circuit with a UL TVSS clamping voltage rating of 400 V and a response time of <5 ns.

D. UPS systems shall be Back-UPS by APC, CyberPower, or an Engineer-approved equal.

2.4 PROGRAMMABLE LOGIC CONTROLLERS (PLC)

A. The Contractor shall be responsible for replacing the existing Programmable Logic Controllers (PLCs) in both the "Blower Control Panel" and the "Filter Control Panel" with the new PLCs specified below. The Contractor shall ensure that all existing I/O, signals, and control functionalities currently handled by the existing PLCs are fully replicated and transferred to the new PLCs. The new PLCs shall be configured to accept all existing inputs and outputs and shall have sufficient capacity for future expansion.

B. The Contractor is responsible for coordinating with the Wastewater Treatment Plant (WWTP) Operator to minimize downtime during the replacement process. This coordination shall include developing a detailed plan to ensure a seamless transition from the old PLCs to the new hardware, with minimal disruption to plant operations. The Contractor shall provide all necessary resources and expertise to perform the swap-over quickly and efficiently, ensuring that the new PLCs are fully integrated into the SCADA system and optimized for current and future operational needs.

C. The Instrumentation Subcontractor shall furnish programmable controllers (PLCs) as specified herein to replace the existing “Blower Control Panel” and “Filter Control Panel” PLCs. PLCs shall be provided complete with rack, power supply, I/O cards, special function cards, instructions, memory, input/output capacity, and appurtenances to provide all features

and functions as described herein. PLC I/O cards may be supplied by third-party vendors if approved by the PLC manufacturer and the Engineer. No substitutions will be permitted unless they are an Engineer-approved equal to the basis of design.

D. All components of the PLC system shall be from the same manufacturer, which shall have fully tested units similar to those being furnished in an industrial environment with associated electrical noise. The PLC system shall have been tested to meet the requirements of the latest revision of NEMA Standard ICS 2-230 (Arc Test) and IEEE C37.90.1 (SWC). The processing unit shall perform the operations functionally described herein based on the program stored in memory and the status of the inputs and outputs.

E. The programmable controller shall be designed to operate in an industrial environment. The PLC shall operate in an ambient temperature range of 0°-60°C and a relative humidity of 5-95 percent, non-condensing. The PLC shall operate on supply voltages of 90-132 VAC at 47-63 Hz or 24 VDC if provided with a battery backup system. An integral fuse shall be provided on the power supply for short circuit protection and shall be front panel accessible. Integral overcurrent and undervoltage protection shall be provided on the power supply.

F. The basis of design for the programmable controller shall be the Automation Direct P2-Productivity 2000 series PLC, or an Engineer-approved equal. The PLC shall be adequately sized to handle all current I/O requirements plus provide capacity for future expansion.

G. The processor and its associated memory shall be enclosed in a modular enclosure. A multiple-position selector switch or equivalent shall be used to select processor operating mode. LED-type indicating lights shall be provided to indicate processor, memory, and battery status. Errors in memory shall activate the memory error indicating lights. The PLC processor shall monitor the internal operation of the PLC for failure and provide an alarm output. Memory shall consist of battery-backed RAM or non-volatile memory (EEPROM or flash memory) capable of retaining the control program for at least one year in the event of power loss. Visual indication shall be provided if battery charge is insufficient to maintain the program in RAM memory for at least two weeks.

    a. The PLCs shall meet the following minimum performance requirements:

    b. I/O Capacity Discrete: 4096

    c. I/O Capacity Analog: 2048

    d. Memory: 64kB or greater

    e. Scan Time: 0.5 msec/k or faster

    f. Processor Clock Speed: Minimum 16 MHz or as required for system responsiveness

    g. The instruction set for the PLC shall include, at a minimum, the following:

    h. Relay-type instructions

    i. Counter and timer instructions

j. Comparison instructions (equal, greater than, limit tests, etc.)

k. Integer and floating point mathematical instructions

l. Advanced math and trigonometric functions

m. Statistical instructions

n. Matrix and array instructions

o. Logical instructions (and, not, or, etc.)

p. BCD conversion instructions

q. Bit modification, moving, and shift instructions

r. File instructions (search, copy, fill, etc.)

s. Diagnostic instructions

t. Sequencer instructions

u. Program control instructions (jump, goto, subroutine, etc.)

v. PID control loops

w. Block read and write capability

x. Send/receive messages

y. Immediate I/O and communications update instructions

H. In addition to a communications port for telemetry communication, communication ports shall be provided for any other devices required (e.g., operator interface unit) plus an additional communication port for connection to a notebook computer.

I. Input/output hardware shall be plug-in modules in associated I/O rack assemblies. Each unit shall handle the required number of process inputs and outputs plus a minimum of 10 percent active prewired spares for each I/O type furnished, plus a minimum of 20 percent spare I/O rack space for the addition of future circuit cards or modules.

J. Discrete inputs shall be a 24 VDC signal (integral to PLC) from dry field contacts. Discrete outputs shall be 24 VDC outputs from the PLC or dry relay contacts (4A minimum) as required. The PLC shall provide momentary and latched outputs as required to interface with motor controls and external devices. Interposing relays shall be provided where required to interface with field equipment. Electrical isolation shall be provided where required.

K. Analog input circuits shall be isolated, 12-bit resolution type. Analog input hardware shall be provided as required for all types of analog inputs being transmitted to the PLC. In general, analog input modules shall be capable of receiving 4-20 mA signals. Analog outputs shall be coordinated with the receivers but shall generally be isolated 24 VDC 4-20mA

outputs powered from the PLC. Each input/output circuit shall have optical isolation to protect the equipment against high voltage transients.

L. Input/output modules shall be configured for ease of wiring and maintenance. The modules shall be connected to wiring arms that can be disconnected to permit removal of a module without disturbing field wiring. Covers shall be provided to prevent operator personnel from inadvertently touching the terminals. The process interface modules shall be provided with screw-type terminal blocks with barriers between adjacent terminals for connection of field inputs. Terminals shall be suitable for accepting up to and including No. 14 AWG wire. All DC output circuits to the field shall include fuses, either integral or at the terminal strip. Output failure mode shall be selectable so that upon station or communication system failure all outputs shall be placed in the non-conducting mode, or remain as they were prior to failure. Light-emitting diodes shall be provided for status indication for each input and output point.

M. Remote I/O shall be provided as specified or shown on the contract drawings. Remote I/O shall be PLC rack type I/O or field modules as manufactured by the PLC manufacturer. Remote I/O shall communicate with the PLC over a data highway network. Remote I/O modules shall be of the same manufacturer as the PLC or Engineer-approved equal.

N. External power supplies shall be provided with the PLC as required to meet specified installed I/O power requirements plus spares. Power supplies shall be modular units, shall be fully redundant, and shall alarm to the PLC upon failure. Power supplies shall have a line regulation of 0.05% and meet the environmental and power requirements specified herein.

O. Manufactured PLC cabling systems may be used to replace individual wiring of I/O to terminal blocks. The cabling system shall consist of an I/O module connector, multiconductor cable, and an interface module consisting of terminals. The terminals shall accept 24-12 AWG wire and be rated for the signals carried. If required, an interface module may consist of components (fuses, relays, surge protection, etc.) and terminals. PLC cabling systems shall be as manufactured by Phoenix Contact, Weidmüller, or Engineer-approved equal.

P. The PLC programming and configuration software shall be the manufacturer's latest version. The software package shall include all programming, configuration, and documentation software needed to place the control and information system in satisfactory operation. The software shall allow both online and offline program development and documentation. Programming shall be accomplished through the use of ladder logic and other high-level programming languages as required. The PLC programming software shall include comprehensive documentation and support resources.

2.5 OPERATOR INTERFACE UNITS

A. An Operator Interface Unit (OIU) shall be provided to view and change PLC parameters and to display alarm messages. The OIU shall provide the following features as a minimum:

1. Minimum display of 80 characters
2. Minimum of 32-key interface

3. Minimum of 60 kB of battery-backed RAM
4. Minimum of 400 configurable display screens
5. Power: 120 VAC or 24 VDC
6. Panel Mount Enclosure: With NEMA rating corresponding to the associated cabinet
7. Operating Environment: 0-55°C, 5-95% relative humidity

B. The OIU shall be configured to display all PLC I/O setpoints and parameters. All equipment failures and alarm I/O shall be displayed. PLC I/O values and operator-entered setpoints shall be displayed with associated units and service descriptions. Menus shall be provided to navigate between screens of different equipment items. Displays shall be arranged in a hierarchical structure with displays for specific equipment items grouped together. Additional functionality shall be as specified elsewhere.

2.6 PLC DATA HIGHWAY NETWORK

A. The PLCs shall be integrated into a high-performance data highway network that supports both Ethernet and serial communications. The network shall include fiber optic transceivers, fiber optic cables, and all necessary accessories to interface seamlessly with the Owner's existing dual data highway and serial network infrastructure. The Contractor shall ensure that the network configuration is optimized for reliability, scalability, and future expansion.

B. All PLCs shall communicate using Ethernet protocol, supporting industrial-grade Ethernet standards such as EtherNet/IP, Profinet, or Modbus TCP/IP, as appropriate for compatibility with the existing SCADA system and other networked devices. The Ethernet network shall be designed to provide high-speed, deterministic communications with minimal latency.

C. Communications between major PLC hubs shall be performed via a redundant, fiber optic Ethernet network configured in a ring topology to provide maximum fault tolerance. The network shall support self-healing capabilities, automatically rerouting traffic in the event of a fiber break or transceiver failure, ensuring continuous operation without manual intervention.

D. Fiber optic transceivers shall be provided to convert the specific PLC data highway communications protocol and any required serial communications into optical signals suitable for transmission over the fiber optic cables. The transceivers shall support modular, rack-mounted, or PLC-mounted configurations and shall be compatible with multiple network topologies, including ring, bus, star, and point-to-point.

E. The fiber optic transceivers shall feature on-line signal monitoring to detect and locate faults, and they shall be hot-swappable to allow for replacement without disrupting network operations. The transceivers must support self-healing communication recovery to maintain network integrity in case of partial failures.

1. Fiber Optic Transceivers shall meet the following updated performance requirements:
    i. Input Power: 110/220 VAC or 24 VDC (as required)

ii. Operating Temperature: -20° to 70°C (extended range for enhanced durability in industrial environments)

iii. Node-to-Node Distance: Up to 15,000 feet (4,572 meters) to support longer runs

iv. Transmit Power: Minimum -10 dBm

v. Receive Sensitivity: Minimum -34 dBm

vi. Wavelength: 1310 or 1550 nanometers (to support longer distances and improved signal quality)

vii. Connector Type: LC or SC (more modern connectors preferred for easier maintenance and higher performance)

F. Fiber Optic Transceivers shall be industrial-grade optical communication modems as manufactured by Phoenix Digital, or an Engineer-approved equivalent. Alternatively, the PLC manufacturer's standard, PLC rack-mounted fiber optic transceiver may be used, subject to approval by the Engineer. All transceivers shall support high-speed data transmission with low latency and provide robust error detection and correction capabilities.

2.7 FIBER OPTIC CABLE

A. Fiber optic cable shall be 4-fiber (2-pair), 50/125 micron graded index (GI) multimode cable or 9/125 micron single-mode cable (depending on distance and bandwidth requirements) with a loose tube construction and a dielectric (Kevlar) central strength member. The cable shall be optimized for both short and long-distance communication with maximum flexibility in installation. The multimode cable shall have a maximum attenuation not exceeding 3.0 dB/km at 850 nm and 1.0 dB/km at 1300 nm, with a bandwidth of 200 MHz-km at 850 nm and 500 MHz-km at 1300 nm. For single-mode, the maximum attenuation shall not exceed 0.35 dB/km at 1310 nm and 0.25 dB/km at 1550 nm. The cable shall be suitable for duct, direct burial, submerged, or aerial applications, featuring a UV-resistant outer sheath. Ripcords shall be included to simplify sheath removal.

B. The cable shall have a maximum tensile load of 2700 N (short term) and 600 N (long term). The minimum bend radius shall be 10 times the cable diameter under no load and 15 times the cable diameter under load. The maximum vertical rise capability shall be no less than 300 meters. The operating temperature range shall be -40° to 70°C to ensure reliable performance in various environmental conditions. Fiber optic cable shall be compliant with current industry standards, such as TIA/EIA-568, ISO/IEC 11801, and ANSI/TIA-568.3-D, and shall be manufactured by a reputable manufacturer such as Corning, Prysmian, or an Engineer-approved equal.

C. Fiber optic cable terminations shall use mechanically spliced, field-installable, LC or SC compatible connectors. These connectors shall offer low insertion loss (typical loss of 0.2 dB or better) and maintain stable optical performance after multiple mating cycles. Connections

shall utilize physical contact field terminations using UV-cured adhesive or factory pre-terminated solutions to ensure durability and consistency. Heat-cured connections shall not be acceptable. Field terminations shall employ a straightforward procedure that requires minimal training and allows for quick, reliable installations.

8. OPERATOR WORKSTATIONS

A. Environmental Requirements:
    1. The equipment shall be designed to operate in an indoor environment. It shall be capable of operation within an ambient temperature range of 0° to 40°C and a relative humidity of 0-90%, non-condensing. The equipment shall operate on supply voltages of 102-132 VAC at 47-63 Hz.

B. Personal Computers:
    1. Personal Computer System Requirements:
        i. Personal computer systems shall be manufactured by Dell, ASUS, MSI, or Engineer-approved equal, with the following minimum specifications:

        ii. Processor: Intel Core i7 or i9 (13th Generation or newer) or AMD Ryzen 7 or 9 (5000 series or newer), with a base clock speed of at least 3.6 GHz and multi-core capabilities with a minimum of 8 CPU cores and 16 threads.

        iii. Memory (RAM): 16 GB DDR4 or DDR5 SDRAM (expandable to 64 GB or more).

        iv. Graphics: Dedicated graphics card with at least 8 GB VRAM, supporting DirectX 12, OpenGL 4.6, and 1920x1080 resolution or higher. Suitable models include NVIDIA GeForce RTX 4060 or AMD Radeon RX 6600 XT, or Engineer-approved equal.

        v. Storage: 1 TB NVMe SSD for operating system and application software, plus a 2 TB SATA HDD for data storage. The SSD should provide high-speed read/write capabilities to ensure quick access and system responsiveness.

        vi. Optical Drive: DVD-RW drive (optional, depending on site requirements and Engineer approval).

        vii. Network Interface: Integrated Gigabit Ethernet (10/100/1000 Mbps) with RJ-45 port. An additional network interface card (NIC) may be included for redundancy or network segmentation, supporting Wake-on-LAN (WoL) and PXE Boot.

        viii. Expansion Slots: At least four PCIe slots for future expansion (e.g., additional NICs, storage controllers, or graphics cards).

        ix. Ports:

            1. Minimum of six USB ports (including USB 3.0 and USB-C).

2. Two HDMI or DisplayPort outputs.
3. Two RS-232 serial ports and one parallel port with high-speed communication capability.

2. Sound System: Integrated high-definition audio with external speaker output; optional external speakers if required by the application.
3. Form Factor: Tower or Small Form Factor (SFF) case, depending on space constraints and cooling requirements.
4. Input Devices:
    i. Mouse: Optical mouse with two or more buttons and scroll wheel by Logitech, Microsoft, or equivalent.
    ii. Keyboard: Full-size 104-key Windows-compatible keyboard with multimedia keys and ergonomic design.
5. Monitor:
    i. Display: 24" or larger LED-backlit monitor with IPS panel technology, manufactured by Dell, LG, ASUS, MSI, or equivalent.
    ii. Resolution: 2560 x 1440 (QHD) minimum; or 3840 x 2160 (4K UHD) recommended for improved clarity and detail.
    iii. Contrast Ratio: At least 1000:1 static contrast ratio.
    iv. Refresh Rate: 60 Hz minimum; higher refresh rates (75 Hz or 144 Hz) are recommended for smoother visuals.
    v. Connectivity: HDMI, DisplayPort, and USB-C inputs with a built-in USB hub for peripheral connectivity.
    vi. Ergonomics: Height-adjustable stand with tilt, swivel, and pivot adjustments for optimal user comfort.
    vii. Other Features: Anti-glare coating, VESA mount compatibility, and energy-efficient design (ENERGY STAR certified).

C. Operating System Compatibility:
    1. All hardware devices shall be compatible with the latest version of Microsoft Windows 10 Professional or Windows 11 Professional. The SCADA software and all peripheral devices must be listed on Microsoft's approved list of compatible hardware.

2.8 PLANT WALL DISPLAY MONITOR

A. The Control Room shall be provided with a fifty-inch (50") flat-screen QHD (Quad High Definition) monitor mounted on the wall. The monitor shall have a minimum resolution of 2560 x 1440 and a viewing angle of 178º (Horizontal) / 178º (Vertical) or better. The monitor

shall be capable of displaying all screens available on the plant workstation with clear visibility and high detail. The monitor shall be a current model by Samsung or LG, such as the Samsung QN50 series, LG 50QNED series, or an Engineer-approved equal that meets or exceeds these specifications.

2.9 REDUNDANT CELLULAR NETWORK ACCESS

A. Purpose and Requirements:
   1. Redundant Internet Access:
      To ensure continuous communication capabilities for the SCADA system during power outages, natural disasters, or network failures, a redundant cellular network access solution shall be provided. This solution will serve as a backup to the primary hardline internet connection, enabling SCADA system communication via a robust and reliable cellular network.
   2. Provider and Service Specification:
      The redundant cellular network access shall specifically utilize AT&T's FirstNet service, which is designed for public safety communications and provides priority and preemption capabilities. This ensures enhanced reliability and performance, particularly during emergency situations such as hurricanes or power outages when conventional communication networks may be compromised.

B. Equipment and Installation:
   1. Cellular Modem and Router Requirements:
      The Contractor shall supply and install a cellular modem and router compatible with AT&T FirstNet. The equipment shall be ruggedized, designed for industrial environments, and capable of maintaining a stable connection in challenging conditions. The cellular modem and router shall support the following minimum requirements:
   2. LTE Cat 6 or higher with fallback to 3G networks where LTE is unavailable.
   3. Dual SIM capability for automatic failover between AT&T FirstNet and an alternative carrier if required.
   4. VPN Support for secure remote access to the SCADA system.
   5. Firewall features to protect against unauthorized access and cyber threats.
   6. Automatic failover and failback capabilities to switch between the primary hardline internet connection and the cellular network seamlessly.
   7. Antennas and Signal Boosters:
      High-gain antennas and signal boosters, if necessary, shall be installed to enhance cellular signal strength and ensure reliable connectivity with AT&T FirstNet. The location and type of antennas shall be determined based on site conditions to optimize signal reception and minimize potential interference.

C. Coordination and Setup:
   1. Account Setup and Configuration:
      The Contractor shall coordinate with the Owner to set up the necessary AT&T FirstNet account for cellular network access. The Contractor is responsible for all equipment, software, and initial configuration required to ensure the cellular network access is fully

functional. This includes registering the cellular devices with FirstNet and ensuring that all data plans and services are activated according to project needs.

2. Testing and Verification:
   The Contractor shall conduct comprehensive testing to verify the functionality of the redundant cellular network access. This includes testing connectivity under various conditions, simulating primary internet connection failures, and ensuring automatic switchover to the cellular network. The system shall be tested to confirm it maintains SCADA system communication and control capabilities, including alarm resets, setpoint adjustments, and remote operation of critical equipment such as pumps and blowers.

D. Security and Access Control:
   1. Secure Remote Access:
      The redundant cellular network access shall support secure remote access to the SCADA system. Access shall be controlled through user authentication, VPN encryption, and firewall rules to ensure that only authorized personnel can access the system remotely. Security protocols shall align with current industry standards such as IEC 62443 or NIST SP 800-82.
   2. User Access Levels:
      Remote access through the cellular network shall adhere to the SCADA system's existing access control levels, including Administrator, Operator, and Viewer levels. These access levels will dictate the range of control actions that each user can perform, ensuring that sensitive operations are restricted to authorized users only.

E. Compliance and Documentation:
   1. Compliance with Standards:
      The cellular network access solution, including all equipment and configurations, shall comply with industry standards for data security, redundancy, and public safety communications. All components must be certified for use with AT&T FirstNet and must meet or exceed the performance requirements specified herein.
   2. Documentation and Training:
      The Contractor shall provide comprehensive documentation detailing the equipment specifications, installation procedures, configuration settings, and testing results. Additionally, training shall be provided to the Owner's staff on the operation and management of the redundant cellular network access, including procedures for monitoring, maintenance, and troubleshooting.

PART 3 EXECUTION

3.1 REQUIREMENTS

Refer to Section 13400 - Instrumentation and Control General Requirements for additional requirements specified in this section.

3.2 TESTING

A. General Testing Requirements

1. The Contractor shall conduct comprehensive testing of the installed SCADA system to ensure that all system components, including status indicators, process signal inputs, and outputs, function as intended and that all signals are properly transmitted and received over the PLC data highway network. The testing process shall verify the integrity, reliability, and accuracy of all communications between the PLCs, Operator Workstations (OWS), and other networked devices.

2. The Contractor shall develop and submit a detailed Testing Plan to the Engineer for approval at least 30 days prior to the commencement of testing. The Testing Plan shall outline the procedures, methodologies, and acceptance criteria for all testing activities, including the sequence of tests, specific tests to be conducted, and the expected outcomes for each test.

3. The Contractor shall provide all necessary test equipment and tools required for testing, calibration, and verification of the SCADA system. Test equipment shall be calibrated and certified by an accredited laboratory to ensure accuracy and reliability.

B. Pre-Operational Testing

1. Visual Inspection: Conduct a visual inspection of all SCADA system components, including PLCs, fiber optic cables, transceivers, OWS, and field devices, to verify proper installation, labeling, and physical condition. Ensure that all wiring is correctly terminated and labeled, all connections are secure, and all equipment is free from physical damage.

2. Continuity and Insulation Resistance Testing: Perform continuity and insulation resistance tests on all wiring and fiber optic cables to ensure proper connections and insulation integrity. All test results shall be documented and compared against manufacturer specifications and project requirements.

3. Power Supply Verification: Verify that all power supplies, including UPS units, are properly installed and operational. Confirm that each power supply provides the correct voltage and current levels to the connected devices and that all power protection devices (e.g., fuses, circuit breakers) are functioning correctly.

C. Network Communication Testing

1. Network Integrity Testing: Verify the integrity of the Ethernet network and fiber optic data highway by conducting tests to check for signal strength, attenuation, and error rates. Perform network diagnostics to identify any potential issues such as signal loss, noise interference, or data collisions.

2. Redundancy and Failover Testing: Test the redundancy and failover capabilities of the network. Simulate network failures (e.g., disconnecting a fiber optic link or shutting down a network switch) to ensure that the system automatically reroutes communications through alternate paths without data loss or significant delay.

3. Latency and Throughput Testing: Measure network latency and throughput to verify that the SCADA system meets performance requirements. Ensure that the network can handle peak data loads without degradation in performance or excessive delays.

D. PLC and I/O Testing

1. PLC Logic and Program Testing: Conduct a thorough review and testing of all PLC logic and programs to verify correct operation according to the approved control narrative. This includes testing all control loops, interlocks, sequencing, and safety functions. Utilize simulation software where applicable to test PLC programs in a controlled environment before live testing.
2. I/O Verification Testing: Test all discrete and analog inputs and outputs to ensure proper operation. Simulate all field inputs (e.g., switches, sensors, and transducers) and verify that the corresponding outputs (e.g., relays, actuators) respond correctly. Record all input and output statuses and compare them against expected results.
3. Signal Scaling and Calibration: Verify the scaling and calibration of all analog inputs and outputs. Ensure that all signals are accurately scaled within the PLC and that all field devices (e.g., flow meters, pressure transmitters) are calibrated according to manufacturer specifications and project requirements.

E. Functional and Operational Testing

1. System Integration Testing: Conduct integration testing to verify that all system components, including PLCs, OWS, field devices, and network infrastructure, work together seamlessly as an integrated system. This includes testing the functionality of all SCADA screens, operator interfaces, alarms, and reports.
2. Alarm and Event Testing: Simulate alarm conditions to verify that all alarms are correctly generated, displayed on the OWS, and logged in the SCADA system. Test alarm acknowledgment and reset functions, as well as alarm escalation and notification procedures.
3. Data Logging and Reporting Testing: Verify the accuracy and completeness of all data logging and reporting functions. Ensure that all process data is correctly logged, archived, and retrievable through the SCADA system. Test the generation of standard and custom reports to verify correct formatting, data content, and delivery.

F. Performance and Stress Testing

1. Load Testing: Conduct load testing to verify that the SCADA system can handle maximum anticipated loads without degradation in performance. Simulate high data volumes, frequent operator interactions, and multiple simultaneous network connections to ensure system stability and responsiveness.
2. Stress Testing: Perform stress testing to evaluate the system's ability to withstand extreme conditions and prolonged use. Simulate power interruptions, network failures, and high-

frequency signal fluctuations to ensure the system remains operational under adverse conditions.

G. Final Acceptance Testing

1. Site Acceptance Test (SAT): Conduct a Site Acceptance Test (SAT) in the presence of the Engineer and the WWTP Operator to demonstrate that the SCADA system meets all project specifications and performance criteria. The SAT shall include a review of all test results, a demonstration of all system functions, and a final inspection of all hardware and software components.
2. Deficiency Correction and Retesting: Document any deficiencies identified during testing and develop a corrective action plan. Retest any components or functions that were found to be deficient until all acceptance criteria are met.
3. Final Documentation and Handover: Upon successful completion of testing and correction of deficiencies, provide all final documentation, including test reports, calibration records, as-built drawings, and operation and maintenance manuals to the Owner.

H. Operator Training and System Handover

1. Training: Provide comprehensive training to the WWTP Operator and designated personnel on the operation, maintenance, and troubleshooting of the SCADA system. Training shall include both classroom instruction and hands-on practice with the live system.
2. System Handover: Formally hand over the SCADA system to the Owner upon completion of all testing, training, and documentation requirements. Ensure that the system is fully operational, stable, and meets all contractual obligations.
3. Refer to Section 13500, Part 3, Section 3.5 - Training and Documentation, for detailed requirements regarding operator training and system documentation.
4. Refer to Section 13410, Part 3, Section 3.5 - Warranty and Support, for detailed maintenance and support requirements, including the two-year maintenance contract and emergency support provisions.

SECTION 13480

INSTRUMENTATION AND CONTROL SCHEDULES

PART 1 GENERAL

1.1 SCOPE

A. The scope includes the integration of new blower systems and the proper incorporation of all existing instrumentation into the SCADA system to ensure a robust, fully functional, and user-friendly control environment.

B. The Contractor shall furnish, test, install, and place in satisfactory operation all equipment required to integrate the new blower systems into the existing SCADA system as specified herein and as shown on the Contract Drawings. This includes the addition of new I/O modules for the blowers and the integration and proper labeling of existing sensors and instrumentation into the SCADA system.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- Section 13400: “Instrumentation and Control General Requirements.”
- Section 13410: “Instrumentation and Control Functional Control Descriptions.”
- Section 13420: “Instrumentation and Control Field Instrumentation.”
- Section 13430: “Instrumentation and Control Enclosures and Control Panels.”
- Section 13450: “Instrumentation and Control Supervisory Control and Data Acquisition Hardware.”

1.3 PLANT NUMBERING SYSTEM

A. All equipment and I/O tag numbering shall adhere to existing plant conventions. Equipment shall be numbered as specified in this section and shown on the Contract Drawings. Any equipment or I/O tags not specified herein or shown on the plans shall be derived by the Contractor in accordance with existing plant conventions and submitted to the Owner for approval.

PART 2 PRODUCTS

2.1 NEW BLOWER I/O INTEGRATION

A. The Contractor shall provide and install all new I/O modules required for the integration of the new blower systems into the existing SCADA system. This includes all necessary I/O cards, wiring, and communication interfaces needed to ensure seamless integration and functionality with the SCADA system as specified in Section 13410 - Instrumentation and Control Functional Control Descriptions.

2.2 EXISTING SENSOR INTEGRATION

A. The Contractor shall ensure that all existing sensors and field instrumentation are properly integrated into the SCADA system. This includes verifying and updating the labeling,

configuration, and scaling of all sensors within the SCADA system to match the existing plant standards and operational requirements.

B. The Contractor shall coordinate with the SCADA integrator to ensure that all existing sensors, including but not limited to flow meters, pressure transmitters, temperature sensors, and level sensors, are accurately represented within the SCADA system. All sensor data shall be correctly mapped to the appropriate tags, and all engineering units and ranges shall be verified and adjusted as necessary.

C. All I/O associated with existing sensors and devices shall be tested to ensure proper communication and functionality with the SCADA system. This includes verifying that all signals are transmitted correctly and that all data points are accurately reflected in the SCADA displays and logs.

2.3 SCADA INPUT / OUTPUT REQUIREMENTS

A. The Contractor shall ensure that the SCADA system is capable of handling all necessary inputs and outputs (I/O) required for the complete operation of the new blower systems and existing instrumentation. The minimum I/O requirements include, but are not limited to, the following:

1. Discrete Input (DI): Digital signals from field devices such as switches and sensors.
2. Discrete Output (DO): Digital control signals sent to devices such as relays and actuators.
3. Analog Input (AI): Continuous signals representing variables such as flow, pressure, or temperature.
4. Analog Output (AO): Control signals sent to field devices that require a variable signal, such as control valves.
5. Serial Communication (Serial): Data transmitted over communication links (e.g., RS-232, RS-485) to integrate various intelligent devices (e.g., VFDs, power monitors).

B. The Contractor shall ensure all available data from devices (such as VFDs, power monitors, etc.) via their serial or network communication ports are provided to the PLC/SCADA system. Hardwired I/O may be replaced with data communicated over network protocols (e.g., Modbus, EtherNet/IP), provided it does not compromise the reliability or response time of critical control functions.

C. The Contractor shall coordinate with the SCADA system integrator to ensure that unique and consistent tag numbers are assigned for all programming and that all I/O points, including those from new blower systems and existing sensors, are correctly configured in the SCADA system to match the plant's operational requirements.

PART 3 EXECUTION

3.1 INSTALLATION AND CONFIGURATION

A. The Contractor shall install and configure all new I/O modules for the blower systems and ensure proper integration with the existing SCADA system. This includes correct wiring,

signal testing, and calibration of all new instruments and devices associated with the new blowers.

B. The Contractor shall verify and update the integration of all existing sensors and instrumentation into the SCADA system. This includes checking that all existing sensors are correctly labeled, configured, and scaled within the SCADA system to match the plant's operational needs.
C. All instrumentation and I/O devices, both new and existing, shall be tested to verify proper operation and signal transmission to the SCADA system. This includes performing loop checks for analog signals and verifying that all discrete signals are correctly interpreted by the PLCs and SCADA system.
D. The Contractor shall collaborate closely with the WWTP Operator and the Engineer to schedule and conduct all required testing and commissioning activities to minimize disruption to plant operations and ensure seamless integration of all new and existing systems.
E. Any discrepancies, non-conformances, or deficiencies identified during installation or testing shall be documented and promptly corrected by the Contractor. All corrections shall be re-tested and verified to ensure full compliance with project specifications and operational requirements.
F. The Contractor shall provide detailed documentation for all installed instrumentation and control devices, including calibration certificates, configuration settings, wiring diagrams, and as-built drawings, as part of the project closeout submittals.
G. Upon successful completion of all testing and commissioning activities, the Contractor shall provide training to the plant's operational staff on the proper use, maintenance, and troubleshooting of both the new blower systems and the integrated SCADA components.
H. Refer to Section 13500, Part 3, Section 3.4 - Training and Documentation, for detailed requirements regarding operator training and system documentation.
I. Refer to Section 13410, Part 3, Section 3.5 - Warranty and Support, for detailed maintenance and support requirements, including the two-year maintenance contract and emergency support provisions.

SECTION 13500

CONTROL NARRATIVE

PART 1 GENERAL

1.1 SUMMARY

A. The scope includes the integration of new blower systems and the proper incorporation of all existing instrumentation into the SCADA system to ensure a robust, fully functional, and user-friendly control environment.
B. The Contractor shall provide, install, and place into full operating condition the control systems described in these Specifications, specifically the EAST & WEST BLOWER CONTROLS. Any required special signal converters, programming, wires, conduit, relays, and other appurtenances needed to achieve the specified functions shall be provided at no extra cost to the Owner.
C. The Contractor shall ensure the seamless integration of all "EXISTING PROCESSES & SYSTEMS" into the new SCADA System proposed as part of this project. Existing controls are generally defined below in Part 2.1. The SCADA Contractor is responsible for reviewing existing SCADA controls and capabilities for all devices and processes to ensure that all existing functionalities are replicated or enhanced in the new SCADA system.
D. The Contractor shall also be responsible for covering all inspection fees, tariffs, royalties, and deposits required for the installation and connection of the remote telemetry system.
E. The scope of work shall include additional services such as operator training, system check-out, start-up assistance, ongoing maintenance services, and operational support following final acceptance.

PART 2 PROCESSES

2.1 EXISTING PROCESSES & SYSTEMS

A detailed list of the existing processes that are part of the current SCADA system and controls for the WWTP facility is provided below. This list is not exhaustive; the SCADA Contractor must review the existing SCADA system capabilities to ensure comprehensive integration of all existing systems into the new SCADA system.

A. North Headworks: Contains flow meter; totalizes with E&W flow meter.

B. East & West Headworks: Contains flow meter; totalizes with North flow meter; has a pinch valve with a logic loop programmed into the existing PLC.

C. North Treatment Train: Has LCP with PLC controlling the mixer, EQ pumps, several floats & alarms, clarifier drive; communicates with blower LCP.

D. East & West Treatment Trains: Each has LCP with PLC controlling the mixer, EQ pumps, several floats & alarms, clarifier drive; communicates with blower LCP.

E. North Blowers: Contains 4 blowers (1 EQ tank, 2 Process, 1 Digester); each with alarms to LCP; operates independently of other processes. Contains Central LCP with VFDs for each blower, which acts as the SCADA hub for the current system. Accepts alarms from North plant LCP. Includes DO and ORP probes for blower speed control and process monitoring.

F. East & West Blowers: Being replaced; controlled from filter LCP

G. East & West EQ Tank Blowers: On single LCP with hardwired alarms back to SCADA.

H. Filter Control Panel: Includes multiple 3-way actuated valves with control logic loops, houses chemical system logic, misc alarms, CL17s, effluent flow control.

I. Stand Alone Clarifier: Has clarifier drive, misc floats, and sensors.

J. Airvac Control Panel: Has LCP controlling the vacuum system; must be adjustable via SCADA.

K. Generator: North ATS and East & West ATS with alarms and status indications.

2.2 NEW EAST & WEST PROCESS BLOWERS

The EAST & WEST blower system shall consist of three (3) identical Kaeser rotary screw blowers, each equipped with an integrated Local Control Panel (LCP) and Variable Frequency Drives (VFDs). The blowers shall be connected via power and MODBUS, with the MODBUS communication running back to the Filter Control Panel PLC. The Filter Control Panel PLC shall serve as the main controller, managing the operational status and speed of each blower's LCP using a PID control loop with a settable time delay and tolerance band based on DO feedback.

2.2.1 Automatic Blower DO Control Using PID Loop with Time Delay (Aeration Control for Each Treatment Train)

A. PID Control Setup with Time Delay:

1. A PID control loop with a settable time delay shall be implemented in the Filter Control Panel PLC to regulate blower speed based on real-time DO measurements.

2. The PID controller will receive continuous input from the DO probes installed in each basin but will execute speed adjustments only after a settable time interval has elapsed.

3. The PID loop parameters (Proportional, Integral, and Derivative gains) and the time delay interval shall be adjustable through SCADA to optimize system performance under varying operating conditions.

B. Operator Configuration:

1. The operator selects the target Dissolved Oxygen (DO) setpoint for each basin via SCADA.
2. The operator assigns specific blowers (Blower #X) to either the East or West Basin, with at least one blower in standby mode. Note that more than one blower can be set to "Standby."
3. Each blower shall have a digital Hand-Off-Auto (HOA) switch available in SCADA. When in "Auto," the blowers will operate based on the PID control loop described in this section. In "Hand," they allow for manual speed adjustments via SCADA input. In "Off," the blowers will not run unless manually activated in "HAND" mode at the blower's LCP.

C. PID Control Logic with Time Delay:

1. The PID controller will calculate the error between the actual DO level and the operator-selected DO setpoint only after the time delay interval.
2. Tolerance Band Check: Before adjusting blower speeds, the system will check if the actual DO level is within a tolerance band (±0.2 mg/L) of the DO setpoint:
    i. If the actual DO is within the tolerance band (Setpoint DO ± 0.2 mg/L), no adjustment is made, and the current blower speed is maintained.
    ii. If the actual DO is outside the tolerance band, the PID controller will calculate the required speed adjustment.
3. Blower Speed Adjustment (Post-Time Delay):
    i. The PID controller adjusts the blower speed proportionally based on the error:
        a. Proportional Control (P): Adjusts blower speed proportionally to the magnitude of the error (difference between setpoint DO and actual DO). The larger the error, the greater the adjustment.
        b. Integral Control (I): Addresses accumulated errors over time to eliminate steady-state errors.
        c. Derivative Control (D): Predicts the rate of error change to dampen overshooting and stabilize the system.
4. The adjusted blower speed is sent to the VFD, and the time delay interval resets, preventing further adjustments until the next interval has elapsed.

D. System Monitoring and Alarm Handling:

1. All alarm and status conditions for the blowers shall be integrated into SCADA to alert the operator of any faults. These conditions include, but are not limited to:

i. Overtemperature

ii. Overpressure

iii. VFD fault

iv. Blower fault

v. Air filter alarm

2. Blower status information to be displayed in SCADA:

i. Blower fault

ii. Blower running in Auto

iii. Blower running in Hand via SCADA

iv. Blower running in Hand via LCP

v. Blower in Off position at LCP

vi. Blower in Off position in SCADA (Note: if the blower is turned to "Off" at the LCP, it should also reflect "Off" in SCADA).

2.2.2 Manual Blower Control

A. Local Control Panel (LCP) Manual Operation:

1. The blowers can be manually operated from the LCP by setting the HOA switch to "HAND."

2. In "HAND" mode at the LCP, the operator can manually adjust blower speeds using the speed control dial or buttons on the blower's integrated LCP.

3. All status indications and alarms will still be communicated back to SCADA, but SCADA will not control the blower operations.

B. SCADA Manual Operation:

1. When the HOA switch is set to "HAND" in SCADA, the operator can manually adjust the blower speed using SCADA interface controls.

2. Manual adjustments in SCADA shall override the automatic PID control logic.

3. The operator must acknowledge any existing faults before manual operation can commence.

4. Blower operation status, including current speed, fault status, and HOA position, shall be continuously displayed in SCADA.

2.3 OPERATOR INTERACTION AND REMOTE ACCESS

A. Operator Workstation (OWS) Functionality:

1. Local Control:
   The Operator Workstation (OWS) shall provide a comprehensive interface for monitoring and controlling the entire SCADA system. Operators shall have access to all process controls, alarms, setpoints, and operational data through the OWS. This includes capabilities to reset alarms, adjust setpoints, start/stop equipment, and switch devices between automatic and manual modes directly from the OWS interface.

2. SCADA Screen Navigation:
   The OWS shall be equipped with a user-friendly interface that allows operators to easily navigate between different process screens, access real-time data, view historical trends, and generate reports. The interface should include intuitive graphical representations of all key process areas to enhance situational awareness.

B. Remote Access and Control via Mobile Devices:

1. Remote SCADA Access:
   The SCADA system shall be accessible remotely via secure web-based or mobile applications that are compatible with tablets, such as iPads, and other mobile devices. Remote access shall provide functionality equivalent to that of the local OWS, allowing operators to monitor and control the system from remote locations.

2. Remote Control Capabilities:
   Remote users shall have the ability to perform all essential control functions remotely, including but not limited to:

   a) Resetting alarms and acknowledging system alerts.

   b) Adjusting process setpoints for flow, pressure, temperature, dissolved oxygen, and other critical parameters.

   c) Manually starting or stopping pumps, blowers, and other equipment.

   d) Switching equipment between automatic and manual (hand) modes directly from the remote interface.

C. Security and Access Levels:

1. User Authentication and Authorization:
   The SCADA system shall implement a robust security framework that requires user authentication and authorization for all local and remote access. Users must log in with a unique username and password, and multi-factor authentication shall be supported for enhanced security.

2. Access Levels:
   The system shall support multiple levels of access control, including but not limited to:

   - Administrator: Full access to all system functions, including configuration changes, alarm management, and user management.

- Operator: Access to standard operational controls, such as starting/stopping equipment, adjusting setpoints, and acknowledging alarms, but restricted from making configuration changes.
- Viewer: Read-only access to monitor system status and view data but without the ability to make any changes or control the system.

3. Audit Trails:
   The SCADA system shall maintain an audit trail of all user actions, both local and remote, including login attempts, changes to setpoints, manual overrides, alarm acknowledgments, and any configuration modifications. These logs shall be securely stored and accessible to authorized users for review and compliance purposes.

D. System Redundancy and Reliability:

1. Remote Access Redundancy:
   The SCADA system shall include redundancy features to ensure continuous availability of remote access. This includes redundant network connections, failover capabilities, and backup servers to prevent downtime in case of network or hardware failures.
2. Fail-Safe Operation:
   In the event of communication loss between the remote device and the SCADA system, the system shall default to a safe operational state based on predefined logic. All remote control sessions shall be logged out automatically to prevent unauthorized access when communication is restored.

E. Compliance with Industry Standards:

1. Cybersecurity Standards:
   All remote access components shall comply with current industry cybersecurity standards, such as IEC 62443 or NIST SP 800-82, to protect against unauthorized access, data breaches, and cyber threats.
2. Data Encryption:
   All data transmitted between the SCADA system and remote devices shall be encrypted using secure protocols (e.g., TLS, SSL) to ensure the confidentiality and integrity of data

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. All control system work, including installation, programming, integration, and testing, shall be performed by a qualified SCADA integrator approved by the Owner prior to the start of construction. The SCADA integrator must demonstrate experience with similar wastewater treatment projects and provide references upon request.
B. The SCADA integrator shall coordinate with the Owner and other contractors to ensure seamless integration of all new and existing systems.

C. All work shall be performed in compliance with the approved project plans, specifications, and applicable codes and standards.

3.2 PRE-IMPLEMENTATION CONTROLS MEETINGS

A. The SCADA integrator shall participate in two (2) mandatory controls meetings prior to the implementation phase. These meetings shall be scheduled by the Owner or Owner's Representative.
    1. Initial Controls Meeting: To review project requirements, existing system capabilities, proposed control strategies, integration points, and responsibilities of all parties. The SCADA integrator shall present their approach to the work, including the proposed control logic, programming methodology, and schedule for integration and testing.
    2. Pre-Implementation Controls Meeting: To finalize the control strategy, review any changes or updates, confirm installation procedures, discuss the commissioning and start-up plan, and address any remaining questions or concerns. This meeting shall occur after submittal reviews are complete and prior to any control system installation.
B. All testing and commissioning of control systems shall follow the procedures outlined in Section 13450, Part 3, Section 3.2 - Testing.

3.3 INSTALLATION AND INTEGRATION

A. The SCADA integrator shall install all control panels, wiring, and related equipment per the approved drawings and specifications. All equipment and installations must comply with applicable codes and standards.
B. The integrator shall be responsible for configuring all PLCs, HMIs, SCADA systems, and communication networks to ensure proper operation and seamless integration with existing plant systems.
C. The integrator shall ensure all new equipment is properly interfaced with the SCADA system, including integration of all alarms, status indications, and control points as specified.
D. All programming and configuration shall be performed by certified personnel with specific experience in wastewater treatment processes and SCADA systems.
E. The integrator shall coordinate with other trades to avoid conflicts during installation and integration activities and ensure compatibility of all systems.
F. The SCADA Integrator shall coordinate closely with the Electrical Contractor to ensure seamless integration of new and existing systems, minimizing any overlap or gaps in responsibilities.

3.4 COMMISSIONING AND START-UP

A. The SCADA integrator shall develop a comprehensive commissioning plan for approval by the Owner prior to beginning any commissioning activities. This plan shall include:
    1. Pre-functional checklists to verify the installation of all control system components.
    2. Functional performance tests to confirm proper operation of all control loops, interlocks, alarms, and system responses.
    3. Integration tests to verify seamless communication between new and existing systems and compliance with the specified control narrative.
B. The SCADA integrator shall provide all necessary personnel and equipment to perform commissioning and start-up activities.
C. Commissioning shall be performed in the presence of the Owner or Owner's Representative, and all findings and corrective actions shall be documented.

D. A commissioning report shall be submitted to the Owner, including all test results, deficiencies identified, and corrective actions taken.
E. The integrator shall provide start-up assistance to ensure the system is operating correctly under normal and emergency conditions.

3.5 DOCUMENTATION AND TRAINING

A. The SCADA integrator shall provide comprehensive documentation for the control system, including as-built drawings, control system schematics, equipment manuals, and detailed programming documentation.
B. All documentation shall be provided in both electronic and hard copy formats to the Owner upon completion of the project.
C. The integrator shall provide training for the Owner's staff on all new systems and equipment. Training shall include operation, troubleshooting, and routine maintenance.
D. Training sessions shall consist of both classroom instruction and hands-on training and shall be scheduled at a mutually agreed time and location.

3.6 WARRANTY AND SUPPORT

A. The SCADA integrator shall provide a warranty on all equipment, materials, and workmanship for a period of one (1) year from the date of final acceptance by the Owner.
B. During the warranty period, the integrator shall provide support to address any defects or issues related to the installation, programming, or integration of the control systems at no cost to the Owner.
C. The integrator shall respond to any warranty-related issues within 24 hours of notification and provide a corrective action plan within 48 hours.
D. The integrator shall also provide options for ongoing support and maintenance services post-warranty, which may be contracted separately by the Owner.
E. Refer to Section 13410, Part 3, Section 3.5 - Warranty and Support, for detailed maintenance and support requirements, including the two-year maintenance contract and emergency support provisions.

3.7 HOUSEKEEPING AND SAFETY

A. The SCADA integrator shall maintain a clean and safe work environment at all times. Work areas shall be kept free of debris, waste materials, and obstructions to ensure safe access and egress.
B. The integrator shall comply with all OSHA standards and safety regulations, and all personnel shall be trained in the appropriate safety procedures for working in an industrial environment.
C. All hazardous materials shall be handled and disposed of according to local, state, and federal regulations, and all work shall be performed in a manner that minimizes risks to personnel and the environment.

END SECTION

DIVISION 15: MECHANICAL

SECTION 15001

PIPE WORK GENERAL PROVISIONS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. Work under this Section includes all material certificates; Shop Drawings; disinfection of potable water mains; and field testing of all pipe, pipe fittings, piping specials, and valves in all sections necessary to complete and make serviceable all piping systems.

B. The requirements of this Section apply to the work in the following Sections:
   1. Section 15001, Pipe Work General Provisions
   2. Section 15061, Steel and Alloy Piping and Copper Tubing
   3. Section 15062, Ductile Iron Piping and Ductile Iron and Cast Iron Fittings
   4. Section 15064-A, PVC Pressure Pipe
   5. Section 15064-B, Polyvinyl Chloride Sewer and Service Pipe
   6. Section 15090, Pipe Couplings and Expansion Joints
   7. Section 15101, Valves

1.2 QUALITY ASSURANCE

A. Codes and Standards: Comply with the provisions of the following codes and standards except as otherwise shown or specified.
   1. AWWA: All applicable standards.
   2. Florida Department of Environmental Protection: All rules and regulations.

1.3 SUBMITTALS

A. Material Certificates: Provide materials certificates signed by the material manufacturer and the Contractor for all pipe and pipe fittings. Certify that each material item complies with the specified requirements.

B. Shop Drawings: Submit Shop Drawings for all valves and special items, restrained joint systems for all systems, and laying schedules in accordance with Section 01340 of these Specifications.

PART 2 PRODUCTS

2.1 TEST RESULTS

The Contractor shall conduct all tests in the presence of the Engineer. Test results shall be certified to the Owner in writing.

2.2 TESTING OF PRESSURE PIPING SYSTEMS

A. Each section of piping shall be tested to a hydrostatic pressure of 150 psi (minimum) or 50 psi above the working pressure. The Contractor is required to furnish all pumps, gauges, instruments, test equipment, and personnel required for the tests, and make provisions for removal of test equipment and draining of pipes after tests have been made. All testing shall be made in the presence of the Engineer.

B. The pressure tests shall be sustained for not less than two hours and as long as the Engineer may require to assure that:
   1. No air pockets are in the line.
   2. No broken pipe or defective materials are in the line.
   3. No leaking joints have been made.

C. Before applying the specified test pressure, all air shall be expelled from the pipe. If outlets are not available at high places, the Contractor shall make the necessary taps at points of highest elevations before the test is made. After the test has been completed, corporation cocks shall be installed at these points and marked by the installation of a valve box.

D. Tests may be made of isolated portions of such piping as will facilitate general progress of the installation. Any revisions made in the piping systems will subsequently necessitate retesting of such affected portions of the piping systems.

E. Where city water service is available, reasonable amounts of water for flushing and testing will be furnished by the Owner at no cost to the Contractor subject to requirements which the Owner may impose.

F. Any defective material or defects in workmanship that become apparent during the tests shall be remedied and the subject piping shall be retested.

G. Prior to pressure testing of buried piping, backfill shall have been partially placed and tamped to provide adequate side support for all pipe and fittings. At joints, trenches shall be sufficiently open for joint inspection.

H. All piping systems shall be thoroughly flushed by providing a velocity of $2^1/_2$-feet per second in the line being flushed.

I. Do not test against closed valves at pressures higher than the allowable seating pressures for individual valves. Contractor may test open valves at pressures up to that specified for the valve bodies. In sections of the line where the test pressures are greater than the allowable seating pressures for the valves, the Contractor shall provide temporary plugs to test against.

J. The leaking tests which may be performed at the same time as the pressure tests shall be sustained for not less than 2 hours. The leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain the specified leakage test pressure after the air in the pipe line has been expelled and the pipe has been filled with water.

K. No pipe line installation will be accepted if the leakage is greater than that determined by the following formula:

$$L = \frac{NDP^{0.5}}{7400}$$

L = allowable leakage in gallons per hour
N = number of joints in length of pipe line tested
D = nominal diameter of pipe in inches
P = average test pressure during leakage test in pounds per square inch

2.3 TESTING GRAVITY FLOW PIPING

A. General:

1. The following procedures apply only to the storm drainage systems. Tests for this piping may be waived at the Engineer's discretion.
2. Field testing of gravity flow pipes, including manholes, for joint integrity and water tightness shall be conducted by either an infiltration test or an exfiltration test. The Contractor shall furnish all plugs, pumps, piping, gauges, timers, instruments, required test apparatus, and all labor required for installing the testing equipment, conducting the test, and removing the testing apparatus after the tests have been completed. All testing shall be done in the presence of the Engineer.
3. The Engineer will determine the type of test required for each section after the ground water table has been measured by the Contractor. The following general criteria will govern the type of test to be conducted.
   a. Wherever the ground water table is measured to be not less than 1 foot above the top of the pipe throughout the full length in the section being tested, an infiltration test shall be used.
   b. Wherever the ground water table is measured to be less than 1 foot above the top of the pipe at the highest point in the section being tested, an exfiltration test shall be used.

B. Measuring Ground Water Table:

1. The Contractor shall provide facilities for measuring the ground water table at intervals equal to and not greater than the manhole spacing, etc., one probe per manhole.
2. Maximum allowable leakage permitted under this Specification is 25 gpd/inch of pipe diameter/mile for sanitary lines and 100 gpd/inch of pipe diameter/mile of pipe for storm water systems. The permissible leakage rate is established for either the infiltration or exfiltration test.
3. Testing, whether for infiltration or exfiltration, is to be performed by standard methods and are to be approved by the Engineer prior to conducting the tests.

C. Testing Gravity Flow Lines by Visual Inspection: All gravity flow sewers 18 inches diameter and smaller shall be subject to testing by visual inspection for alignment and grade. A section of pipe between two manholes will have passed the test when a light held in a manhole will show a full circle when viewed from an adjoining manhole through the carrier pipe. Visual inspection is in addition to I/E tests.

D. Failures: If, for any reason, a section of pipe fails either of the tests previously outlined or any substitute test procedure approved by the Engineer, the Contractor shall locate the defective

materials and/or installation and make any necessary repairs. After the corrective actions have been taken, the section of pipe shall be retested subject to the same provisions or requirements outlined above.

2.4 RELATIONSHIP OF SEWERS TO WATER MAINS

A. Sewer Parallel to Water Main: Sewers shall be located, during design, at least 10 feet horizontally from any existing or proposed water main. If, for absolutely essential reasons, it is not possible to achieve such separation, the sewer may be located not less than 3 feet from a water main - horizontally, provided there is at least 18 inches vertical separation between the bottom of the water main and the top of the sewer, with the sewer below the water main.

B. Vertical Separation: Whenever sewers must cross under water mains, the sewer shall be laid at such an elevation that the top of the sewer is at least 18 inches below the bottom of the water main. When the elevation of the sewer cannot be buried to meet the above requirement, the water main shall be relocated to provide this separation or reconstructed with slip-on or mechanical-joint ferrous pipe for a distance of 10 feet on each side of the sewer. One full length of water main pipe should be centered over the sewer so that both joints will be as far from the sewer as possible.

C. Special Conditions: When it is impossible to obtain proper horizontal and vertical separation as stipulated above, the water main should be constructed of slip-on or mechanical-joint ferrous pipe and the sewer constructed of mechanical-joint ferrous pipe and both services should be pressure tested to assure watertightness.

D. Must meet all applicable Florida Department of Environmental Protection and local codes and regulations.

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SECTION 15061

STEEL AND ALLOY PIPING AND COPPER TUBING

PART 1 GENERAL

1.1 SCOPE

A. The work covered by this section includes furnishing all labor, equipment, and materials required to furnish, install, and test steel pipe, alloy pipe, stainless steel pipe, and copper tubing, including all fittings, sleeves, unions, and accessories, as specified herein and/or shown on the Drawings.

B. The Contractor's attention is called to the fact that all steel and alloy piping or copper tubing is not necessarily shown completely on the Drawings, which are more or less schematic. However, the Contractor shall furnish and install all pipe and fittings and do all piping work indicated or required for the proper operation of all equipment and services requiring such piping.

1.2 GENERAL DESIGN REQUIREMENTS

A. All such work shall be done by competent workmen in a thorough workmanlike manner according to best practice and in compliance with all codes and applicable regulations, with proper provisions for uncoupling, draining, expansion, and contraction.

B. Process piping furnished as an integral part of an item of equipment shall conform to the requirements of the latest edition of ANSI B 16.3, Code for Petroleum Refining Piping, or ANSI B 16.4, Code for Refrigeration Piping, as applicable.

1.3 QUALITY CONTROL

Prior to its incorporation into the work, the Contractor shall submit to the Engineer written evidence that the pipe furnished under this Specification is in conformance with the material and mechanical requirements specified herein. Certified copies of independent laboratory test results or mill test results from the pipe supplier may be considered evidence of compliance provided such tests are performed in accordance with the appropriate ASTM or AWWA testing standards by experienced, competent personnel. In case of doubt as to the accuracy or adequacy of mill tests, the Engineer may require that the Contractor furnish test reports from an independent testing laboratory on samples of pipe materials.

1.4 SHOP DRAWINGS AND ENGINEERING DATA

Complete shop drawings and engineering data on fabricated piping shall be submitted to the Engineer in accordance with the requirements of the section entitled "Submittals" of these Specifications.

1.5 STORAGE AND PROTECTION

A. Piping and accessories shall be stored and protected in accordance with the requirements of these Specifications.

B. All piping and tubing and accessories shall be stored above ground fully supported so as not to bend or deflect excessively under their own weight. Piping shall be stored with slope so as to be free draining.

1.6 SHOP PAINTING

All ferrous piping not specified to be galvanized or otherwise coated shall be cleaned and shop primed or coated in accordance with the requirements of these Specifications or as specified herein.

1.7 GUARANTEE

Provide a guarantee against defective equipment and workmanship in accordance with the requirements of the section entitled "Guarantees and Warranties" of these Specifications.

PART 2 PRODUCTS

2.1 GENERAL

A. Unless otherwise shown or specified on the Drawings, all piping $2^{1}/_{2}$ inches and smaller shall be copper tubing, except that Schedule 40 red brass threaded nipples with 125-pound forged bronze threaded fittings per ANSI B16.15 are acceptable for short branches to pressure gauges and drains. Unless otherwise shown or specified, pipe 3 inches and larger shall be galvanized alloy pipe or cast iron or ductile iron pipe. Carbon steel pipe shall be used only where approved by the Engineer or where specifically indicated on the Drawings.

B. No broken, cracked, deformed, misshapen, imperfectly coated, or otherwise damaged or defective pipe or fittings shall be used. All such materials shall be removed from the site of the work.

2.2 ALLOY PIPE

A. Alloy pipe shall be nickel-copper alloy steel pipe conforming to the requirements of ASTM A 714, Grade IV or V, Class 4. Alloy pipe in sizes 2 inches and larger shall be seamless.

B. Alloy pipe 6 inches and smaller shall be screwed, Schedule 40. Alloy pipe for process piping in sizes 3 inches through 6 inches shall be welded, Schedule 40. Alloy pipe in sizes 8 inches through 14 inches shall be welded, Schedule 20 exposed, Schedule 40 buried.

C. Screwed fittings shall be of 150-pound malleable iron conforming to ASTM A 197 and ANSI B16.3 or 3,000 pound forged nickel-copper alloy steel conforming to ANSI B16.11. Unions shall be 300-pound malleable iron.

D. Welded fittings shall be wrought nickel-copper alloy steel of the same composition as the pipe and shall conform to ANSI B16.9.

E. Unless otherwise shown or specified, alloy pipe and fittings shall be hot-dip galvanized in accordance with the requirements of ASTM A 153. Exposed alloy piping shall be field primed and painted after installation in accordance with the requirements of the section entitled "Painting" of these Specifications.

2.3 STEEL PIPE

A. Steel pipe in sizes $2^1/_2$ inches and smaller shall be seamless carbon steel pipe conforming to the requirements of ASTM A 120. Steel pipe in sizes 3 inches through 10 inches shall be seamless carbon steel pipe conforming to the requirements of ASTM A 53, Grade B.

B. Unless otherwise specified or shown, steel pipe 6 inches and smaller shall be screwed, Schedule 40. Steel pipe for process piping in sizes 3 inches through 6 inches shall be welded, Schedule 40. Steel pipe in sizes 8 inches through 10 inches shall be welded, Schedule 20 exposed, Schedule 40 buried.

C. Screwed fittings $2^1/_2$ inches and smaller shall be 150-pound malleable iron conforming to ASTM A 197 and ANSI B16.3. Unions shall be 300-pound malleable iron.

D. Welded fittings shall be of the butt-welded type of wrought carbon steel conforming to ASTM A 234, Grade WPB and ANSI B16.9. Reducing branch connections shall be made using threadolets or weldolets.

E. Flanges shall be 150-pound, forged steel conforming to ASTM A 181, Grade I, and ANSI B16.5. Bolts shall be ASTM A 307, Grade B, cadmium plated. Nuts shall be heavy hex nuts conforming to ASTM A 307, Grade B, cadmium plated. Gaskets shall be of red rubber or compressed asbestos, 1/16-inch thick, conforming to ANSI B16.21. Gaskets for piping operating at temperatures in excess of 150°F shall be compressed asbestos or soft corrugated metal.

F. Unless otherwise shown or specified, steel pipe and fittings 6 inches and smaller in size shall be hot dip galvanized in accordance with the requirements of ASTM A 153. Exposed steel piping shall be field primed and painted in accordance with the requirements of the section entitled "Painting" of these Specifications.

2.4 STAINLESS STEEL PIPE

A. Stainless steel pipe in sizes 10 inches and smaller shall be seamless welded stainless steel pipe conforming to the requirements of ASTM A 312 or 778, Type 304L.

B. Unless otherwise specified or shown, stainless steel pipe $1^1/_2$ 2 inches and smaller shall be screwed, Schedule 40S. Steel pipe in sizes 2 inches through 10 inches $2^1/_2$ inches and larger shall be welded, Schedule 10S.

C. Screwed fittings and unions $1^1/_2$ inches and smaller shall be 3,000-pound forged stainless steel conforming to ASTM A 182, Grade F304 and ANSI B16.11.

Welded fittings shall be of the butt-welded type of wrought stainless steel conforming to ASTM A 403, Grade WP304 WPW 304L or A774TP 304L and ANSI B16.9. Reducing branch connections shall be made using threadolets or weldolets. Larger diameter tees and reducing tees may be fabricated from pipe without additional reinforcement.

D. Flanges shall be 150-pound, forged stainless steel conforming to ASTM A 182, Grade 304 and ANSI B16.5. Bolts shall be heavy hex conforming to ASTM A 193, Grade B8. Nuts shall be heavy hex conforming to ASTM A 194, Grade 8. Gaskets shall be red rubber or compressed asbestos, 1/16-inch thick, conforming to ANSI B16.21. Gaskets for piping operating at temperatures in excess of 150°F shall be compressed asbestos or soft corrugated metal.

2.5 COPPER TUBING

A. Exposed copper tubing for water or gas shall be seamless hard-drawn copper tube conforming to the requirements of ASTM B 88, Type L. Buried copper tubing shall be seamless, annealed copper tube conforming to the requirements of ASTM B 88, Type K. Annealed copper tube may be furnished in straight lengths or coils.

B. Copper tubing for instrument air service in sizes 5/8 inch O.D. and smaller shall be coated, seamless, bright annealed copper tube conforming to ASTM B 68, Type DHP. Wall thickness of copper tube shall be as follows:

Tube O.D. (inch)	Wall Thickness (inch)
$^1/_4$	0.030
3/8	0.032
$^1/_2$	0.035
5/8	0.040

Instrument air tubing shall be factory coated with a layer of black PVC meeting the requirements of ASTM D 1047, IPCEA S-61-402, and applicable UL standards. Minimum coating thickness shall be 0.032 inch. Unless otherwise shown, minimum size of instrument air tubing shall be 3/8 inch O.D.

C. Fittings for copper tube shall be wrought copper conforming to ASTM B 75 and ANSI B16.22 for silver brazed joints. Fittings for annealed copper tube in instrument air service shall be of the flareless, compression type, Hoke "Gyrolok," Crawford "Swagelok," Parker "Trible-Lok", or equal, conforming to ASTM B 16 or B 124.

2.6 STAINLESS STEEL TUBING

A. Stainless steel tubing for sample and process leads shall be seamless, bright annealed stainless steel tube conforming to ASTM A 269, Type 304L with minimum 3/8-inch O.D. and 0.035-inch wall thickness.

B. Fittings for stainless steel tubing shall be of the flareless, compression type of Type 304L stainless steel.

C. Where process leads or sample tubing are specified to be heat traced, furnish pre-insulated factory traced and jacketed tubing with 4 watt per foot, parallel, self-regulating, electric tracing, glass fiber, insulation and black, 105° PVC jacket overall. Tubing shall conform to Part 2.06 A. above. Product shall be factory mutual approved for Class I, Division 2 locations and shall operate on 120 volt, 60 hertz, single-phase power. All necessary termination and splicing accessories shall be furnished by the tubing manufacturer.

2.7 UNIONS

Unions shall be of the ground joint type. Unions in carbon steel and alloy steel piping shall be 300-pound galvanized malleable iron conforming to ASTM A 197 and ANSI B16.3 with bronze to iron seats. Unions in stainless steel piping shall be 3,000-pound forged stainless-steel conforming to ASTM A 182, Grade F304 and ANSI B 16.11. Unions in copper piping shall be cast red bronze with bronze-to-bronze seats.

2.8 PIPE DOPE

A. All threaded connections shall be made up using Teflon pipe dope applied to the male threads only.

B. Virgin Teflon thread tape shall be Hercules Packing Company "Herculon," 3M Company "Scotch No. 48," Crane Packing Company "Teflon Thread Tape," or equal.

C. Teflon thread paste may be used in place of tape on very large or very small joints.

2.9 EXPANSION COUPLINGS

A. Expansion couplings for steel and alloy pipe shall conform to the requirements of the section entitled "Pipe Couplings and Expansion Joints" of these Specifications.

B. Expansion couplings shall be furnished where shown on the Drawings, required, or directed by the Engineer.

2.10 LININGS

A. Where shown or specified, piping shall be furnished with a coal tar enamel lining or coal tar epoxy lining as described herein.

B. Coal tar enamel linings shall consist of a primer and a hot-applied lining of coal tar enamel. Pipe to be coated shall be given a solvent cleaning followed by a commercial blast cleaning in accordance with SSPC SP-6. Primer shall be applied immediately after blasting. Thickness of coal tar enamel lining shall be 3/32 inch. Except for specials and welded field joints, all pipe shall be lined in the shop by mechanical means. Coal tar enamel lining shall conform to the requirements of AWWA C203.

C. Coal tar epoxy linings shall consist of a two-component inhibitive epoxy primer and a two-component high build, polyamide cured coal tar epoxy lining. Pipe to be coated shall be given a solvent cleaning followed by a near white blast cleaning in accordance with SSPC SP-10. Primer shall be applied immediately after blasting to a minimum dry film thickness of 1.5 mils. Coal tar epoxy finish shall be applied in two coats having a minimum dry film thickness of 10 mils per coat. Finished lining shall have a dry film thickness of 20-25 mils. Except for specials and welded field joints, all pipe shall be lined in the shop by mechanized means. Coal tar epoxy linings shall conform to the requirements of AWWA C209.

D. The manufacturers of the lined pipe and field lining materials shall furnish the Engineer written certifications that the pipe lining systems conform to all applicable requirements of AWWA C203 or AWWA C209, as appropriate.

2.11 COATINGS

A. Where shown or specified, buried piping shall be furnished with a coal tar enamel coating or cold-applied, plastic tape wrap coating as described herein.

B. Coal tar enamel coatings shall consist of a primer, a hot-applied coating of coal tar enamel, a bonded wrap of coal tar saturated asbestos felt, and a protective wrapping of 75-lb. Kraft paper. Pipe to be coated shall be given a solvent cleaning followed by a commercial blast cleaning in accordance with SSPC SP-6. Primer shall be applied immediately after blasting. Except for specials, fittings, and field joints, all pipe shall be coated in the shop by mechanical means. Coal tar enamel coatings shall conform to the requirements of AWWA C203.

C. Cold-applied, plastic tape wrap coatings shall consist of a primer, a cold-applied wrap of laminated polyethylene tape, and a protective wrapping of 90-lb. Kraft paper or 50-50-50 lb. laminated Kraft paper. Pipe to be coated shall be given a solvent cleaning followed by a commercial blast cleaning in accordance with SSPC SP-6. Primer shall be applied immediately after blasting. Laminated tape wrap shall have an overall thickness of not less than 30 mils and shall overlap each preceding wrap by at least $^1/_2$ inch. Except for specials, fittings, and field joints, all pipe shall be coated in the shop by mechanical means. Cold-applied plastic tape wrap coatings shall comply with the requirements of AWWA C210. Plastic tape coatings and materials shall be as manufactured by the Tapecoat Company, Republic Steel Corporation, Polyken Division of Kendall Company, or equal, subject, however, to the requirements of these Specifications.

D. The manufacturers of the coated pipe and field coating materials shall provide the Engineer with written certifications that the pipe coating systems conform to all applicable requirements of AWWA C203 or AWWA C210, as appropriate.

PART 3 EXECUTION

3.1 GENERAL

A. All exposed piping shall be firmly anchored and supported by pipe supports or anchors as shown or required. Pipe supports shall be furnished as shown on the Drawings or in

accordance with the requirements of the section entitled "Pipe Supports and Hangers" of these Specifications. All pipe shall be carefully placed to the proper lines and grades as shown on the Drawings.

B. Full lengths of pipe shall be used wherever possible. Short lengths of pipe with couplings will not be permitted. Pipe shall be cut to exact measurement and shall be installed without forcing or springing.

C. Lines which slope shall have the right-of-way over lines whose elevations can be changed. Offsets, transitions, and changes in direction in pipes shall be made as required to maintain proper head room, slope, etc.

D. Piping shall be installed in such manner and at such times as will require a minimum of cutting and repairing of building structures. In case any such cutting or repairing is necessary, it shall be done only with the permission of Engineer. Cutting and repairing shall be performed by craftsmen of the trade which originally executed the work, and repairs shall match the original condition.

E. Except for annealed tubing, all changes in direction in piping systems shall be made with suitable fittings. Annealed tubing shall be bent using suitable bending tools.

F. When storing and installing piping, care shall be taken to prevent damage to the pipe coatings. Steel pipe with an exterior bituminous or plastic coating or wrapping shall be handled using rubber or canvas slings. All damaged coatings shall be repaired to the satisfaction of the Engineer.

G. A liberal number of unions and/or flanged joints shall be used to permit the ready removal of any section. Unions shall be installed in all piping connections to equipment, to regulating valves, and wherever necessary to facilitate the dismantling of piping and removal of valves and other items requiring maintenance. Flanges on equipment may be considered as unions.

H. Installed piping shall not interfere with the operation of or accessibility to doors and/or windows, shall not encroach on aisles, passageways and equipment, and shall not interfere with the servicing or maintenance of any equipment.

I. The interior of all piping shall be free from obstructions and protrusions. All burrs shall be removed from the inside and outside edges of all cut pipe by reaming. Cutting shall be done in such a manner so as to leave a smooth end at right angles to pipe threads. Tool marks and unnecessary pipe threads shall be avoided. Cuttings and other foreign material shall be removed from the inside of the pipe prior to installation.

J. Unless otherwise shown on the Drawings, piping and tubing laid underground shall have a minimum cover over the top of the pipe as follows:

- Located in Roadway 48 inches
- Located in Other Paved Areas 36 inches
- Water, Gas, and Drain Piping, 4-inch I.D. and larger 30 inches
- Water, Gas, and Drain Piping, 32-inch I.D. and smaller 24 inches
- Located under Building 6 inches

K. Suitable galvanized steel pipe sleeves of adequate inside diameter shall be provided where piping or tubing passes through walls and floors of buildings and structures. Inside diameter of sleeve shall be approximately 2 inches larger than outside diameter of pipe or insulation. A welded steel plate waterstop with a minimum dimension 4 inches larger than outside diameter of sleeve shall be furnished for use in underground walls. Sleeves shall be built into the concrete or masonry wall or floor. Under no circumstances will blocking out or breaking of walls be permitted for later insertion. After installation of piping, the space between the pipe and the sleeve shall be caulked air and watertight. Caulking shall be oakum and lead in concrete and masonry construction and rope asbestos in wood or plaster construction.

L. After installation, the interior of all piping shall be cleaned as necessary to remove flux, slag, scale, rust, dirt, oil, and other foreign material. As piping is installed, open ends shall be covered or plugged as necessary to prevent the entrance of foreign matter and to maintain the required cleanliness.

M. Piping laid underground shall be fully supported along its entire length by a compacted layer of select earth backfill or sand in accordance with the requirements of the section entitled "Earthwork" of these Specifications. Select earth backfill (or sand, in the case of coated or wrapped steel pipe) shall also be placed and compacted around the piping to provide a cover of not less than 12 inches over the top of the pipe.

N. Piping and tubing shall be supported as shown on the Drawings and/or specified in the section entitled "Pipe Supports and Hangers" of these Specifications.

O. Changes in pipe size shall be made using reducing fittings, not bushings. If centerline elevation is not specified, use eccentric reducers in horizontal piping. On liquid lines, eccentricity shall be down with top of pipe level. On vapor and gas lines, eccentricity shall be up with bottom level.

P. Indicated locations and sizes of equipment connections are approximate; exact locations and sizes of piping, valves, etc., shall conform to approved shop drawings. Connection sizes shall not be smaller than scheduled size or equipment outlet size, whichever is larger.

3.2 INSTALLATION OF STEEL AND ALLOY PIPING

A. Pipe threads shall be concentric with the outside of the pipe and shall conform to ANSI B2.1. When threading stainless steel pipe, dies shall have 20° to 30° hook. Finished joints shall have no more than three threads exposed. Before assembly, pipe ends and threads shall be inspected and any defective pieces replaced. All joints shall be properly aligned before connection to prevent thread damage. Pipe dope shall be used on the male threads of all threaded connections. Teflon thread tape shall be applied two threads back from the end of the pipe or fitting to prevent shredding. Excess pipe dope shall be trimmed or cleaned off to provide adherence for paints or coatings. After joining, exposed threads in underground piping shall be given a heavy coat of bituminous paint or other suitable protective compound prior to backfilling.

B. All flanges shall be faced and drilled and shall be true and perpendicular to the axis of the pipe. Flanges shall be cleaned of all burrs, deformations, or other imperfections before joining.

Flanged joints shall be installed so as to ensure uniform gasket compression. All bolting shall be pulled up to the specified torque by crossover sequence. Where screwed flanges are used, the pipe edge shall not extend beyond the face of the flange, and the flange neck shall completely cover the threaded portion of the pipe. Where slip-on flanges are used, the distance from the end of the pipe to the gasket face of the flange shall not exceed "t" plus 1/4 inch, where "t" is the pipe wall thickness. Unless otherwise required, bolt holes shall straddle the vertical and horizontal axes of the pipe. Connections to equipment shall be made in such a way that no strain is placed on the equipment flanges.

C. For flanged connections between steel or alloy piping and cast or ductile iron piping or valves, steel flanges shall be flat faced and furnished with full-face gaskets, insulating bushings, and, when buried, stainless steel bolts.

D. Where steel or alloy pipe is connected to copper tubing, insulating bushings or couplings shall be used to prevent galvanic corrosion.

3.3 INSTALLATION OF COPPER TUBING

A. Annealed copper tubing shall be cut square, and ends reamed using suitable tools. Bending tools shall be used in making bends. Minimum bend radii shall be 1 inch for 1/4-inch O.D. tubing and 1-1/2 inches for tubing 3/8-inch O.D. and larger. Compression fittings shall be installed in conformance with the manufacturer's instructions. Plastic coatings shall be cut back only far enough to permit installation of fittings. When a section of tubing is cut from a coil, the end of the unused portion shall be crimped closed.

B. Hard drawn copper tubing and fittings shall be assembled using silver brazing alloy and flux as recommended by the manufacturers. Tubing shall be properly cut square, ends reamed, and both fitting and tubing polished with steel wool before fluxing. Joints shall be properly heated, care being taken not to overheat. After the brazing alloy has been run in, the joint shall be wiped clean. Brazing wire shall be fluxed before using. Unless otherwise specified, copper tubing shall be installed in conformance with the manufacturer's instructions.

3.4 FIELD TESTING

A. After all piping has been placed and backfilled between the joints, each run of newly laid pipe, or any valved section thereof, shall be tested by the Contractor in the presence of the Engineer, and tests shall be continued until all leaks have been made tight to the satisfaction of the Engineer.

B. All piping carrying liquids under pressure shall be subjected to a hydrostatic gauge pressure of 150 percent of the maximum expected operating pressure or 150 psig, whichever is greater, based on the elevation of the lowest point of the section under test, corrected to the elevation of the pressure gauge. All piping carrying air shall be subjected to a hydrostatic gauge pressure of at least 150 percent of the maximum expected operating pressure or 15 psig, whichever is greater. The above pressures shall be maintained for a minimum of two consecutive hours. No leakage will be allowed. Leakage may be determined by loss of pressure, soap solution, or other methods approved by the Engineer.

C. Process piping, designed in accordance with ANSI B16.3 or ANSI B16.4, shall be tested in accordance with the requirements contained therein.

D. The Contractor shall take all precautions necessary to protect any equipment that might be damaged by the pressures used in the tests. Delicate equipment shall be valved off, removed, or otherwise protected.

E. All piping shall be securely anchored and restrained against movement prior to application of test pressures. Prior to the pressure test, pipe laid in trenches shall be partially backfilled adequately to secure the pipe during the test. All joints, fittings and valves will be left open where possible. All exposed pipe, fittings, valves, and joints shall be carefully examined during the pressure test.

F. Before applying the specified test pressure during a test using water as the pressurizing medium, all air shall be expelled from the pipe. If hydrants, blowoffs, or air release valves are not available at the high places, the Contractor shall make the necessary taps at points of highest elevation before the test is made and insert plugs after the test has been completed.

G. Subject welded joints to hammer tests while under pressure.

H. Any leakage developing during the test shall be corrected at the Contractor's expense by tightening, replacing packing or gaskets, or replacing defective portions of the piping system. No caulking will be permitted. If the defective portion cannot be located, the Contractor, at his expense, shall remove and reconstruct as much of the original work as necessary to obtain a piping system tested without leakage.

I. After all tests on any section have been completed to the satisfaction of the Engineer, the Contractor shall carefully clean, blow out, and drain the line of all water to prevent freezing of the same. The Contractor shall also demonstrate to the satisfaction of the Engineer that any and all lines are free from obstructions and foreign material.

J. The Contractor shall bear the complete cost of the tests, including set up, labor, temporary piping, blocking, gauges, bulkheads, water, air, soap solutions, and other materials required to conduct the tests.

3.5 FIELD PAINTING

Following installation and testing, all exposed piping shall be field primed and painted in accordance with the requirements of the section entitled "Painting" of these Specifications.

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SECTION 15064-A

PVC PRESSURE PIPE

PART 1 GENERAL

1.1 SCOPE

A. The work covered by this section includes furnishing all labor, equipment, and materials required to install and test polyvinyl chloride (PVC) pressure pipe, including valves, unions, fittings, couplings, adaptors, and accessories, as shown on the Drawings and/or specified herein.

B. The Contractor's attention is called to the fact that all PVC piping and accessories are not necessarily shown completely on the Drawings which are more or less schematic. However, the Contractor shall furnish and install all piping indicated or required for proper operation of the equipment or services requiring such piping.

1.2 QUALITY ASSURANCE

A. The Contractor, at the Engineer's request, shall furnish a certificate from the manufacturer of the pipe and fittings that the manufacturer is fully competent and capable of manufacturing PVC pipe and fittings of uniform texture and strength that will fully comply with these specifications and have so manufactured this class of pipe in sufficient quantities to be certain that it will meet all normal field conditions of usage. The manufacturer must have adequate equipment and quality control facilities to be sure that each extrusion of pipe is uniform in texture, dimensions, and strength.

B. All pipe shall be tested and inspected at the place of manufacture for all requirements of the latest ASTM and commercial standard tests and certified copies of the test reports covering each shipment shall be submitted to the Engineer prior to laying.

C. Each length of pipe and each fitting shall have the following data clearly marked on each piece:
   1. Nominal size
   2. Type and grade of material and ASTM standard
   3. SDR, class, or schedule rating
   4. Manufacturer
   5. National Sanitation Foundation's seal of approval

1.3 SHOP DRAWINGS AND ENGINEERING DATA

Complete shop drawings and engineering data shall be submitted to the Engineer in accordance with the requirements of the section entitled "Submittals" of these Specifications.

1.4 STORAGE AND PROTECTION

A. PVC piping and accessories shall be stored and protected in accordance with the requirements of the section entitled "General Equipment Stipulations" of these Specifications.

B. PVC pipe and fittings shall be stored under cover.

C. All pipe and accessories shall be stored aboveground and fully supported so as not to bend or deflect excessively under its own weight. Height of stacked pipe shall not exceed 4 feet. Bundled pipe shall not be stacked more than two bundles high.

D. Kinked, flattened, buckled, broken, or otherwise defective pipe and fittings shall not be used and shall be removed from the site.

E. Pipe shall be handled using nylon slings. Wire rope slings or chains shall not be

used. 1.5 GUARANTEE

Provide a guarantee against defective equipment and workmanship in accordance with the requirements of the section entitled "Guarantees and Warranties" of these Specifications.

PART 2 PRODUCTS

2.1 PVC PIPE AND FITTINGS

A. The pipe and fittings shall be homogenous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects. The pipe shall be as uniform as commercially practical in color, opacity, density, and other physical properties.

B. The manufacturer shall provide waterstops, acceptable to the Engineer, which shall be applied to the outside of plastic pipe when the pipe is to be enclosed in any structure where concrete or mortar is used which will prevent leakage along the outer wall of the barrel of the pipe.

C. No single piece of pipe shall be laid on any project covered by this specification unless it is found to be generally straight. Such pipe shall have a maximum ordinate as measured from the concave side of the pipe not to exceed 1/16-inch per foot of length. If the deviation from straightness exceeds this requirement, then the particular piece of pipe shall be rejected for use until it can comply with this provision.

D. Wyes, tees, bends, and adapters and any other fittings required or directed by the Engineer shall be constructed of ductile iron as directed in Section 15062 of these Specifications. Engineering data for such fittings showing cross-sectional views with dimensions shall be provided and such data and fittings shall be approved by the Engineer prior to their use. The materials used in the manufacture of fittings shall conform with the requirements for the pipe with which they shall be used and any variation of such requirements shall be subject to the approval of the Engineer. Fittings shall have wall thicknesses equal to or greater than that of the pipe to which they are joined.

2.2 PIPE

A. PVC pipe shown on the Drawings to be installed outside of structures or buried underground and used to convey water or wastewater shall have push-on joints unless otherwise noted on the Drawings. All pipe material shall be Grade 1, Type I, polyvinyl chloride (PVC) in accordance with ASTM D 1784, Class 12454-B. All pipe material shall be National Sanitation Foundation approved for use with potable water. Pipe in sizes $1^1/_2$-inches through 3 inches (1/2 inches through 12 inches for corrosive fluids) shall be SDR 21 with 200 psi pressure rating in accordance with ASTM D 2241. Pipe in sizes 4 inches through 12 inches shall be either SDR 21 with 200 psi pressure rating in accordance with ASTM D 2241 or Class 200 in accordance with AWWA C 900, depending on which is called for on the Drawings or in the Bid Schedule. Maximum lengths of pipe shall not exceed 20 feet.

B. PVC pipe shown on the Drawings to be installed inside of structures or used to transport liquid or gaseous chlorine shall have threaded joints. Solvent welding of field joints will not be permitted. PVC for threaded joints shall be Schedule 80, National Sanitation Foundation approved and shall conform to the latest requirements of Commercial Standard CS 207 and ASTM D 1785 for Schedule 80 water pressure ratings. Pipe material shall be Type I, Grade 1, in accordance with the requirements of ASTM D 1784, Class 12454-B. Fittings shall comply with the requirements of ASTM D 2464 for molded, Schedule 80, screwed fittings.

C. When operating temperatures exceed 140°F, pipe material shall be chlorinated polyvinyl chloride (CPVC) in accordance with ASTM D 1784, Type IV, Grade 1, Class 23477-B.

2.3 FITTINGS

A. All fittings required in PVC piping systems conveying water or wastewater shall be cast iron or ductile iron as specified in Section 15062 of these Specifications. Engineering data for fittings showing cross-sectional views with dimensions shall be provided and such data and fittings shall be approved by the Engineer prior to their use. Connections between cast iron or ductile iron fittings and PVC pipe shall be made by use of special adaptors similar to Mueller Transition Gland A-399 by Mueller Co., Transition Gasket F6340 by Clow Corporation or a similar transition which has been approved by the Engineer. The joint shall be mechanical joint for ductile iron or cast iron as described in Section 15062 of these Specifications.

B. Fittings for PVC pipe inside of structures or used to convey liquid or gaseous chlorine shall comply with the requirements of ASTM D 2464 for Molded, Schedule 80, screwed fittings.

2.4 PVC VALVES AND STRAINERS

A. Unless otherwise shown or required, all valves, unions, and strainers in PVC piping shall be constructed of Type I, Grade 1 PVC. Valves shall be NSF approved and shall have a working pressure of 150 psi.

B. Ball valves shall have double union type body, Teflon seats, Viton seals, full diameter port, and NPT threaded ends. Ball valves in 4-inch size may have single union body.

C. Check valves shall be of the ball type with union body, Viton seat, and NPT threaded ends.

D. Strainers shall be of the wye type with NPT threaded ends and 8 or 10 mesh strainer basket.

2.5 JOINTS

A. Push-On Joints

1. The joints shall be designed so that the pipe and fittings may be connected on the job without the use of solvent cement or any special equipment. The push-on joint shall be single rubber gasket joint designed to be assembled by the positioning of a continuous, molded, rubber ring gasket in an annular recess in the pipe or fitting entering pipe into the socket thereby compressing the gasket radially to the pipe to form a positive seal. The gasket and the annular recess shall be so designed and shaped that the gasket is locked in place against displacement as the joint is assembled. Details of the joint design and assembly shall be in accordance with the joint manufacturer's standard practice. The joints shall be designed so as to provide for the thermal expansion or contraction experienced with a total temperature change of at least 75°F in each joint per length of pipe. The joint shall comply with ASTM D 3139. Gasket shall comply with ASTM F 477.
2. Lubricant furnished for lubricating joints shall be nontoxic, shall not support the growth of bacteria, shall have no deteriorating effects on the gasket or pipe material, and shall not impart color, taste, or odor to water. The lubricant containers shall be labeled with the manufacturer's name.
3. Gaskets shall meet all applicable requirements of ANSI A21.11. Gasket dimensions shall be in accordance with the manufacturer's standard design dimensions and tolerances. The gasket shall be of such size and shape as to provide an adequate compressive force against the spigot and socket after assembly to affect a positive seal under all combinations of joint and gasket tolerances. The trade name or trademark, size, mold number, gasket manufacturer's mark and year of manufacture shall be molded in the rubber on the back of the gaskets.
4. Gaskets shall be vulcanized natural or vulcanized synthetic rubber. No reclaimed rubber shall be used. When two hardnesses of rubber are included in a gasket, the soft and hard portions shall be integrally molded and joined in a strong vulcanized bond. They shall be free of porous areas, foreign material, and visible defects. The required properties of the gasket rubber and the required method of test are given in the following table:

ASTM Test Property	Method	Main Body of Gasket	Harder Portion (if used)
Hardness, Durometer "A"	D 676 at 76” 6°F	45-70	78-90
Minimum Ultimate Tensile, psi	D 412	2,000	1,200
Minimum Ultimate Elongation, Percent[1]	D 412	300	125
Minimum Aging, Percent[2]	D 572[3]	60	60

[1] Of original length.

[2] Of original values of tensile and ultimate elongation.

[3] Oxygen pressure method: After 96 hours at 70 "1°C at 300 +10 psi.

5. The gasket manufacturer shall set up such quality control procedures as will ensure the gasket's meeting the requirements of this standard. He shall furnish a monthly report of representative quality control test results to the pipe manufacturer.
6. A sample push-on fitting shall be submitted to the Engineer for examination and approval prior to delivery of any pipe.

B. Threaded Joints
1. Joints shall be made with American Standard IPS threads. All joints shall be made up with Teflon thread tape or thread dope or with pipe manufacturers recommended joint compound for use with chlorine solution.
2. All fittings shall be Schedule 80 with screwed joints. Gaskets for flange fittings and unions shall be as recommended by pipe manufacturer for use with chlorine solution.

PART 3 EXECUTION

3.1 LAYING PIPE

A. All provisions with respect to trenching, backfilling, bedding, and pipe laying shall conform to the applicable requirements of the sections entitled "Earthwork" and "Ductile Iron Piping and Ductile Iron and Cast Iron Fittings" of these Specifications.

B. All provisions with respect to connections and existing utilities shall comply with the applicable requirements of the section entitled "Ductile Iron Piping and Ductile Iron and Cast Iron Fittings" of these Specifications.

C. Exposed piping shall be supported in accordance with the requirements of the section entitled "Pipe Supports and Hangers" of these Specifications. Metal valves and valve boxes shall be supported independently of piping. PVC piping shall be isolated from direct contact with metal or concrete supports by a 1/32-inch sheet of neoprene.

D. When a joint consists of a PVC flange and a metal flange, the metal flange shall be flat faced and furnished with a full face resilient gasket.

E. PVC valves shall be installed with the flow arrow in the proper direction. Union nuts on PVC valves shall be tightened only hand tight in accordance with manufacturer's instructions. Spare O-ring seals and seats shall be furnished with each PVC valve.

F. Where specifically shown or called for on the Drawings, service line taps into PVC pipe shall be made using tapping saddle constructed for use on PVC pipe. The saddle shall be constructed of bronze or brass, shall have all stainless steel bolts or screws, and have a resilient rubber gasket to provide a positive, watertight seal.

G. PVC pipe laid underground shall have a minimum of 36 inches of cover in traffic areas and 30 inches of cover in non-traffic areas.

3.2 FIELD TESTING

A. After all piping has been placed and backfilled between the joints, each run of newly laid pipe, or any valved section thereof, shall be tested by the Contractor in the presence of the Engineer, and tests shall be continued until all leaks have been made tight to the satisfaction of the Engineer.

B. All piping shall be subject to a hydrostatic gauge pressure equal to the rated pressure class of the pipe being tested. The allowable leakage shall be as shown in Table 1. The duration of the test shall be a minimum of 2 hours.

C. The Contractor shall take all precautions necessary to protect any equipment that might be damaged by the pressures used in the tests. Delicate equipment shall be valved off, removed, or otherwise protected.

D. All piping shall be securely anchored and restrained against movement prior to application of test pressures. Prior to the pressure test, pipe laid in trenches shall be partially backfilled adequately to secure the pipe during the test. All joints, fittings, and valves will be left open where possible. All exposed pipe, fittings, valves, and joints shall be carefully examined during the pressure test.

E. Before applying the specified test pressure, all air shall be expelled from the pipe. If hydrants, blow-off valves, or air release valves are not available at the high places, the Contractor shall make the necessary taps at points of highest elevation before the test is made and insert plugs after the test has been completed.

F. Any excessive leakage developing during the test shall be corrected at the Contractor's expense. If the defective portion cannot be located, the Contractor, at his expense, shall remove and reconstruct as much of the original work as necessary to obtain a facility meeting the specified leakage limits.

G. After all tests on any section have been completed to the satisfaction of the Engineer, the Contractor shall carefully clean, blow out, and drain the line of all water to prevent the freezing of the same. The Contractor shall also demonstrate to the satisfaction of the Engineer that any and all lines are free from obstructions and foreign material.

H. The Contractor shall bear the complete cost of the tests, including set-up, labor, temporary piping, blocking, gauges, bulkheads, water, air, soap solutions, and any other materials required to conduct the tests.

I. All pipe used for gaseous chlorine shall be tested with ammonia solution as recommended by the manufacturer of the chlorination equipment.

TABLE 1

ALLOWABLE LEAKAGE
(U.S. Gallons per 100 Joints per Hour)

Pipe Diameter (inches)	Test Pressure (psi)			
50	50	100	150	200
4	0.35	0.50	0.60	0.75
6	0.53	0.75	0.90	1.10
8	0.70	1.00	1.20	1.40
10*	0.88	1.25	1.50	1.75
12*	1.05	1.50	1.80	2.10

*Single-gasket coupling is one joint. Twin-gasket coupling is two joints.

3.3 DISINFECTION

After installation and testing, all potable water piping shall be disinfected in accordance with the requirements of the section entitled "Disinfection of Potable Water Lines and Water Storage Tanks" of these Specifications.

3.4 FIELD PAINTING

After installation, all exposed piping shall be field primed and painted in accordance with the requirements of the section entitled "Protective Coatings" of these Specifications.

END OF SECTION

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SECTION 15090

PIPE COUPLINGS AND EXPANSION JOINTS

PART 1 GENERAL

1.1 SCOPE

The work covered by this section includes furnishing all labor, equipment, and materials required to furnish and install pipe couplings and expansion joints, including grooved couplings, flanged adaptors, expansion couplings, and rubber expansion joints, as shown on the Drawings, specified herein, and/or required for proper installation of piping and equipment.

1.2 SHOP DRAWINGS AND ENGINEERING DATA

Complete shop drawings and engineering data shall be submitted to the Engineer in accordance with the requirements of the section entitled "Submittals" of these Specifications.

1.3 STORAGE AND PROTECTION

Pipe couplings shall be stored and protected in accordance with the requirements of the section entitled "General Equipment Stipulations" of these Specifications.

1.4 SHOP PAINTING

Pipe couplings shall be cleaned, shop primed, and shop painted as specified herein.

1.5 GUARANTEE

Provide a guarantee against defective materials and workmanship in accordance with the requirements of the section entitled "Guarantees and Warranties" of these Specifications.

PART 2 PRODUCTS

2.1 EXPANSION COUPLINGS

A. Unless otherwise shown or specified, expansion couplings shall be of a gasketed, short sleeve type, with a diameter to fit the pipe properly. Expansion couplings shall have a working pressure of not less than 150 PSIG.

B. Each short sleeve coupling for joining cast iron or ductile iron pipe shall consist of one cylindrical cast iron middle ring without pipe stop, two high-grade malleable iron or steel followers, two rubber compound, wedge section gaskets, and a sufficient number of track head, electroplated steel bolts to compress the gaskets properly. Cast iron couplings shall be Dresser Style 53, Rockwell Style 441, or equal.

C. Each short sleeve coupling for joining steel pipe shall consist of one cylindrical steel middle ring without pipe stop, two steel follower rings, two rubber-compound, wedge section gaskets, and a sufficient number of track head, electroplated steel bolts to compress the gaskets properly. Steel couplings shall be Dresser Style 38, Rockwell Style 411, or equal.

D. Where expansion couplings are required for joining cast iron pipe to steel pipe of the same nominal size, steel transition couplings, Dresser Style 62, Rockwell Style 413, or equal, shall be used.

E. Rubber gaskets shall be composed of a resilient synthetic rubber compound suitable for use in wastewater containing oil and grease.

2.2 GROOVED COUPLINGS

A. Grooved couplings for cast iron and ductile iron pipe shall consist of two or more ductile iron housing clamps, a single rubber compound gasket, and electroplated oval-neck track bolts with heavy hex nuts. Housing shall be ribbed for strength and self-centering. Rubber gasket shall be composed of a resilient synthetic rubber compound suitable for use in wastewater containing oil and grease.

B. Grooved couplings shall provide for a pipe end separation of not less than 3/32-inch and a deflection of not less than 0°45'.

C. Grooved couplings shall engage two circumferential grooves cut at the ends of the pipe sections to be joined. The grooves shall provide a positive mechanical grip that locks the pipe ends together such that they cannot blow apart under pressure, vibration, or sag. Grooves shall be cut with a radius at the inside corners of the grooves.

D. Grooved couplings for joining cast iron or ductile iron pipe shall be Vitraulic Style 31, Gustin-Bacon Gruvajoint No. 500, or equal.

2.3 FLANGED ADAPTORS

A. Flanged adaptors shall be used for joining plain end cast iron or ductile iron pipe to flanged valves, pumps, and fittings. Flanged adaptors shall be suitable for working pressures to 150 PSIG.

B. Flanged adaptors in sizes 12-inch and smaller shall consist of an ASTM A 126, Class B cast iron flanged body drilled to mate with a 125-pound cast iron flange per ANSI B16.1, a cast iron follower ring, a rubber-compound, wedge section gasket, and a sufficient number of track head, electroplated steel bolts to compress the gasket properly.

C. Flanged adaptors in sizes 14-inch and larger shall consist of a high strength steel flanged body drilled to mate with a 125-pound cast iron flange per ANSI B16.1, a high strength steel follower ring, a rubber-compound, wedge section gasket, and a sufficient number of electroplated steel bolts to compress the gasket properly.

D. Rubber gasket shall be composed of a resilient synthetic rubber compound suitable for use in wastewater containing oil and grease.

2.4 FLANGED RUBBER EXPANSION JOINTS

A. Flanged rubber expansion joints shall be standard spool-type single or multiple arch expansion joints constructed of abrasion resistant rubber reinforced with high tensile strength synthetic fabric and steel rings.

B. Ends of the expansion joint shall be integral with the body and shall be full faced and drilled per ANSI B16.1 for 125-pound flanges. Beveled and split, galvanized steel retaining rings shall be provided to prevent damage to flanges and to distribute bolting stresses during assembly.

C. Tube, body, and flanges shall be constructed using Buna-N for wastewater, natural rubber for clean water, and Buna-N or neoprene for air. For working temperatures in excess of 180°F or for chemical service, tube, body, and flanges shall be constructed of Viton. The exterior of the expansion joint shall be coated with Hypalon to resist weathering.

D. When used to convey slurries, raw water, or untreated wastewater in horizontal piping, arches shall be filled with a special soft rubber compound integrally cured in the arches.

E. In unrestrained piping systems or pipe systems subject to excessive longitudinal deflection, joints shall be furnished with two plated steel control rods filled with nuts to limit compression and extension and prevent damage to the joint.

F. Rubber expansion joints shall be "Redflex," as manufactured by Red Valve Company, "Invincible Expansion Joint," as manufactured by Mercer Rubber Company, or equal, subject to the requirements of this section.

2.5 SLIP-ON RUBBER EXPANSION JOINTS

Slip-on rubber expansion joints for low pressure applications (less than 15 PSIG) up through 6-inch-diameter in size shall be sleeve-type, single-arch expansion joints constructed of abrasion resistant rubber reinforced with high tensile strength synthetic fabric.

A. Ends of the joint shall be designed to slip over pipe ends and shall be secured in place with adjustable stainless steel clamps. Two clamps shall be provided on each end of the joint.

B. Joint shall be constructed of Buna-N for wastewater and Buna-N or neoprene for air at working temperatures up to 180°F.

2.6 SHOP COATINGS

A. Couplings and adaptors shall have finish as follows:

Material	Location	Primer	Finish
Cast Iron	Buried or Submerged	Asphaltic Varnish Inside and Out	
Cast Iron	Exposed	Asphaltic Varnish (Interior)	
Cast Iron	Exposed	Primer (Exterior)	(Field Applied)
Steel	Buried or Submerged	Epoxy Primer Inside and Out	Coal Tar Epoxy
Steel	Exposed	Primer (Exterior)	(Field Applied)
Steel	Exposed	Epoxy Primer (Interior)	Coal Tar Epoxy (Interior)

B. Coatings used for couplings and adaptors in potable water shall be approved for use with potable water.

2.7 SPARE PARTS

The Contractor shall furnish two spare gasket sets and two spare track head bolt sets for each size and type of coupling.

PART 3 EXECUTION

3.1 INSTALLATION

A. Pipe couplings and expansion joints shall be installed where shown on the Drawings, required, or directed by the Engineer. Couplings and joints shall be installed in strict conformance with the manufacturer's instructions.

B. Pipe ends shall be cleaned, brushed, or filed to produce a mating surface for the gasket that is free from dirt, rust, chuck marks, mill scores, dents, burrs or other foreign substances that would impede proper gasket seating.

C. Grooves for grooved couplings shall be accurately located and cut with a suitable grooving tool.

D. A lubricant recommended by the coupling manufacturer shall be used in seating all gaskets.

E. On expansion couplings and flanged adaptors, bolts shall be tightened diametrically opposite each other and in progression so that the inner rims project an equal distance over the flares of the middle ring at all points. Bolts shall be tightened sufficiently to ensure a watertight joint but shall not be tightened beyond the point of stretching.

F. On grooved couplings, bolts shall be tightened alternately and uniformly so the housing clamps come together evenly and the gasket is not pinched. Bolts shall be tightened until the housing clamps meet.

G. Following installation and testing, couplings shall be field painted in accordance with the requirements of the section entitled "Protective Coatings" of these Specifications. Rubber expansion joints shall not be painted.

END OF SECTION

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SECTION 15095

PIPE SUPPORTS AND HANGERS

PART 1 GENERAL

1.1 DESCRIPTION

This section covers all pipe supports, hangers, and brackets necessary to install piping furnished under these Contract Documents. The Contractor shall furnish and install all foundations, anchor bolts, pipe supports, shims, hangers, clamps, and hardware required for a complete installation as shown on the Drawings and/or specified herein.

1.2 SHOP DRAWINGS AND ENGINEERING DATA

Complete shop drawings and engineering data shall be submitted to the Engineer in accordance with the requirements of the section entitled "Submittals" of these Specifications.

1.3 STORAGE AND PROTECTION

Pipe supports and accessories shall be stored and protected in accordance with the requirements of these Specifications.

1.4 SHOP PAINTING

Fabricated pipe supports and accessories not specified to be galvanized or cadmium plated shall be cleaned and shop primed in accordance with the requirements of these Specifications.

1.5 GUARANTEE

Provide a guarantee against defective equipment and workmanship in accordance with the requirements of the section entitled "Guarantees and Warranties" of these Specifications.

PART 2 PRODUCTS

2.1 MATERIALS

All supports and hangers shall meet the following material requirements:

A. All structural steel shall conform to ASTM A 36.

B. All pipe support columns shall conform to ASTM A 53, Grade B, and shall be minimum Schedule 40.

C. All embedded anchor bolt materials shall conform to ASTM A 193, Grade B8; ASTM A 276, Type 304; or IFI-104, Grade 304. Nuts shall be heavy hex nuts conforming to ASTM A 194, Grade 8 or IFI-104, Grade 304. Minimum anchor bolt size for pipe supports shall be 5/8-inch diameter.

D. All rod and bolting materials in contact with cold piping (less than -20E F) shall conform to ASTM A 320, Grade B8. Nuts shall be heavy hex nuts conforming to ASTM A 194, Grade 8 or 8T.

E. All rod and bolting materials shall conform to ASTM A 307, Grade B, and shall be cadmium plated. Nuts shall be heavy hex nuts conforming to ASTM A 307. Cadmium plating shall conform to ASTM A 165, Type NS.

F. All carbon steel or malleable iron straps, hangers, clamps, U-bolts, and other hardware in contact with the pipe shall be cadmium plated or hot-dip galvanized.

G. Expansion type anchor bolts shall be of stainless-steel construction and shall comply with Federal Specification FF-S-325.

H. Long runs of pipe subject to expansion shall be hung by means of adjustable swivel pipe roll hangers, Grinnell, Figure 174; Fee and Mason, Figure 2729; or equal.

I. Short runs of uninsulated pipe subject to expansion in sizes up to and including 3-1/2 inches as well as all pipe of those sizes not subject to expansion shall be hung by means of adjustable swivel, split pipe ring, Grinnell, Figure 104; Fee and Mason, Figure 199; or equal.

J. Insulated piping and tubing, short lengths of 4-inch and larger pipe subject to expansion, and pipe 4 inches and larger not subject to expansion shall be hung by means of adjustable steel clevis hangers, Grinnell, Figure 260; Fee and Mason, Figure 239; or equal.

K. Pipe 2 inches and less in diameter and not subject to expansion may, when paralleling walls, be supported by single hook clamp hangers, Grinnell, Figure 168; Fee and Mason, Figure 327B, or equal.

L. Flat strap hangers will not be permitted. Hangers relying on mastics or adhesives shall not be used.

M. Pipe supported from underneath and subject to expansion shall have adjustable pipe roll stand supports, Grinnell, Figure 274; Fee and Mason, Figure 161; or equal. The pipe roll stand shall be supported by concrete piers, structural steel, or steel brackets as required.

N. Pipe supported from underneath and not subject to expansion shall have cast-in-place concrete supports as shown on the Drawings or adjustable pipe saddle supports on properly sized pipe stanchions and ample, properly grouted floor flanges. Saddle supports shall be Grinnell, Figure 264; Fee and Mason, Figure 291; or equal.

O. Hangers suspended from structural steel shall be supported on U. F. S. beam clamp, Grinnell, Figure 228L or 2921; Fee and Mason, Figure 252L or 253L; or equal with links as required.

P. Hangers from concrete work shall be secured by universal, galvanized metal inserts, Grinnell, Figure 282; Fee and Mason, Figure 2570; or equal, placed in the concrete at the time of pouring. Wooden plugs or other improvised means shall not be used for any form of hanger fastening.

Q. Steel or concrete pipe supports for all piping between undisturbed earth and face of structures shall be in accordance with the details shown on the Drawings.

R. All interior and exterior concrete piers shall be Class A concrete meeting the requirements of these Specifications.

S. Rods for supporting suction bells or foot valves of pump intakes shall be stainless steel of the size shown on the Drawings. The rods shall be furnished complete with stainless steel turnbuckles and eyes or other approved means for connection to the suction bell and stainless-steel eye bolt anchored in the concrete. Supports for other pump suction pipelines shall be as shown on the Drawings.

T. Uninsulated copper tubing shall be hung by means of copper-plated, split- ring hangers with copper-plated sockets, Grinnell Figure CT-109, Fee and Mason Figure 360, or equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Contact between ferrous supports and non-ferrous piping materials shall not be permitted. Supports and clamps shall be rubber coated or copper plated as necessary to prevent this condition.

B. Adequate supports shall be provided so that there is no movement or visible sagging between supports.

C. Hangers shall permit a minimum of $1^{1}/_{2}$-inch vertical adjustment after installation.

D. Hanger rods shall be galvanized carbon steel conforming to the following sizes:

Minimum	**Rod Diameter, In.**
	1/2 and under
$^{3}/_{4}$-2	3/8
2 $^{1}/_{2}$ - 3 $^{1}/_{2}$	$^{1}/_{2}$
4	5/8
6	$^{3}/_{4}$
8-12	7/8

E. Carbon steel, alloy steel, stainless steel, and hard-drawn copper pipe shall be supported on maximum intervals as follows:

Maximum Interval for Steel (feet)	Maximum Interval	Pipe Size (inches)	Liquid Gas for Copper (feet)
1/2	5	6	4
3/4	6	7	5
1	7	9	6
1 1/2	9	11	8
2	10	13	8
2 1/2	11	14	9
3	12	15	10
4	13	17	11
6	17	21	--
8	19	24	--
10	22	27	--
12	23	29	--
14	25	32	--
16	27	35	--
18	28	37	--
20	30	39	--
24	32	42	--

F. Annealed copper tubing, polyethylene tubing, and PVC piping shall be supported on maximum intervals as follows:

Tube Size (inches)	Maximum Interval (feet)
3/8 and smaller	2
1/2 - 5/8	3
3/4 - 1-1/8	4
1-1/4 - 2	5
2-1/2 - 3-1/2	6
4	7
6	8

G. Where indicated or directed by the Engineer, exposed piping and tubing carrying liquid shall be sloped as necessary to permit complete draining. Pipe deflection between supports shall be considered when determining the slope required to permit complete drainage. All underground piping shall be sloped uniformly for complete drainage.

H. Cast iron or ductile iron piping shall be supported as recommended by the manufacturer, and at all valves and fittings larger than 4 inches in size. At least one support shall be provided per pipe section or at every other joint, whichever is closer. Supports shall be located next to hubs or bells.

I. Open ends of pipe columns used for support shall be completely covered with a $^{1}/_{4}$-inch-thick plate or angle leg welded in place.

J. All threaded connections installed loose, such as hanger rods and U-bolts, shall have a double nut installation.

K. Vertical piping shall be supported as shown or required to prevent buckling or swaying utilizing special brackets. Unless otherwise shown, vertical piping shall be supported at the bottom and at each floor. Vertical copper tubing one inch and smaller in size shall be supported at 5-foot intervals.

L. Provide a support within 18 inches of each elbow and within 24-inches of each equipment connection.

M. Pipes passing through non-load bearing walls and partitions shall not bear on building construction. Pipes shall not be supported from roof decking, bar joists, or ceiling suspension systems unless approved by the Engineer.

N. Insulation on hot piping (carrying fluids above 70°F) shall be protected at supports and hangers with a 12-inch-long galvanized steel protection saddle with welded center support. Protection saddle shall be Grinnell Figure 160 or 161, Fee and Mason Figure 171 or 1710, or equal.

O. Insulation on cold piping (carrying fluids at 70°F or below) shall be protected at supports and hangers by galvanized steel insulation shields with a 180-degree contour. Insulation shields shall be Grinnel Figure 167, Fee and Mason Figure 81, or equal.

P. On insulation finished with an aluminum jacket, a 1/32-inch-thick sheet of neoprene shall be provided between the jacket and the shield.

Q. Hangers shall be selected to fit around insulation.

R. Following installation, all pipe supports shall be field primed and painted with the specified painting system for the application in accordance with requirements of the section entitled "Painting" of these Specifications.

S. Unless otherwise shown, piping shall not be fastened to a support in such a manner than would prevent axial movement due to thermal expansion and contraction.

T. No pipe supports shall be anchored to or supported from floor grating.

U. Unless otherwise noted, piping dimensions shown on the Drawings are for reference only and shall be verified in the field by the Contractor. The Contractor shall size supports and hangers using actual field dimensions.

END OF SECTION

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SECTION 15101

VALVES

PART 1 GENERAL

1.1 SCOPE

A. The work covered by this section includes furnishing all labor, equipment, and materials required to furnish and install all metal valves, including operators, boxes, and accessories, as specified herein, shown on the Drawings, or required for proper completion of the work under these Contract Documents.

B. The Contractor's attention is called to the fact that all valves, especially in the smaller sizes, are not necessarily shown completely on the Drawings, which are more or less schematic. However, the Contractor shall furnish and install all valves indicated or required for proper operation of the equipment or services requiring such valves.

C. Modulating electric motor-operated and pneumatic cylinder-operated control valves shall be furnished under the section entitled "Instrumentation and Controls" of these Specifications.

D. Polyvinyl chloride (PVC) valves shall be furnished under the section entitled "Polyvinyl Chloride Pressure Pipe" of these Specifications.

1.2 SHOP DRAWINGS AND ENGINEERING DATA

Complete shop drawings and engineering data shall be submitted to the Engineer in accordance with the requirements of the section entitled "Submittals" of these Specifications.

1.3 STORAGE AND PROTECTION

A. Valves and accessories shall be stored and protected in accordance with the requirements of these Specifications.

B. Valves shall be completely drained prior to shipment. Ends of flanged and mechanical joint valves shall be protected with full size wooden baffles securely bolted to the valve ends. Size of baffles shall be at least equal to outside diameter of flange. Valves 24 inches in size and larger shall be secured to a wooden skid to facilitate handling and storage.

1.4 SHOP PAINTING

A. Valves and accessories shall be cleaned, shop primed, and shop painted in accordance with the requirements of these Specifications, or as specified herein.

B. Unless otherwise specified, all interior and exterior non-machined, nonbearing ferrous surfaces on iron body valves, gates, and accessories shall be blast-cleaned and painted at the factory with two coats of asphaltic varnish conforming to Federal Specification TT-V-51c.

Exterior non-machined, nonbearing ferrous surfaces on valve operators and on non-submerged or non-buried butterfly and eccentric plug valves shall be blast-cleaned and painted at the factory with one coat of zinc chromate primer conforming to Federal Specification TT-P-645 and one coat of compatible alkyd enamel. Other paint systems may be proposed by the valve supplier, subject to the Engineer's approval.

1.5 OPERATION AND MAINTENANCE DATA

Submit complete operation and maintenance data on the valves in accordance with the requirements of the section entitled "Operation and Maintenance Data" of these Specifications.

1.6 QUALITY ASSURANCE

The valve manufacturers shall furnish a written certification to the Engineer that all valves and operators furnished comply with all applicable requirements of the governing AWWA standards specified herein.

1.7 GUARANTEE

Provide a guarantee against defective equipment and workmanship in accordance with the requirements of the section entitled "Guarantees and Warranties" of these Specifications.

PART 2 PRODUCTS

2.1 GENERAL

A. All castings, regardless of material, shall be free from surface defects, swells, lumps, blisters, sandholes, or other imperfections.

B. All valves shall have the name of the manufacturer, rated working pressure, and size of the valve cast upon the body or bonnet in raised letters. Alternately, the name of the valve manufacturer, rated working pressure, and size may be stamped on a stainless-steel identification plate permanently attached to the valve body or bonnet. Valves specified to conform with AWWA requirements shall have the letters "AWWA" cast upon the valve body or bonnet in raised letters.

C. Valves and operating mechanisms shall be of the proper size and dimensions to fit the pipe connections thereto and shall be installed in the position and within the space shown on the Drawings.

D. Unless otherwise specified, the direction of rotation of the operator to open the valve shall be to the left (counterclockwise). Each valve body or operator shall have cast thereon the word OPEN and an arrow indicating the direction to open.

E. A union or coupling shall be provided within 2 feet on each side of a threaded end valve unless the valve can be otherwise easily removed from the piping. This shall not apply to soldered end valves in copper plumbing.

F. All exposed bolts and nuts on buried or submerged valves and operators shall be brass or stainless steel for corrosion resistance. Exposed bolts and nuts on exposed valves and operators shall be of corrosion-resistant materials or shall be zinc or cadmium plated.

G. Valves and operators, whether manual or powered, shall be provided as a single, coordinated unit by a single supplier.

H. Valve operators shall be of sufficient size and capacity to seat, unseat, and operate the valve under the maximum specified differential pressure. Where no maximum differential pressure is specified, the operator shall be designed for a differential pressure equal to the maximum working pressure of the valve. Additional allowances shall be made for the lubricating and/or scale forming tendencies of the fluid.

2.2 GATE VALVES

A. Unless otherwise specified, all gate valves 3 inches in size and smaller and those larger than 12-inches shall be of the single disc, double-sealed, solid tapered wedge type; gate valves in sizes 4 through 12 inches shall be of the single disc, resilient seated type. Valves shall have non-rising stems and shall be capable of being repacked under pressure when valve is fully open. Iron body gate valves for potable water lines larger than 12-inches shall be of the double disc type.

B. Gate valves $2^1/_2$ inches in size and smaller installed above grade shall be bronze body, bronze-fitted valves, and shall have 150-pound, cast bronze body, union bonnet, Teflon-impregnated asbestos packing, and threaded ends per ANSI B2.1. Bronze shall conform to ASTM B 62. Brass for nuts and gland shall conform to ASTM V 16. Valve discs shall be reversible. Bronze gate valves shall be Stockham Fig. B-130, Nibco Fig. T-136, or equal. For use in copper plumbing, gate valves shall be furnished with solder ends per ANSI B16.18. Gate valves $2^1/_2$ inches in size and smaller installed below ground shall be cast iron body, bronze mounted type with 2-inch square operating nut equal to the type specified in paragraph C below.

C. Gate valves 3 inches in size and those larger than 12 inches in water and wastewater shall be iron body, bronze mounted valves conforming in all respects to the applicable material and dimensional requirements of AWWA C500. Minimum working pressures shall be 200 psi for valves from 3 to 14 inches in size and 150 psi for valves 16 inches and larger. Gate valves shall have an O-ring or self-adjusting chevron packing stem seal, and 125-pound, flanged ends per ANSI B16.1, except for valves to be buried underground, which shall have mechanical joint ends per ANSI A21.11 (AWWA C111). Body seat rings shall be ASTM B 62 bronze and shall be screwed into the body so as to be field replaceable. Disc faces and all moving parts shall be bronze or bronze mounted. Cast iron for body and bonnet shall conform to ASTM A 126, Grade B. Iron body gate valves with solid wedge discs shall be M & H (Dresser) Fig. 2067, Transverse City Fig. A248, or equal. Iron body gate valves with double discs shall be M & H (Dresser) Fig. 67, Mueller Fig. A-2380, or equal.

D. Gate valves in sizes 4 through 12 inches for use in water and wastewater shall be of the iron body resilient seated type, manufactured in conformance with AWWA C509. Gate shall be of cast iron with bonded resilient seat and integral flush drain. Minimum working pressures shall be 200 psi when unbalanced pressure is applied to either side of the gate. Gate valves shall

have a minimum of two 0-ring stem seals; one above and one below the integral stem collar. The area between the 0-rings shall be filled with permanent lubricant. Valve shall have no metal fasteners or screws exposed in the wetted portion of the valve. All ferrous surfaces shall be shot blasted to a white metal finish. All interior and exterior valve surfaces, including the interior of the gate and all bolt holes shall be coated with an epoxy coating in accordance with AWWA C550. The minimum thickness of the coating shall be 8 mils. Valve ends shall be of the type required for the installation as specified herein or shown on the Drawings and shall meet the requirements as specified in the above paragraph C of this section. Resilient seated gate valves shall be Kennedy Ken-Seal, American Darling CRS-80 or equal.

E. Gate valves 3 inches in size and larger in steam service shall have 125-pound cast iron body, bronze trim, and outside stem and yoke.

F. Gate valves shall be furnished with nut, wrench, chain, or handwheel operators as shown on the Drawings. Unless otherwise shown or specified, valves shall have operators as specified in Part 2.19 of this section. Extension stems, floorstands, and valve boxes and covers shall be furnished where shown or required.

2.3 KNIFE GATE VALVES

A. Knife gate valves shall be of the flanged wafer type with outside stem and yoke and a metal-seated, knife-blade gate with a beveled edge designed to push aside or cut through solids in its path. Knife gate valve shall have full round port opening and shall have a working pressure of at least 125 psi in sizes 24 inches and smaller and 50 psi in sizes 30 inches and larger.

B. Knife gate valves shall have a heavy, one-piece body and end flanges of steel or cast iron. Valves shall be lined throughout with stainless steel, including the chest and packing areas. Liner shall extend beyond flange to form raised face mating surface. Knife gate shall be of ground and polished stainless steel of sufficient thickness to resist deformation of rated pressure across the gate. A full circle, raised-face seat with machined gate jambs at the sides and bottom shall be provided to hold the gate and assure positive seating. All wetted parts of the valve shall be of Type 304 stainless steel.

C. Knife gate shall be sealed with a minimum of four rings of Teflon or neoprene-impregnated asbestos packing. Gland shall be of corrosion-resistant material or shall be specially coated for corrosion resistance. Gland bolts and nuts shall be stainless steel.

D. A heavy, fabricated, angular steel yoke assembly with stainless steel rising stem and bronze yoke sleeve shall be provided on the valve. Valve shall be provided with handwheel operator or extension stem and floorstand as shown on the Drawings. Valves 24 inches and larger shall have a geared operator.

E. Ends of the valve shall be flanged and shall be drilled to mate with 125-pound cast iron flanges per ANSI B16.1.

F. Knife gate valves shall be Dezurik "Series L," Fabri-Valve "Figure 22," or equal.

2.4 GLOBE AND ANGLE VALVES

A. Unless otherwise shown or specified, globe valves with straight-through pattern globe bodies shall be furnished. The direction shall be "flow opening." Globe and angle valve stems, seats, and seat rings shall be accessible and replaceable without removing the valve from the piping system. Valves shall be capable of being repacked under pressure when the valve is fully open.

B. Valves sized $2^{1}/_{2}$-inches and smaller shall be bronze-body and bronze mounted. Valves shall have 150-pound, cast bronze body, union bonnet, Teflon-impregnated asbestos packing, and threaded ends per ANSI B2.1. Bronze for body and bonnet shall conform to ASTM B 62. Valves for shutoff applications shall have a renewable disc, Buna-N for water or gas, Teflon for steam. Valves for throttling applications shall have a stainless-steel plug-type disc hardened to at least 350 Brinnell and renewable stainless steel seat ring. Bronze globe valves shall be Stockham Fig. B-22 or B-29, Jenkins Fig. 106 or 546, Nibco Fig. T-235, or equal. Bronze angle valves shall be Stockham Fig. B-222 or B-229, Nibco Fig. 335, or equal. Valves used in copper plumbing shall have solder ends per ANSI B16.18.

C. Valves sized 3 inches and larger shall be iron body, bronze mounted valves. Valves shall have 125-pound, cast iron body, bolted bonnet, outside stem and yoke, Teflon-impregnated asbestos packing, and 125-pound, flanged ends per ANSI B16.1. Cast iron for body and bonnet shall conform to ASTM A 126, Grade B. Bronze for trim shall conform to ASTM B 62. Valves for shutoff applications shall have renewable disc, Buna-N for water or gas, Teflon for steam. Valves for throttling applications shall have bronze disc and renewable bronze seat ring. Packing gland bolts shall be bronze with brass nuts.

D. Valves shall be furnished with operating nut, wrench, or handwheel operator as shown on the Drawings. Unless otherwise shown or specified, valves shall be furnished with operators as specified in Part 2.24 of this section.

E. Where used as a stop and waste valve, globe valve shall be furnished with a 1/8-inch drain cap on downstream portion of body.

2.5 BUTTERFLY VALVES

A. Unless otherwise shown or specified, butterfly valves shall be of the resilient seated, tight-closing type and shall conform in all respects to the applicable material and dimensional requirements of AWWA C504. Wafer-type butterfly valves in sizes 24 inches and larger shall conform to all general requirements of AWWA C504 except laying length. Butterfly valves shall operate from fully open to fully closed with a 90-degree rotation of the valve stem.

B. Valves shall be designed for the working pressures and/or pressure class designations shown on the Drawings or specified in these Specifications. If a working pressure or pressure rating is not given, the following requirements shall apply:

Service	AWWA Pressure Rating
Low Pressure Air	25B
Wastewater or Sludge	150B
Potable or Plant Water	150B

Wafer type valves shall have a pressure rating of not less than 150 psi. Valves shall be drip-tight and bubble-tight at rated pressure differential across the valve in both directions.

C. Valve body shall be one-piece, constructed of cast iron conforming to ASTM A 126, Class B. The diameter of the opening shall be not less than the diameter of the corresponding pipe size. Unless otherwise specified, valve body shall be of the short-body style in accordance with Table 2 of AWWA C504. This requirement shall not apply to wafer type valves. No part of the valve internals shall extend beyond the valve ends when the valve is in the closed position. Short-body valves shall have 125-pound flanged ends per ANSI B16.l. Wafer type valves shall be designed to fit between 125-pound flanges per ANSI B16.1.

D. Disc shall be cast bronze conforming to ASTM B 143, Alloy 1A, cast iron conforming to ASTM A 48, Class 40, Ni-resist cast iron conforming to ASTM A 436, Type 1 or 2, or Ni-resist ductile iron conforming to ASTM A 439, Type D2. When used in wastewater or raw water, disc shall be streamlined with no exterior ribbing or openings.

E. Shafts shall be polished stainless steel conforming to ASTM A 276, Type 304 or Type 316. All keys and pins used in securing valve disc to shafts shall be stainless steel or monel.

F. Valve seat shall be of one-piece, molded synthetic rubber, Buna-N (Hycar) for wastewater and Buna-N or neoprene for air. Where temperatures exceed 180EF, EPT or Viton seats shall be used. Retaining rings, if used, shall be stainless steel. The method of mounting valve seat shall conform to the applicable requirements of AWWA C504, Section 8. Valve seats in sizes 24 inches and larger shall be field replaceable without necessity of chipping, burning, or cutting. Seats secured with retaining rings shall be fully adjustable. Metal seat mating surfaces shall be smoothly contoured and polished 18-8 stainless steel or monel. Alloy cast iron will not be acceptable as a seat mating surface. Sprayed or plated seat mating surfaces will not be acceptable.

G. Shaft seals shall be O-ring or self-adjusting chevron packing of Buna-N or neoprene. Shaft seals shall conform to the requirements of AWWA C504, Section 10, and shall be of a design that allows replacement of the seal without removing the valve shaft. Alternately, pull-down packing is acceptable if the packing is adjustable and replaceable without removing valve operator.

H. Valve bearings shall be self-lubricating, sleeve-type bearings of corrosion resistant materials. Bearing load shall not exceed 2,500 psi. Valves 24-inches in size and larger shall be provided with an adjustable, two-way thrust bearing to center the disc in the valve and allow the valve to be installed with the valve stem vertical. Bearing shall be easily accessible for adjustment.

I. Where the valve is installed adjacent to a fitting, flow meter, another valve, or similar items, a spool piece or adaptor coupling shall be furnished as a spacer so that valve disc does not

interfere with the operation of the adjacent meter or valve or contact cement linings on pipe or fittings.

J. Valve shall be furnished with a lever operator, rotary manual operator, electric motor operator, or pneumatic cylinder operator as shown on the Drawings. Unless otherwise shown or specified, a lever operator shall be furnished on valves 6 inches and smaller, and a rotary manual operator shall be furnished on valves 8 inches and larger. Extension stem and floorstand shall be furnished, where shown or required.

K. Butterfly valves shall be as manufactured by BIF, Pratt, or equal.

2.6 TWO-WAY PLUG VALVES

A. Unless otherwise shown or specified, two-way plug valves shall be of the eccentric, non-lubricated type with resilient, neoprene-faced or epoxy-coated plugs providing drip-tight shut-off at rated pressure. Port area shall not be less than 80 percent of the corresponding full pipe area in sizes 12-inches and smaller and 100 percent of the corresponding full pipe area in valves 14 inches and larger. Two-way valves shall operate from fully open to fully closed with a 90-degree rotation of the valve stem. Plug valves shall meet or exceed the latest revision of AWWA Standard C517.

B. Valves shall be designed for a working pressure of not less than 175 psi in sizes through 16 inches and 150 psi in sizes 18 inches and larger. Valves shall be drip-tight at rated pressure differential in both directions.

C. Valves shall have bodies of ASTM A 126, Grade B or ASTM A 48, Grade 40 cast iron. Valves 4 inches and larger in size shall have bolted bonnet.

D. Body seats for resilient-faced plugs shall be welded in and shall contain a minimum of 90 percent nickel. Welded-in seats shall conform to the applicable requirements of AWWA C507, Section 7.2 and AWWA C504, Section 9.4.

E. Plugs without a resilient coating or facing shall be epoxy coated and shall have a field replaceable, full-circle rubber seat securely attached to the plug. Body seats shall be nylon coated.

F. Shaft seal shall be of the self-adjusting or split-V type of Buna-N and shall comply with the applicable requirements of AWWA C504, Section 11 and AWWA C507, Section 10. Seals requiring adjustment shall be adjustable and replaceable without bonnet or shaft removal.

G. Bearings shall be supplied in both the upper and lower journals. Bearings shall be permanently lubricated and replaceable with stainless steel, bronze, or specially coated corrosion-resistant sleeves and bushings. Bearings shall conform to the applicable requirements of AWWA C504, Section 9 and AWWA C507, Section 8.

H. Valves sized $2^1/_2$ inches and smaller shall have threaded ends per ANSI B2.1. End connections for valves sized 3 inches and larger shall be 125-pound flanged per ANSI B16.1, except for valves to be buried underground, which shall have mechanical joint ends per ANSI A21.11

(AWWA C111). Flanged end valves in sizes 12 inches and smaller shall have a laying length equal to that of an AWWA gate valve of the same size.

I. Valves intended for buried or submerged service shall be sealed against the entrance of water and dirt.

J. Valves shall be furnished with a lever operator, rotary manual operator, or electric motor operator as shown on the Drawings. Unless otherwise shown or specified, a lever operator shall be furnished on valves 6 inches and smaller, and a rotary manual operator with handwheel shall be furnished on valves 8 inches and larger. Extension stem, floorstand, and valve box shall be furnished where shown or required.

K. Two-way plug valves shall be DeZurik "Series 100 Eccentric Plug Valve," Dresser "X-Centric," or equal.

2.7 THREE-WAY PLUG VALVES

A. Three-way plug valves shall be of the nonlubricated, tapered plug type. Manual valves for drip-tight shutoff shall have resilient, neoprene-faced plugs. Electric motor operated and pneumatic cylinder operated valves and manual valves for flow diverting service where drip-tight shutoff is not required shall be metal-to-metal seated or hard rubber lined. Plug shall be designed to shut off one port at a time and shall be capable of 360-degree rotation.

B. Valves shall be suitable for working pressures to 125 psig. Operators shall be capable of operating the valve against a pressure differential of not less than 35 psig.

C. Valve body shall be constructed of cast iron conforming to ASTM A 126, Class B. Valve shall have upper and lower stainless steel sleeve bearings and Buna-N or Teflon stem packing. Stem packing shall be adjustable and replaceable without valve disassembly or removal of operator. Valve shall have 125-pound flanged ends per ANSI B16.1.

D. Valves in drip-tight service shall have resilient-faced plugs with lift, turn, and reseat action. Valve shall be furnished with a single lift, turn, and reseat lever or double handwheel, rotary manual operator. Handwheel operator shall have one handwheel to lift and reseat the plug and one handwheel to turn the plug. Drip-tight shutoff shall be provided throughout the lift, turn, and reseat action.

E. Valves in flow-diverting service shall have metal-to-metal seats or hard rubber lining on all interior wetted surfaces. Plug shall be constructed of Ni-Resist cast iron or other material of equivalent corrosion resistance and strength. A device shall be provided to permit easy adjustment of the plug-to-seat clearance without valve disassembly. Manually operated valves shall have lever operator or single handwheel, rotary manual operator. Where shown or specified, valve shall be furnished with an electric motor operator or pneumatic cylinder operator.

2.8 BALL VALVES

A. Ball valves shall be of the quarter turn type with full pipe size opening through the valve. Ball valves shall be suitable for a differential working pressure in either direction of not less than 400 psi.

B. Ball valves shall have a three-piece, bolted body designed to allow the interior portion of the valve to be removed without disturbing adjacent piping.

C. Unless otherwise specified or required, ball valves shall have brass body, self-aligning brass ball, blowout-proof brass stem, reinforced Teflon seats and seals, plastic-coated plated steel handle, and threaded ends per ANSI B2.1. Ball valves shall be Powell "Star," Worcester "Miser," or equal.

D. Ball valves shall be available with Type 316 stainless steel construction where shown or specified.

2.9 CHECK VALVES

A. Unless otherwise shown or specified, check valves shall be of the swing type suitable for use in either horizontal or vertical piping. Disc shall swing entirely clear of the path of flow when in the open position. All internal parts shall be readily accessible and easily replaced in the field.

B. Check valves in sizes $2^1/_2$ inches and smaller shall be Y-pattern, regrinding, bronze-body, bronze-mounted valves. Valves shall have 200-pound, cast bronze body, renewable bronze disc, screwed cap, and threaded ends per ANSI B2.1. Bronze for body and cap shall conform to ASTM B 61. Brass nuts and pin shall conform to ASTM B 16. Valves shall have a hinge bumper capable of preventing the valve from sticking in the open position and an arrow cast on the valve body to indicate direction of flow. Bronze check valves shall be Powell Fig. 560Y, Stockham Fig. B-345, Nibco Fig. T-453-B, or equal.

C. Check valves in sizes 3 inches and larger shall be iron body, bronze-mounted valves conforming to AWWA C508. Valves shall have 125-pound cast iron body, bolted and gasketed cover, stainless steel or brass hinge pin, renewable bronze seats and disc, outside lever and adjustable weight, and 125-pound flanged ends per ANSI B16.1. Cast iron for body and cap shall conform to ASTM A 126, Grade B. Bronze for disc and seats shall conform to ASTM B 62. Iron body check valves shall be Mueller Fig. 2600-6-01, M & H (Dresser) Fig. 50, Nibco Fig. F-918-BL&W, or equal.

D. Valves shall be installed with pressure under the disc.

E. Check valves in air or gas piping sized $2^1/_2$ inches or smaller shall be bronze, swing type check valves conforming to the requirements of Item B above, except that the disc shall have a replaceable, resilient seat of Buna-N or Teflon. Bronze check valves for air or gas service shall be Nibco Fig. T-453-W, Kennedy Fig. 442, or equal.

F. Check valves in air or gas piping sized 3 inches and larger shall be of the double-plate, spring-loaded, clapper type with cast iron body, aluminum bronze or bronze plates, stainless steel hinge pin and springs, and Buna-N seats. When operating temperatures exceed 180°F, Viton seats shall be used. Check valves shall be wafer style bodies suitable for mounting between two 125-pound ANSI B16.1 flanges. Check valves shall be rated for a working pressure of not less than 150 psi. Clapper style check valves shall be Mission "Duo-Check," FMC, or equal. Clapper style check valves in horizontal piping shall be installed with the pin in a vertical position.

2.10 SOLENOID VALVES

A. Two-way solenoid valves shall be of the packless type with full-area ports. Four-way solenoid valves shall be of the two-position, poppet type and shall feature tight seating discs with zero leakage.

B. Valve body shall be forged brass or stainless steel with resilient seat of Viton, Buna-N, or Teflon. Coils shall be molded, continuous-duty coils with epoxy-encapsulated, Class F insulation.

C. Solenoid valves shall be furnished with a NEMA-4 solenoid chamber enclosure and shall be designed for operation on 120-volt, 60 hertz, single-phase power. Unless otherwise shown or required, two-way valves shall be normally closed (when de-energized). Conduit connection box shall be integral with solenoid chamber. Valves shall be UL listed and CSA approved.

D. Solenoid valves shall be wired into the pump motor control circuit so that the valves are open (energized) whenever the pump motor is running. Solenoid valves shall not require differential pressure for operation.

E. Solenoid valves shall be as manufactured by Automatic Switch Company, Skinner, or equal.

2.11 HOSE BIBBS

Hose bibbs shall be angle hose valves of bronze construction suitable for 200 psi minimum working pressure. Valves shall have a renewable Teflon or resilient disc and shall be furnished with a $^{3}/_{4}$-inch male hose outlet connection. Body and bonnet shall be ASTM B 62 bronze. Valves shall be furnished with a suitable cap and chain. Inlet connection shall be threaded per ANSI B2.1.

2.12 HOSE VALVES

Hose valves shall be wedge disc, rising stem gate valves of bronze construction suitable for 200 psi minimum working pressure. Valves shall have a male outlet hose connection and a threaded inlet connection per ANSI B2.1. Valves shall be furnished with a suitable cap and chain. Body and bonnet shall be ASTM B 62 bronze.

2.13 SILLCOCKS

Sillcocks shall be of the frost-proof type with bronze construction, sill flange, extended body, and renewable resilient disc. Sillcock shall have a $^{3}/_{4}$-inch male hose outlet connection.

2.14 PRESSURE REDUCING VALVES FOR WATER

A. Pressure reducing valves shall automatically reduce a higher inlet pressure to a preset, steady outlet pressure. The reducing valve shall be very sensitive to slight pressure changes and immediately control the main valve to maintain the desired pressure. Valve outlet pressure shall be adjustable between 25 and 75 psi.

B. The main valve shall be direct acting, single-seated, spring-loaded, diaphragm-actuated, globe type valve. When the downstream pressure exceeds the pressure setting, the main valve shall close drip-tight. Piston actuators will not be acceptable. Main valve shall be guided at two locations. No external packing glands shall be used and the diaphragm shall not be used as a seating surface.

C. Pressure reducing valves sized 2 inches and smaller shall have cast bronze body, stainless steel seat ring, Teflon, Buna-N, or composition disc and diaphragm, and outside screw adjustment. Valves shall be suitable for 230 psi inlet pressure. Valves shall be furnished with threaded ends per ANSI B2.1. Bronze pressure reducing valves shall be Mueller Fig. H-9300, Watts Regulator No. 223S, or equal.

D. Pressure reducing valves $2^{1}/_{2}$ inches and larger shall have cast iron body, bronze trim, bolted cover, and pilot-controlled main valve. The pilot control system shall be external, connected to the valve with union fittings. Pressure setting shall be adjustable by a single screw adjustment enclosed in a tamperproof housing. Valve shall be suitable for an inlet pressure of not less than 175 psi. Valves sized $2^{1}/_{2}$ inches shall have threaded ends per ANSI B2.1. Valves 3 inches and larger shall have 125-pound, flanged ends per ANSI B16.1. Valve body and cover shall be of cast iron conforming to ASTM A 48. Valve trim and pilot control shall be of ASTM B 61 or B 62 bronze. Pilot control trim shall be stainless steel. Valve shall be supplied with an integral strainer, constructed of heavy and fine mesh monel screens, to protect the pilot control system from foreign particles. Pilot controlled valves shall be Clayton Fig. 90G-01, Golden Anderson Fig. 45-D, or equal.

E. A separate Y-pattern strainer with threaded or bolted cleanout shall be furnished and installed immediately upstream of each pressure reducing valve. Area through the screen shall be not less than four times the full pipe area. Strainers shall have a pressure rating not less than that of the protected pressure regulating valve.

F. A 2-inch pressure gauge with tee-head, bronze gauge cock shall be installed on the upstream and downstream side of each pressure regulating valve unit. Pressure gauges on the upstream side shall have a range of approximately 0 to 160 psi. Pressure gauges on the downstream side shall have a range of approximately 0 to 80 psi.

2.15 GAUGE COCKS AND PET COCKS

A. Gauge cocks shall be of all bronze construction with threaded female ends and tee handle.

B. Pet cocks shall be of all bronze construction with threaded male end and lever handle. Pet cocks shall be of $^{1}/_{4}$-inch minimum size.

2.16 NEEDLE VALVES

Needle valves shall be of all bronze construction and shall have a seat opening of not less than $^{1}/_{4}$-inch. Valves shall be furnished with 200-pound bronze body, bronze stem, Teflon-impregnated asbestos packing, and threaded ends per ANSI B2.1. Bronze for body shall conform to ASTM B 61. Needle valves shall be Stockham Fig. B-64, Jenkins Fig. 741-G, or equal.

2.17 CURB STOPS AND CORPORATION STOPS

A. Curb stops shall be of all bronze construction with straight-through unobstructed pattern flow, Teflon coated plug, top and bottom O-ring plug seals, O-ring port seals, and solid tee handle. Valves shall be suitable for 175 psi minimum working pressure. A quarter turn shall operate the valve from fully open to fully closed position. Valves shall comply with the applicable requirements of AWWA C800.

B. Curb stops shall be furnished with cast iron foot pieces to permit the curb box to rest on a solid surface without bearing on the curb stop or piping.

C. Curb boxes shall be of cast iron, shall have a 2-inch inside diameter, and shall be of the extension type with lid and plug. One compatible steel shut-off rod of suitable length shall be furnished. Curb boxes and bases shall be coated with a suitable bituminous coating.

D. Corporation stops for service line connections shall be precision fitted, individually lapped, ground joint key stops of all bronze construction. For tapped connections to water mains, inlet threads shall be of the steep taper, corporation stop type. Corporation stops shall conform to the applicable requirements of AWWA C800.

2.18 MUD VALVES

A. Mud valves shall have cast iron, bronze fitted construction with heavy-duty yoke and nonrotating disc. Seating surfaces, stem, and lift nut shall be bronze. Mud valves shall have non-rising stem and flanged base frame drilled to mate with a 125-pound cast iron flange per ANSI B16.1.

B. Mud valves shall be furnished with an Acme-threaded brass or stainless steel extension stem and a floorstand operator with handwheel.

C. Mud valves shall be Mueller "A-25600," M&H (Dresser) "Fig. 40," Clow "F-3075," or equal.

2.19 FLAP VALVES

A. Flap valves shall be designed to withstand the stresses resulting from high-head seating applications and to maintain sensitivity to unseating heads.

B. Flap valves shall have iron bodies and shall be bronze mounted. Valves shall be furnished with bronze hinge pins, flap rings, and seat rings.

C. Valves shall be furnished with 125-pound flanged ends per ANSI B16.1.

D. Flap valves shall be Clow F-3012, Mueller A-2540-6, M&H (Dresser) Figure 47, or equal.

2.20 PRESSURE RELIEF VALVES

A. Pressure relief valves shall be installed as shown on the Drawings. Length of valve shall be suitable for the thickness of slab or wall.

B. Floor type valves shall have an inside diameter of 4 inches and shall be cast iron, bronze mounted, with bottom strainer and non-separating, removable cover. Floor type valves shall be Clow "F-1492," Rodney Hunt, American Darling, or equal.

C. Wall type valves shall have a 4-inch flanged connection suitable for connection to a 4-inch flanged wall pipe. Valves shall have iron bodies and shall be bronze mounted. The valve manufacturer shall supply the wall pipe and end strainer for complete installation of each valve. The valve shall be furnished with resilient seats of neoprene or Buna-N. Maximum flap opening angle shall not exceed 80 degrees. Wall type valves shall be Clow "F-1494", Rodney Hunt "FV-AC", or equal.

D. Wall type valves shall be installed so that the bolt holes straddle the centerline. The strainer plug shall be caulked into the wall pipe with lead wool.

2.21 SHEAR GATES

A. Shear gates shall be of the iron body, bronze mounted, double wedge type and shall be furnished with lift rod complete with handle and catch. Length of lift rod shall be as shown on the Drawings or as required.

B. Shear gates shall be furnished with 125-pound flanged ends per ANSI B16.1.

C. Shear gates shall be Clow "F-3000," M&H "Figure 44," or equal.

2.22 AIR RELEASE VALVES

A. Air release valves shall have cast iron body, stainless steel float, and stainless steel or bronze trim.

B. Valve shall be designed for a working pressure adequate to accommodate the line pressure on which the valve will be installed and shall be equipped with an orifice appropriate to the venting needs of the pipeline.

C. Sewage valves shall be equipped with an elongated body, a 2-inch NPT inlet connection, and a $^1/_2$-inch NPT outlet connection and shall be provided with 2-inch inlet shut-off valve, 1-inch blow-off valve, and $^1/_2$-inch back-flush valve with quick-disconnect coupling and flushing hose with quick-disconnect connections.

D. Sewage valves shall be Valve and Primer "APCO 400," Multiplex "Crispin," Val-Matic "Sewage Air Release Valve," or equal.

E. Water air release valves shall be provided with a bronze shut-off valve, and shall be "Apco" or approved equal.

F. Combination air vacuum/air release valves shall be installed complete with gate valve at locations shown on the Drawings. Valves 2 inches and smaller shall have NPT screwed inlet. Combination air vacuum/air release valves shall be Valve and Prime Corp., APCO Combination Air Release Valve (Standard), Crispin Universal Air Valve, or equal.

2.23 SAFETY AND RELIEF VALVES

A. Safety and relief valves shall conform to the latest requirements of the ASME Boiler and Pressure Vessel Code, Section I - Power Boilers, Section IV - Heating Boilers, or Section VIII - Unfired Pressure Vessels, as applicable. Valves for nontoxic or nonflammable gases shall be side outlet, unpacked, lifting lever type, constructed of materials suitable for the conditions of service. Valves for toxic or flammable gases or valves with pressure on the relief side shall be side outlet, closed cap type. All valves shall be National Board stamped and shall bear the approved nameplate. Valve relieving capacity shall not be less than 125 percent of heat input to be relieved.

B. Relief valves for use in non-code piping for nonflammable liquids and gases shall have full-size side outlet, bronze body and disc, cadmium plated or stainless steel spring, unpacked lifting lever, and NPT threaded connections. Unless otherwise specified, valve shall be set to relieve at 25 percent above the pipeline working pressure. Non-code relief valves shall be suitable for relief settings from one to 250 psig and temperatures to 550°F.

C. Domestic hot water heater relief valves shall be ASME rated, bronze body, combination temperature, and pressure type with lifting lever and corrosion-proof, thermal element extending into the tank. Valve shall conform with ANSI Z21.22 and shall be National Board stamped.

D. Where specified, safety and relief valves shall be furnished with rupture disc on the pressure side of the valve. Rupture disc shall be of the knife-edge, reverse buckling type and shall be constructed of stainless steel. Rupture disc shall have a setpoint accuracy of ±5 percent and working pressure of 90 percent of setpoint. A vented, indicating telltale shall be provided between disc and safety valve in accordance with ASME codes.

E. Relief valves for relief of large quantities of low pressure gases shall be weight-loaded, combination type pressure/vacuum relief valves designed for high capacity venting at low over-pressure or vacuum with minimum blowdown. Valves shall have aluminum or stainless steel bodies, covers, hoods, and pallets, stainless steel springs and stems, and reinforced Teflon diaphragms. Low pressure/vacuum relief valves shall be as manufactured by Singer, Shand and Jurs, Varec Division of Emerson Electric, or equal.

2.24 PRESSURE RELIEF VALVES FOR WATER

A. Pressure relief valves for cold water in sizes $1^1/_2$ inches and smaller shall be direct acting, single seated, spring loaded, diaphragm operated, globe type. Valve shall have bronze body, stainless steel trim, resilient disc, stainless steel, Monel, or bronze diaphragm and outside,

tamperproof screw adjustment. Valve shall be suitable for 200 psi working pressure. Valve shall have NPT threaded ends per ANSI B2-1. Valve shall have no external packing glands. Seat, disc, and diaphragm shall be removable.

B. Pressure relief valves for water in sizes 2 inches and larger shall be of the hydraulically operated, pilot actuated, diaphragm type globe or angle valves designed to relieve excessive pressure, sustain a constant back pressure, and prevent surges. The valve shall be fast opening and slow closing and shall be cushioned to prevent water hammer. Speed of opening and closing shall be adjustable. Valve shall be suitable for 175 psi working pressure. Setpoint shall be externally adjustable by means of tamperproof screw adjustment.

C. The valve shall have a cast iron body and bolted bonnet conforming to ASTM A 126, Class B, or ASTM A 48, Class 30, bronze pilot and main valve trim, resilient seat disc, stainless steel pilot trim, and reinforced synthetic rubber diaphragm. Seat ring, disc, and diaphragm shall be removable without removing valve from line. No external packing glands shall be used and the diaphragm shall not be used as a seating surface. Valve stem shall be guided at both ends. Pilot control shall be of the diaphragm actuated, spring-loaded type.

D. A fine mesh stainless steel or Monel strainer shall be provided in the pilot control piping to protect the pilot valve. An indicator rod shall be provided to show valve position.

E. Valve shall be provided with 125-pound flanged ends drilled per ANSI B16.1.

F. Pilot actuated pressure relief valves shall be Clayton Figure 50G, OCV Series 108-3, or equal.

2.25 ALTITUDE VALVES

A. Altitude valves shall be single-acting, hydraulically operated, pilot actuated, diaphragm or piston type globe valves designed for ground level control of water level in storage tanks. Valve shall be of the non-throttling differential type and shall be air and water cushioned on closing to prevent surges on shutoff. Valve shall be suitable for 175 psi working pressure. Operating point and closing speed shall be adjustable.

B. Valve shall have a cast iron body and bolted bonnet conforming to ASTM A 126, Class B, bronze pilot control valve and main valve trim, resilient seat disc, stainless steel pilot trim, and reinforced synthetic rubber diaphragm. Seat ring, disc, and diaphragm shall be removable without removing the valve from the line. Piston type valves shall be constructed with removable resilient seals and guides to prevent metal-to-metal contact. No external packing glands shall be used and the diaphragm shall not be used as a seating surface. Main valve stem shall be guided at both ends. Pilot control shall be three-way, hydraulically balanced, diaphragm type.

C. An indicator rod shall be provided to show valve position. A fine mesh stainless steel or Monel strainer shall be provided in the control piping. A $4^{1}/_{2}$-inch pressure gauge calibrated in both psi and feet of water shall be provided on both sides of the altitude valve.

D. Valve shall be furnished with flanged ends drilled per ANSI B16.1.

E. A standard repair kit shall be supplied for the altitude valve. Kit shall include liner cup, seat ring, cover gasket, indicator packing, vent packing, and piston cup for main valve, seat ring, lower packing, upper packing, stem gasket, and diaphragm for pilot.

F. Altitude valves shall be GA Industries Figure 3200-D; Clayton Figure 206, OCV Series 3331; or equal.

2.26 ANTI-CAVITATION BACKPRESSURE/RELIEF/RECIRCULATION VALVE

A. Submittals
1. Submit detailed product data and descriptive literature including dimensions, weights, headloss data, pressure rating and materials of construction.
2. Provide shop drawings that clearly illustrate the general arrangement of the equipment and cross-sectional views of the components.

B. Quality Assurance
Supplier shall have been manufacturing anti-cavitation automatic control valves for a period of at least 10 years and shall, at the request of the Engineer, provide a list of installations involving equipment of similar size and application.

C. Anti-Cavitation Valve
1. Construction. Valve shall consist of a main valve assembly and a system of hydraulic controls completely assembled and tested as a unit and ready for field installation.
2. Main Valve
   a. Main valve body shall be angle style, constructed of high-strength cast iron conforming to ASTM A126 Class B with integral flanges, faced and drilled per ANSI B16.1 Class 125.
   b. The main valve shall operate on the differential piston principle such that the area on the underside of the piston is no less than the pipe area and the area on the upper surface is greater than that of the underside. There shall be no diaphragms or springs in the main valve.
   c. The valve piston shall be fully guided on its outside diameter and all guiding and sealing surfaces shall be bronze. There shall be a renewable, resilient seat attached to the piston that seats against a non-corrosive metallic body seat. A stainless steel perforated skirt shall be attached to the piston and all throttling shall occur through precision-machined orifices, the diameter, quantity and orientation of which shall be engineered to match each valve's specified flow and pressure drop requirements. The valve design shall locate the seat upstream of the severe throttling to protect the seat from the effects of cavitation. A visual indicator of valve position shall be provided.
   d. A replaceable, stationary stainless steel liner shall be installed in the outlet of the valve to contain the flow immediately downstream of the point of severe throttling to protect the valve body. The perforated skirt and outlet liner shall be the only components exposed to cavitation. The valve shall be fully capable of operating in any position without the need of springs and shall not incorporate stems, stem guides or spokes in the waterway.
   e. The main valve shall be serviceable in the line through a single flanged cover that provides easy access to all internal components.

3. Controls
    a. Provide a system of hydraulic controls to enable the valve to perform the functions listed below. All controls and control piping shall be suitable for the working pressure.
    b. Provide a direct-acting, spring-loaded, normally closed over pressure pilot with stainless steel body and trim.
    c. Provide a stainless steel needle valve for adjustable closing speed control
    d. Provide a wye-strainer with stainless steel screen and pilot isolating valves

D. Function - The valve shall be tightly closed as long as the inlet pressure is below the setting of its pilot. The valve shall open when the inlet pressure rises to the pilot setting and throttle as necessary to maintain or limit the inlet pressure as set on its pilot.

E. Manufacturer – The valve shall be GA Industries, Inc., Series 8500, Figure 8566-D

2.27 MANUAL VALVE OPERATORS

A. Unless otherwise shown or specified, all valves shall be furnished with manual operators as follows:
    1. Gate Valves
        a. Buried: Extension stem and valve box with standard operating nut.
        b. Submerged or Located in Deep Vault - Extension stem with floorstand and handwheel operator.
        c. Exposed
            1) Less than 7 feet above working surface – Handwheel operator.
            2) More than 7 feet above working surface – Chainwheel operator.
    2. Globe Valves: All – Handwheel operator.
    3. Butterfly and Plug Valves
        a. Buried: Rotary manual operator with extension stem and valve box and standard operating nut.
        b. Submerged or Located in Deep Vault: Rotary manual operator with extension stem and floorstand with handwheel.
        c. Exposed
            1) Less than 7 feet above working surface: Lever operator (6 inch and smaller) or rotary manual operator and handwheel.
            2) More than 7 feet above working surface: Rotary manual operator and chainwheel.

B. Operating nuts for buried or submerged valves shall be standard 2-inch square nuts and shall conform to AWWA C500, Section 19. Extension stems, valve boxes, and stem guides shall be furnished where shown, specified, or required for proper operation.

C. Hand lever operators shall have heavy-duty, cast iron bracket, cast iron latching lever, and self-lubricating bushings and shall be capable of securing the valve at the fully open and fully closed position and a minimum of five intermediate positions. Lever operators shall be installed so that the lever is parallel with the axis of the pipe in which the valve is installed when the valve is fully open.

D. Rotary manual operators for aboveground service shall be of the worm and worm gear or of the traveling nut type. Rotary operators shall have a heavy-duty, weatherproof cast iron or steel housing with gasketed, removable cover and shall be equipped with a mechanical dial or slot type position indicator and a suitable handwheel. Manual operators shall be totally enclosed and sealed to prevent the entrance of rain, dirt, and corrosive atmospheres. Traveling nut operators shall have a grease-lubricated alloy steel screw stem, brass nut, and self-lubricating bronze bushings. Worm gear operators shall have hardened, grease lubricated alloy steel worms and bronze worm gears. All exterior bolts and fasteners shall be bronze or stainless steel for corrosion resistance. Valve shall open with counter-clockwise rotation of the handwheel.

E. Manual rotary operators for buried or submerged service shall conform with the requirements of Item D above except the operator shall be totally enclosed and completely sealed to prevent the entrance of water and dirt. Buried or submerged operators shall be finished on the outside with a bituminous or other approved coating. Rotary operators for buried or submerged service shall be capable of withstanding 300 ft-lbs of torque on the operating nut or handwheel. A corrosion resistant, dial-type valve position indicator shall be provided at the operating nut on the extension stem of buried operators to provide a remote indication of valve position.

F. Chain wheel operators shall be of heavy cast iron construction and shall be equipped with chain guide and looped, flexible, operating chain. Chain shall be heavily galvanized or cadmium plated and shall extend to within 60 inches of the floor.

G. All manual rotary and lever operators shall be capable of seating or unseating the valve disc under the most adverse conditions in the particular application with not more than an 80-pound pull on the handwheel or lever. Valve operators shall be capable of holding the valve in any position between fully open and fully closed without creeping or fluttering. Operators shall be provided with adjustable, mechanical, stop-limiting devices to prevent over-travel of the valve disc in the open and closed positions. Manual rotary and lever operators shall comply with all applicable requirements of AWWA C504, Sections 11.1, 11.2, and 11.3.

2.28 NONMODULATING ELECTRIC MOTOR OPERATORS

A. Where shown or specified, valves shall be furnished with a nonmodulating electric motor operator. The electric motor operator shall include the motor, reversing contactors, fused control power transformer, operator unit gearing, limit switch gearing, limit switches, torque switches, control relays, interconnecting wiring, stem nut for rising stem valves, declutch lever or knob, and auxiliary handwheel as a self-contained unit. The motor operator shall be housed in a NEMA 4 weatherproof housing, sealed against the entrance of rain, dirt, and corrosive atmospheres with O-rings or compressible gaskets. The operator shall be sized to move the valve from fully open to fully closed in approximately 60 seconds.

B. The motor shall be specifically designed for valve operator service and shall be of high torque, totally enclosed, nonventilated construction, with motor leads brought into the limit switch compartment. Motor insulation shall be NEMA Class B or Class F with a maximum continuous rise of 80°C over an ambient of 40°C. Motor shall be designed to operate on 460-

volt, 60-hertz, 3-phase power unless otherwise shown or specified. The motor shall be of sufficient size to open or close the valve against the maximum expected differential pressure when voltage to the motor terminals is 10 percent above or below nominal voltage. Motor torque at stall shall be not less than two times that required to operate the valve at maximum differential. Motor shall be capable of continuous operation for a period of 15 minutes at a torque output equal to 40 percent of the maximum seating/unseating torque without overheating. Motor frame shall be NEMA standard. The motor shall be prelubricated and all bearings shall be of the anti-friction type. Motor shall be easily removable without dismantling the operator and shall be furnished with inherent thermal overload protection and space heater.

C. The operator shall be a double reduction unit with the capability of quickly changing the output speed with a simple gear change. The power gearing shall consist of generated spur or helical gears of heat-treated steel and worm gearing. The worm shall be of hardened alloy steel and the worm gear shall be of alloy bronze accurately cut with a hobbing machine. All power gearing shall be grease or oil lubricated. Ball or roller bearings shall be used throughout. Oil lubricated models shall be furnished with oil fill and drain plugs and dipstick or sight glass.

D. Limit switches and associated gearing shall be an integral part of the valve operator. Limit switch gearing shall be of the intermittent type, totally enclosed in its own gear case to prevent dirt and foreign matter from entering the gear train, grease-lubricated, and shall be made of bronze or stainless steel. Limit switches shall be of the adjustable type capable of being set to trip at any point of valve travel between fully open and fully closed, and not be subject to breakage or slippage due to overtravel. Limit switches shall be gear driven by the valve operating mechanism and shall be in step at all times whether in manual or motor operating mode.

   Limit switches shall be of the heavy-duty, open-contact type with rotary wiping action. Microswitches or similar switch configurations are not acceptable.

   Each electric valve operator shall have a minimum of two rotor-type switch assemblies and a minimum of two normally open and two normally closed contacts per rotor.

E. Each electric valve operator shall be equipped with a double torque switch which is responsive to loads encountered in either the opening or closing direction. Each side of the switch shall have a numbered dial and shall be adjustable. A calibration tag shall be mounted near each switch correlating dial setting with unit output torque. Torque switch setting shall be easily adjusted with a screwdriver.

   The torque switch shall operate during the complete valve cycle without the use of auxiliary relays, linkages, latches, or other devices. The torque switch shall be wired to shut off the actuator motor in the event excessive torque is being generated in either direction of travel. The closing torque switch shall be wired to shut off the operator motor when a predetermined torque is reached which corresponds to the required seating thrust for wedging gate or globe valves.

Operator shall be provided with a contact to prevent nuisance tripping of the torque switch when the valve becomes jammed in the closed position. The contact shall allow the valve to open slightly then restore torque protection throughout the remaining valve travel.

F. The valve operator shall have a stem nut of high tensile bronze or other material, compatible with the valve stem and suited to the application. The nut arrangement shall be of the two-piece type to simplify field replacement. The stem nut for rising stem valves must be capable of being removed from the top of the actuator without removing the actuator from the valve, disconnecting the electrical wiring, or disassembling any of the gearing within the actuator.

G. A handwheel shall be provided for manual operation. The handwheel shall not rotate during motor operation nor shall a fused motor prevent manual operation. When in manual operating position, the unit will remain in this position until motor is energized at which time the valve operator will automatically return to electric operation and shall remain in motor position until handwheel operation is desired. This movement from motor operation to handwheel operation shall be accomplished by a positive declutching knob or lever which will disengage the motor and motor gearing mechanically but not electrically. Alternately, an automatic declutching mechanism actuated by motion of the handwheel is acceptable. Hand operation must be reasonably fast and require no more than 80 pounds of rim effort at a maximum required torque. It shall not be possible for the unit to be simultaneously in manual and motor operation. Handwheel shall open the valve with counterclockwise rotation and shall have an arrow and the word OPEN cast in raised letters on the rim.

H. The valve operator shall have a built-in lost motion device that travels sufficiently enough to allow the motor to reach full speed before imparting a hammer blow to start valve in motion in either the closing or opening direction. This lost motion device also must permit motor to attain full speed before load is encountered, and load should be shared equally by two lugs cast integrally on the drive sleeve.

Lost motion device is not to be provided for those valves used in inching, throttling, regulating, or modulating service.

I. The limit switches, torque switch, control circuits, and terminal strip connections shall be accessible by removing the cover of the limit switch compartment. A thermostatically-controlled, 120-volt space heater shall be provided in the limit switch compartment.

J. A mechanical, dial-type position indicator shall be provided on the valve operator housing for a continuous local indication of valve position.

K. Unless otherwise specified, a push-button valve control station shall be provided integral with the valve operator housing. The control station shall have open, stop, and close push buttons and red (open) and green (closed) position indicating lights. Lights and push buttons shall be heavy-duty and oil-tight. Where specified, a separately-mounted push-button valve control station with an automatic-manual selector switch in addition to the above listed controls shall be furnished. Separately-mounted control stations shall have a stainless steel or cast aluminum enclosure and shall be rated NEMA 4. Selector switch shall have an extra set of contacts to indicate to the computer system when the valve is under automatic control.

L. A rotary operator shall be furnished for electric motor operators on butterfly and plug valves. Rotary operators shall conform with the applicable requirements of Part 2.24 of this section.

M. Where shown or specified, electric motor operators shall be mounted on a floorstand remotely from the valve. An extension stem shall be furnished to connect the electric motor operator and the valve.

N. Electric valve operators shall be as manufactured by Limitorque, EIM, or equal.

2.29 NONMODULATING PNEUMATIC CYLINDER OPERATORS

A. Where shown or specified, valves shall be furnished with a nonmodulating pneumatic cylinder operator. Nonmodulating pneumatic cylinder operators for on/off butterfly and plug valves shall be of the double-acting type of rack and gear, slotted (scotch) yoke, or swivel (trunnion-mounted) design.

B. Rack and gear operators and scotch yoke operators shall have a weatherproof, heavy-duty cast iron or steel housing with removable, gasketed cover. The housing shall be totally enclosed and sealed against the entrance of rain, dirt, and corrosive atmospheres. Rack and gear operators shall have grease lubricated, hardened alloy steel rack and pinion gearing. Scotch yoke operators shall have a slotted, cast iron or steel yoke, cast iron or steel yoke nut, and renewable bronze bushings. Swivel or trunnion-mounted operators shall have a steel or cast iron cross-head bracket with stainless steel trunnion pins and locked-in, renewable bronze bushings and a cast iron valve lever with locked-in, renewable bronze bushings and stainless steel lever pin. Valve position on all operators shall be mechanically indicated by a dial-type or slot-type indicator on the operator crosshead or housing. Operator shall be equipped with adjustable, mechanical stops to prevent overtravel of the valve disc or plug in the open or closed positions.

C. Pneumatic cylinders shall be constructed of centrifugally cast aluminum manganese bronze, hard-coated aluminum alloy, or glass fiber reinforced epoxy with special low friction additives. Inside surfaces of cylinder shall have a 16-micro-inch or smoother finish. Piston and cylinder heads shall be of cast bronze, hard-coated aluminum alloy, or nonmetallic materials. Piston rod, nut, and lockwasher shall be of stainless steel, and the rod shall have a 4-8 micro-inch finish with a surface of hard chrome plating, minimum 0.0005 inch thick. Piston rings and the piston rod seal shall be of the self-adjusting, wear compensating type and made of Buna-N rubber. Piston rod seal assembly shall be contained in a removable, corrosion-resistant recess, allowing replacement of the seals without removing the cylinder heads. Piston rod dirt wipers shall be installed on both sides of the piston rod seal. Adjustable cushions shall be provided on each end of the cylinder. Flexible hoses shall be furnished by the valve operator manufacturer for connections from the cylinder ports to the mounting bracket. Pneumatic cylinders shall be suitable for operating pressures of up to 100 psig. All cylinder components shall be designed with a minimum factor of safety of five at maximum rated operating pressure. Cylinder shall be prelubricated at the factory.

D. The cylinder operator shall be furnished with 120-volt, four-way solenoid valve and speed control valves. Speed control valves shall include a bronze needle valve on each instrument air connection to the pneumatic cylinder. The pneumatic cylinder shall open at a rate controlled

by one needle valve setting and close at a rate determined by the other needle valve setting. The four-way solenoid valve, speed control valves, and all interconnecting piping and hoses shall be furnished completely assembled on the valve operator. Unless otherwise specified, valves shall be adjusted to move from fully open to fully closed and vice versa in a time interval of 5 to 10 seconds.

E. Where shown or specified, the pneumatic operator shall be furnished with a manual rotary operator and handwheel sized to allow manual operation of the valve in the event of instrument air supply failure.

F. Where required, a lubricator of the oil fog type shall be furnished on the air supply line to the pneumatic cylinder operator. It shall be $^1/_4$-inch in size with $^1/_2$-pint visible oil supply and shall be Norgen Type 10-002-006, Parker-Hannifin Model LS-3025, or equal.

G. Pneumatic cylinder operators shall be designed and sized in accordance with the applicable requirements of AWWA C504, Section 11. Unless otherwise shown or specified, pneumatic cylinder operators shall be designed for operation on an 80 psig supply pressure.

2.30 EXTENSION STEMS

A. Extension stems shall be solid steel not smaller than the stem of the valve or galvanized steel pipe having an inside diameter not smaller than outside diameter of the valve or valve operator stem. Extension stems shall connect to the valve by a flexible, socket coupling. All couplings shall be pinned, keyed, or socket type.

B. Each extension stem for buried valves shall extend to within 6 inches of the top of valve box or floor box and shall be provided with spacers that will center the stem in the valve box. A standard wrench nut shall be provided on the top of extension stem. Extension stems for rising stem valves shall be stainless steel or carbon steel with bronze or stainless steel sleeves. Sleeves shall be of sufficient length and location to extend through each stem guide throughout the full vertical stem travel. Extension stems for submerged service shall be stainless steel or bronze.

C. Stem guides shall be of bronze-bushed, cast iron construction adjustable in two directions. Stem guides shall be installed so the unsupported length of the extension stem does not exceed 10 feet or an L/r of 200.

D. Bevel gear extension stems shall be furnished where it is impractical to locate the floorstand directly over the valve. Such stems shall include a sufficient number of bearings to permit easy operation of the valves.

2.31 FLOORSTANDS

A. Floorstands shall be of the heavy pattern type and shall be constructed of cast iron or steel. Floorstand shall have a height of approximately 36 inches. The floorstand shall have an integral bottom flange suitable for bolting to a concrete floor.

B. Floorstands for manually operated non-rising stem valves shall be furnished with a slot-type position indicator in the floorstand body. Floorstands for rising stem valves shall have a removable stem cover with slot-type position indicator. Stem covers shall consist of a galvanized, slotted steel pipe attached to the top of the floorstand with a pointer riding up and down in the slot. The open and closed points shall be marked on the pipe cover.

C. Floorstands for rising-stem valves shall be provided with a bronze operating nut supported by tapered, grease-lubricated roller or ball bearings. Positive mechanical seals shall be provided on the operating nut where it passes through the floorstand housing to retain lubricant and exclude moisture and dirt. Lubricating fittings shall be provided for lubricating bearings.

D. Handwheels shall have a minimum diameter of 14 inches and shall be designed to seat or unseat the valve at the maximum differential with not greater than a 40 pound tangential pull on the handwheel rim. An arrow and the word “OPEN” shall be cast on the handwheel in raised letters.

E. Each floorstand shall have a conspicuous, permanently-attached nameplate showing the valve manufacturer's name, valve size, model designation, serial number, and any other pertinent information. Nameplate shall be of corrosion resisting metal with raised or stamped lettering and contrasting background.

F. Floorstands shall be set vertical and plumb with the valve operating stem for free operation without binding or distortion. Floorstand shall be shimmed and grouted in place as required for proper installation.

G. Following manufacture, interior and exterior, non-machined, nonbearing ferrous floorstand surfaces shall be blast-cleaned and painted at the factory with one coat of zinc chromate primer conforming to Federal Specification TT-P-645 and one coat of compatible alkyd enamel.

   Interior surfaces of floorstands shall be protected for the life of the unit by a minimum of three coats of an approved paint.

2.32 VALVE BOXES

A. All buried valves shall be provided with three-piece, cast iron, extension sleeve type, valve boxes suitable for the depth of cover as shown on the Drawings.

B. Valve boxes shall not be less than 5 inches in diameter, shall have a minimum thickness of 3/16-inch at any point, and shall be provided with suitable cast iron bases and covers. Covers shall have cast thereon an appropriate name designating the service for which the valve is intended ("W" for water, "S" for drain or waste lines). Covers in roadways shall be of the deep locking type.

C. All parts of valve boxes, bases, and covers shall be heavily coated with a suitable bituminous finish.

D. Valves and boxes shall be set plumb. Each valve box shall be placed directly over the valve it serves with the top of the box flush with the finished grade.

2.33 T-HANDLE OPERATING WRENCH

A. The Contractor shall furnish four T-handle, steel valve operating wrenches with sockets compatible with standard 2-inch square valve operating nuts.

B. The operating wrenches shall be at least 36 inches in length.

2.34 SPARE PARTS

A. The following spare parts shall be furnished where applicable for the valves specified herein:
1. Stem packing - One set each type and size valve
2. Renewable stainless steel or bronze seat ring - One each type and size valve
3. O-ring stem or shaft seals - One set each type and size valve
4. Resilient seat or disc - One each type and size valve
5. Shaft bearings or bushings - One set each type and size valve
6. Hinge pin, disc, spring, - One set each size check valve and disc bolts
7. Gaskets - One set each type and size valve
8. Special tool or seat wrench - One each required for valve servicing and maintenance

B. The following spare parts shall be furnished for electric motor operators:
1. O-rings and seals - One set each operator
2. Fuses - Three each size and type
3. Indicator lights - Three each type
4. Operating nut for rising stems - One each operator
5. Lubricant – 1-year supply each operator

C. The following spare parts shall be furnished for pneumatic cylinder operators:
1. O-rings, rod seals, and wipers - One set each operator
2. Pins and bushings - One set each operator
3. Pneumatic cylinder and air control assembly - One each size

D. Spare parts shall be suitably protected against corrosion and impact to withstand long-term storage. All parts shall be clearly labeled and identified by manufacturer's name and number and the valve to which they belong.

PART 3 EXECUTION

3.1 FACTORY TESTS

A. All valves shall be tested at the point of manufacture for proper and unobstructed operation and for leakage and adequacy of design.

B. Iron body gate valves shall be tested in accordance with AWWA C500, Section 29.

C. Butterfly and plug valves shall be tested in accordance with AWWA C504, Section 13.

D. Iron body check valves shall be tested in accordance with AWWA C508, Section 5.

E. All other valves shall be given an operation test, a leakage test at rated pressure differential, and a hydrostatic test at two times rated pressure. During the hydrostatic test, there shall be no leakage through the metal, the end joints, or the shaft or stem seal, nor shall any part be permanently deformed. During the leakage test, leakage shall not exceed that permitted by ANSI B16.104, Class IV, for metal seated valves and Class VI for resiliently seated valves.

3.2 INSTALLATION

A. All valves shall be installed in strict conformance with the Drawings and approved shop drawings and manufacturer's instructions.

B. Unless otherwise shown or specified, butterfly valves shall be installed with stems in the horizontal position.

C. Double plate, clapper type check valves in horizontal piping shall be installed with the stem in the vertical position.

D. Safety and relief valves shall be installed in a vertical position. Valves relieving compressed gases or liquids at a temperature above atmospheric boiling point shall be piped full size outside of building so discharge cannot hit any person or structure. Valves relieving liquids below their boiling points shall be piped full size to the nearest floor drain.

E. Swing check valves shall be installed only in a horizontal position. Lever shall be free to operate without obstruction.

F. All underground valves shall be installed using a concrete valve box with cast iron frame and cover or in a cast iron valve box as specified herein.

G. Four-way solenoid valves shall exhibit no leakage in either position.

H. Valves shall be installed in such a way that operators and packing are easily accessible. Valves with field replaceable seats shall be installed with sufficient clearance to permit removal of valve bonnet and stem without removing valve from the line.

3.3 FIELD TESTING

Following installation, all valves shall be tested by the Contractor under the anticipated operating conditions. The ability of the valves to operate properly without leakage, binding, sticking, fluttering, or excessive operating torque shall be demonstrated to the satisfaction of the Engineer. The Contractor shall at his own expense adjust and/or replace any valve as necessary to assure satisfactory operation.

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DIVISION 16: ELECTRICAL

SECTION 16010

GENERAL ELECTRICAL PROVISIONS

PART 1 GENERAL

1.1 DESCRIPTION

A. Furnish and install all materials, equipment, labor, supervision and services necessary to complete all electrical work specified herein and shown on the Drawings.

B. Principal Features:
   1. Complete system of conduits, cables and conductors to supply electrical energy throughout the facility.
   2. Lighting fixtures, ballasts, and lamps.
   3. Distribution and lighting panels.
   4. Installation of Owner furnished equipment.

1.2 APPLICABLE STANDARDS AND CODES

A. Local, State, and National Electrical Codes.

B. Latest version of National Electrical Code.

C. Rules of the Electrical Utility and the National Electrical Safety Code.

D. Latest version Life Safety Code 101.

E. NECA Standard of Installation.

F. NFPA (National Fire Protection Association).

1.3 FEES AND TESTS

Contractor shall be responsible for all fees for permits, inspections, and tests necessary to complete this work. Contractor shall demonstrate to the Owner and the Engineer that all items of equipment installed are completely operational and free of defects in all modes.

1.4 COORDINATION WITH OTHER TRADES

Furnish and locate all anchor bolts, inserts and supports for installation by the other trades as required. Coordinate the location of all fixtures, outlets, equipment, and devices with other trades to avoid conflicts.

1.5 LIST OF PROPOSED MANUFACTURERS

List of Proposed Materials: The Contractor shall submit a complete list of the proposed manufacturers for each of the items listed in the following electrical specifications. Additional

submittal data, sufficient to determine equality, shall be required if the Contractor proposes to substitute another manufacturer's equipment.

1.6 RESPONSIBILITY

A. The Contractor shall be responsible for completing systems in accordance with the intent of these Contract Documents:
   1. Coordinating the details of facility equipment and construction for all specification divisions which affect the work covered under Division 16, Electrical.
   2. Furnishing and installing all incidental items not actually shown or specified, but which are required by good practice to provide complete function systems.

   Intent of Drawings - Electrical plan drawings show only general locations of equipment, devices and raceways, unless specifically dimensioned. The Contractor shall be responsible for the proper routing of raceway, subject to the review of the Engineer.

   Departures from Contract Documents - Submit to the Engineer in writing details of any necessary, proposed departures from these Contract Documents, and the reasons therefor. Submit such requests as soon as practicable and within 30 days after award of the Contract. Make no such departures without written review of the Engineer.

   Substitution of Materials and Equipment - In accordance with provisions elsewhere in these Contract Documents, manufacturers' names and catalog numbers stated herein are intended to indicate the type and quality of equipment or materials desired. Unless substitution is specifically forbidden, proposed alternatives may be submitted for review.

PART 2 PRODUCTS

2.1 REFERENCE TO DRAWINGS

Reference shall be made to Drawing Schedules, Details, Notes, and Specifications for: manufacturer, model, catalog number, size, capacity, performance, ratings, and installation of equipment and material.

2.2 CHOICE OF MATERIALS AND EQUIPMENT

A. In submitting substitutions, bidders should note the following minimum considerations: (1) capacities shown are absolute minimal and must be equaled, (2) physical size limitations for space allotted, (3) structural properties, (4) noise level, (5) interchangeability, (6) compatibility with other materials and assemblies, (7) similar items shall be same manufacture and style wherever possible.

B. All material and equipment, for which a UL, ANSI, or a NEMA Standard is established, shall be so approved and labeled or stamped.

C. Adhesives are not acceptable as a mounting, supporting, or assembling technique, unless noted otherwise.

2.3 ELECTRICAL EQUIPMENT

A. NEMA Standards shall be taken as minimum requirements for electrical equipment.

B. Equipment shall operate properly under a plus or minus 10 percent voltage variation.

2.4 SUBMITTALS DURING CONSTRUCTION

A. Provide complete manufacturers' descriptive information and shop drawings for all equipment, material and devices furnished under Division 16, Electrical, including certified outline drawings, arrangement drawings, elementary (schematic) diagrams, interconnection and connection diagrams, in accordance with provisions elsewhere in these Contract Documents. Provide the number of copies specified herein for the Engineer, Contractor and Operation and Maintenance Manuals.

B. Provide certified shop drawings, literature and requested samples showing items proposed for use, size, dimensions, capacity, special features required, schematic (elementary) control diagrams, equipment schedules, rough-in, etc., as required by the Engineer for complete review and for use during installation. Use NEMA device designations and symbols for all electric circuit diagrams submitted. Make content of the schematic (elementary) connection or interconnection diagrams in accordance with the latest edition of NEMA ICS 1.

C. Manufacturer's standardized elementary diagrams will not be acceptable unless applicable portions of the diagram have been clearly identified and non-applicable portions deleted or crossed out.

PART 3 EXECUTION

3.1 WIRING ELECTRICALLY OPERATED EQUIPMENT

The Contractor shall be responsible for all electrical connections to all equipment requiring electrical power. This responsibility applies to equipment furnished under this and other Divisions and by the Owner.

3.2 RECORD AND AS-BUILT DOCUMENTS

A. Maintain at the job site a set of Contract Documents kept current by indicating thereon all changes, revisions, and substitutions, between work as specified and as installed.

B. Furnish Owner with one complete set of reproducible drawings and two complete, clean sets of Specifications showing installed locations, size, catalog numbers, etc., of all work and material as taken from record documents.

C. For each piece of equipment, provide four sets of manufacturer's printed catalog pages, operating and maintenance instructions, and wiring and connections diagrams. Bind this information into $8^{1}/_{2}$- by 11-inch booklets.

3.3 EQUIPMENT OPERATION

This Division is responsible for: (1) proper rotation, (2) observing that lubrication has been properly performed, (3) that motors operate within nameplate limits, and (4) adjustment of circuit breaker and MCP trip settings.

3.4 CIRCUIT CONTINUITY

Complete installation shall be free of short circuits, grounds, open circuits, and other defects. Tests shall be made as required to prove that all parts of installation meet specified performances.

3.5 CLEANING AND PAINTING

Fixtures, panels, and equipment shall be thoroughly cleaned. All equipment shall be touched up or repainted as required to present a clean professional appearance. Paint all ferrous metal which is not otherwise protected against corrosion. Paint exposed pipe threads with Bitumastic No. 50.

3.6 IDENTIFICATION

A. Identify all major items of equipment including controls, panels, switches, contractors, motor starters, junction boxes, and metering by permanent nameplates, with wording approved by Engineer. Secure metal nameplate frame with screws or brads. Adhesives are acceptable on components within NEMA 1 enclosures.

B. Nameplates after installation shall be easily visible and shall bear notations corresponding to those shown on record drawings.

C. All conduits shall be identified with a stamped stainless steel tag system (Brady or approved equal). Conduit tags shall be permanently attached to each exposed end of conduit runs such as in manholes, pull boxes, panels, junction boxes, etc. and at each point of entry into a structure or building. Each tag shall be stamped with the appropriate conduit number per the conduit and cable schedules.

   Each instrument shall be identified with a stamped stainless steel tag system (Brady or approved equal). Instrument tags shall be permanently attached to each individual instrument and stamped with the appropriate number per instrument Specification Section No. 13620, 13621.

D. Each cable shall be identified with a permanent labeling system (Brady Catalog Number B-292 with printed legends or approved equal). Instrumentation cables shall be labeled with the appropriate instrument number of the originating signal (Ex. FT-2020-1). Multiplex cables, power and control cables shall be labeled with the appropriate cable number per the conduit and cable schedules.

E. All power panels, lighting panels, control panels, control cabinets, etc. shall be identified with permanently mounted phenolic labels.

F. All power and lighting panels shall have typed schedules mounted on panel doors.

3.7 TEST PERIOD

A. Each piece of equipment shall continue to meet performance specifications throughout the first year of actual operation. Contractor shall replace or repair any defect due to faulty workmanship or material which shall develop within 1 year from date of acceptance. This guaranty shall cover both material and labor.

B. For first year after final acceptance, Contractor shall provide, at no cost to Owner, any required maintenance and service necessary to assure the proper operation of the system. Date of acceptance shall be certified by Engineer as that date on which the contract has been satisfactorily completed in accordance with the Contract Documents.

3.8 GROUNDING

See section entitled "Grounding" of these Specifications.

3.9 ELECTRICAL TESTING AND START-UP

A. General

1. Prior to energizing any equipment, the electrical contractor shall thoroughly vacuum clean the equipment with an industrial type vacuum cleaner. The outside of all electrical equipment shall be cleaned and paint touched up as required to leave equipment in an "as purchased" condition.
2. During start-up of new equipment, the electrical contractor shall provide sufficient personnel to aid with start-up of the electrical equipment to remove any faults, and to make the necessary adjustment for proper operation of electrical equipment and installation. This includes sufficient personnel to aid equipment service personnel in their check-out of the electrical equipment and service.
3. All testing equipment shall be furnished by Contractor.
4. All failures under tests due to defective material or poor workmanship shall be corrected by the Contractor at no expense to the Owner.
5. The electrical contractor shall not, under any circumstances, energize any electrical equipment covered by these Specifications without first obtaining permission from Engineer.

B. Grounding: After all connections have been made to the ground, ground tests shall be made to verify its adequacy.

C. Typewritten directories shall be inserted in all panels showing the designation of each circuit. All power and replacement fuses necessary for testing shall be furnished and paid for under this item.

3.10 INSTALLATION OF EQUIPMENT

The electrical contractor shall coordinate with Contractor and Owner in order to have electric power available when required.

END OF SECTION

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SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 DESCRIPTION

Provide all labor, equipment and materials required to complete the installation specified herein, and shown or scheduled on the Drawings. Since the Drawings are schematic, all fittings, connectors, etc. are not shown, but shall be furnished as required for a complete functional installation.

1.2 QUALITY ASSURANCE

Where not otherwise specified, all material and methods shall be of the highest industrial quality suitable for the application. All panelboards, motor starters, transformers, and other electrical equipment that is stored prior to installation, or that is installed outdoors, shall be protected from corrosion and rust with a product equal to Zerust Vapor Capsules or Cutler-Hammer Oxidation Inhibitor Capsules.

1.3 SHOP DRAWINGS

Shop drawings are required for the following items: Panels, safety switches, motors, motor starters, control equipment, emergency light equipment, transformers, telephone devices, receptacles, circuit breakers, and lighting fixtures. A list of product manufacturers is required for all other items covered by these Specifications.

1.4 AREA CLASSIFICATIONS

A. Wet Locations: The following areas shall be considered wet locations:
   1. All outdoor areas:
      a. Pump Station Area.
      b. Headworks Area
   2. All areas below grade unless otherwise specified:
      a. Wet Well Area
      b. SBR
   3. Materials, equipment and incidentals in areas identified as wet locations shall meet NEC and NEMA requirements for wet locations. Enclosures shall meet NEMA 4 requirements as a minimum and NEMA 4X requirements where specified. Conduits shall be terminated at enclosures with watertight, threaded hubs.

B. Corrosive and Hazardous Locations: The following areas shall be considered corrosive locations:
   1. All areas below grade unless otherwise specified
      a. Wet Well Area
      b. Chemical Feed Area
      c. Chemical Storage

2. Materials, equipment and incidentals in areas identified as corrosive shall meet NEC and NEMA requirements for corrosive and hazardous locations. Conduit systems shall be Schedule 80 PVC and enclosures shall meet NEMA 4X requirements. Conduits shall be terminated at enclosures with watertight, threaded hubs. Independent supports shall be stainless steel.

PART 2 PRODUCTS

2.1 MATERIALS

A. Conduits

1. Types: Galvanized rigid steel conduit (GRC), polyvinyl chloride conduit (PVC), PVC duct, or coated metal conduit (CGRC, CAL, CIMC).
2. Minimum size: 3/4" for GRC, IMC, and PVC.
3. Reference Standards:
   a. GRC - Federal Specifications WW-C-581, UL labeled, UL Standard 6, ANSI C80.1, hot dip galvanized mild steel.
   b. PVC - NEMA TC-2, UL 651, ANSI C33.91, NEC Article 347, UL listed, Schedule 40, heavy wall, 90EC, Federal Specification W-C-1094A.
   c. Coated metal conduit:
      1) Coating shall be corrosion, abrasion, flame and weather-resistant and shall be either:
         a) Nominal 10 mil thermosetting linearized phenolic coating compound.
         b) Nominal 40 mil thermoplastic vinyl coating compound.
      2) The metal conduit prior to coating, shall meet the requirements for the specific type of conduit as listed above.
4. Manufacturers: Triangle, Allied, Carlon, Republic, Wheatland, VAW, Occidental, or equal.
5. Restrictions:
   a. PVC shall not be installed in exposed locations.
   b. All instrumentation circuits shall be installed in an approved type of steel conduit (CGRC, CIMC, or EMT).
   c. FLEX shall be used in dry interior applications under the following conditions:
6. Inside existing block walls.
7. For connection to lighting fixtures and other equipment subject to vibration or movement.

B. Wires and Cables

1. Power, light, and control cables (600 volt and below).
   a. No. 6 AWG - 500 MCM: Type RHH-RHW-USE, 75EC, 600 volt, insulation with Class B stranded copper conductors, UL Standard 44 and 854.
   b. No. 14 - No. 8 AWG: Type THHN/THWN, 75EC, 600 volt, insulation with solid or stranded copper conductors, UL Standard 83, ANSI C33.80. No. 14 may be used for control wiring but not for power and lighting circuits.
   c. Pirelli, General Electric, Brand-Rex, or equal.
2. Instrumentation Cables:
   a. Two or three conductor shielded cable: Belden 8719 or 8718, Samuel Moore 1852 or 1862, Quabbin 3135 or 3140, or equal.
   b. Other types: as required by equipment supplier, or as shown on the Drawings.

3. Color Codes
    a. For 120/240 volt, single phase systems, or 120/208 volt, three phase systems, each cable shall be color-coded black, red, blue or white and the assigned color shall be used consistently for that phase throughout the system. The insulation shall be colored for all sizes where sock colors are available. Black insulation with colored marking tape may be used for #8 AWG and larger. The white conductor shall be the neutral.
    b. For 480/277 volt, three phase systems, each cable shall be color-coded brown, orange or yellow, and the assigned color shall be used consistently for that phase throughout the system. The insulation shall be colored for all sizes where stock colors are available. Black insulation with colored marking tape may be used for #4 AWG and larger. The neutral conductor shall be color coded white.

C. Wire Connections and Devices
1. Wire and cable splices:
    a. No. 12 - No. 10 AWG: Scotch "Scotchlok" Type R, Thomas & Betts (T & B) "Piggy", Ideal No. 452 (Red) Wingnuts, WAGO Type WC, or equal.
    b. No. 8 and larger: T & B Method Color-Keyed Compression Joints, Ideal, Anderson, or equal. Hex Socket Screw Tap Connectors and Mechanical Lugs. UL listed per UL 486B.
2. Equipment Terminals: T & B Locktite Lugs, Ideal, Ilsco, or equal.
3. Electrical Insulating Tape: Plymount "Slipknot Grey," Scotch 33+, or equal.

D. Outlet Boxes and Covers
1. Outlet Boxes: Raco, Steel City, or equal.
2. Outlet Box Covers:
    a. Switch: Sierra Cat. No. S-1N, S-2N, etc.; Hubbell 93071, or equal.
    b. Weatherproof Covers: Sierra Cat. No. WPD-8, or equal.

E. Switches. Heavy-duty, AC quiet, premium, specification grade, toggle type. Federal Specification W-S-896E. UL Test UL 20.120/277 volts AC, 15 amps; gray toggle. General Electric, Hubbell, or equal.

F. Receptacles. Two-pole, 3-wire, straight blade, heavy-duty grounding. Federal Specification W-S-596d. U. Test UL 498. 120 volts AC, 15 amps, gray urea face. Bryant, Leviton, or equal.

G. Device Plates. Satin finished, Type 430 stainless steel - gauged as required for areas noted on the Drawings. Impact resistant lexan (brown, gray or ivory as necessary to match wall finish) for other interior areas.

H. Safety Switches. Furnish and install fusible and non-fusible, three pole, 240 volt, safety switches where shown on the Drawings. All safety switches shall be NEMA General Duty Type TG and UL listed. All switches shall be of dead front construction with blades fully visible when in the "OFF" position with the door open. Mechanism shall be quick-make, quick-break with provisions for up to three padlocks in the OFF position. All switches on the load side of a starter shall be provided with an electrical interlock kit to break power to the control circuit before the main blades open. All exterior switches shall be of code gauge (UL98), galvanized steel, NEMA 3R, or foamed thermo-plastic NEMA 4X. Enclosures shall

be Carlon, Hoffman or equal, or as furnished by the electrical equipment manufacturer. Safety switches shall be Siemens- Allis (ITE), Federal Pacific, Cutler-Hammer, or equal.

I. Overcurrent Protective Devices
1. Fuses. Fuses shall not be installed until equipment is ready to be energized. All fuses shall be furnished and installed by the electrical contractor. All fuses shall be of the same manufacturer. Fuses shall be as follows:
   a. Mains, Feeders, and Branch Circuits
      1) Circuits 0 to 600 ampere shall be protected by current limiting Bussmann Low-Peak Dual-Element Fuses LPN-RK (250 volts). All dual-element fuses shall have separate overload and short-circuit elements. Fuse shall incorporate a spring activated thermal overload element having a 284°F melting point alloy and shall be independent of the short-circuit clearing chamber. The fuse must hold 500% of rated current for a minimum of 10 seconds and be UL listed with an interrupting rating of 200,000 amperes RMS symmetrical. The fuses shall be UL Class RK1.
      2) Motor Circuits: All individual motor circuits rated 240 amperes shall be protected by Bussmann Low-Peak Dual-Element Fuses LPN-RK (250 volts). The fuses for 1.15 service factor motors shall be installed in ratings approximately 125% of motor full load current except where high ambient temperatures prevail, or where the motor drives a heavy revolving part which cannot be brought up to full speed quickly, such as large fans. Under such conditions the fuse should be 150% to 200% of the motor full load current. Larger hp motors shall be protected by Bussmann Type KRP-C Hi-Cap Time-Delay Fuses of the rating shown on the Drawings. 1.0 service factor motors shall be protected by Bussmann Low-Peak Dual-Element Fuses LPN RK (250 volts) installed in ratings approximately 115% of the motor full load current except as noted above. The fuses shall be UL Class RK1 or L.
      3) Circuit breaker panels shall be protected by Bussmann Low-Peak Dual-Element Fuses LPN-RK (250 volts) as shown on the Drawings. The fuses shall be UL Class RK1.
   b. Spares
      Upon completion of the building, the Contractor shall provide the Owner with spare fuses as shown below:
      1) 10% (minimum of 3) of each type and rating of installed fuses shall be supplied as spares.
      2) Bussmann spare fuse cabinets - Catalog No. SFC - shall be provided to store the above spares.
   c. Manufacturers: Bussmann, Gould, Chase-Shawmut, or equal.
2. Circuit Breakers: Westinghouse, General Electric, Square D, Siemens-Allis (I-T-E), or equal. Federal Specification W-C-375B/Gen 126, NEMA AB1-1975, UL489-1980. Time-current trip curves shall be submitted for approval for three-pole circuit breakers supplying motor loads for manufacturers other than those listed.
3. UL listed interrupting ratings for protective devices shall be 22,000 amps RMS symmetrical unless noted otherwise.

J. Supporting Devices
1. Expansion and/or Deflection Fittings: O. Z. Gedney, Appleton, or equal.
2. Channel Support: Unistrut, Kindorf, Super Strut, or equal.

3. Fastening Devices: Caddy, Appleton, or equal.
4. Cable Ties: Ideal, Panduit, Thomas & Betts, or equal.

K. Panelboards

1. General: Furnish panelboards as described herein and with protective devices of the required number, rating and type as shown on plans. Panelboards shall be UL listed and labeled under requirements of UL 67 and UL 50. Panel shall bear UL short circuit rating level in addition to the UL panel label. Panels shall meet NEMA PBI, U.S. Federal Specification WP 115a, and shall comply with NEC 2005 code. Circuit-breakers shall be bolt-in type. Neither plug-in breakers nor the "load-center" type construction is acceptable. Panels shall be Square D, Siemens-Allis (I-T-E), GE, Westinghouse, or equal. Panels shall have a minimum of 42 pole spaces, unless specifically shown otherwise.
2. Electrical rating: Lighting Panels shall be rated:
   a. 120/240 volts, single-phase, three-wire, solid neutral, 60 hertz, and 10,000 amp symmetrical interrupting, or
   b. 120/208 volt, three-phase, four-wire, solid neutral, 60 hertz, 10,000 amps symmetrical interrupting.
3. Distribution Panels shall be rated:
   a. 480Y/277 volt, three-phase, four-wire, solid neutral, 60 hertz, 30,000 amps symmetrical interrupting.
   b. Where noted, 480Y/277 volt, three-phase, three-wire, 60 hertz, 30,000 amps symmetrical interrupting. Panels DA and DB shall be suitable for use as service equipment.
4. Boxes and fronts: Boxes shall be galvanized code gauge steel, minimum of 4 inches of wiring gutters at all points. Fronts, complete with trim clamps, shall be of code gauge sheet steel, painted light grey over a rust inhibitor and shall be equipped with door, hinges, cylinder lock and directory card. All locks shall be keyed alike. After installation directory card shall be typed with circuit designations corresponding to circuit breaker numbering.
5. Interiors: Complete factory assembled interiors shall consist of a reinforced galvanized sheet steel frame with bus bars and circuit breakers properly supported to prevent vibration, breakage in handling, and to withstand the indicated short circuit currents. All terminals shall be solderless type suitable for copper or aluminum cable of sizes indicated. Bus bars shall be tin-plated aluminum and sequence phased. Neutral bar, when required shall be located on the opposite end of the panel from mains, and shall be insulated.
6. Circuit breakers: Circuit breakers shall be fully interchangeable without disturbing adjacent units. Breakers shall be quick-make, quick-break, and trip indicating. All 2 and 3 pole breakers shall have common trips. All single pole 15 and 20 amp breakers shall be UL listed for switching duty. Where indicated on plans furnish ground fault breakers UL listed in accordance with UL 943 Class I - Group 1, 5 milliamp sensitivity.
7. Drawings: Drawings shall be submitted under Section 01300 showing: Mains - type and locations, schedule of branch devices, bus rating, lug sizes, box dimensions, and panelboard short circuit rating.

L. Wall and Floor Seals. Wall seals are required for all wall penetrations below grade. Floor seals are not required for slab on grade penetrations but are required for floors below grade. Seals shall be Spring City, O.Z. Gedney, or equal.

M. Dry Type Transformers (600 volt and below)

1. General: Distribution transformers shall be dry type, two winding power transformers as manufactured by Square D, General Electric, or equal. All units shall be manufactured in accordance with latest reversions of ANSI C89.2, NEMA ST-20, NEMA TR-27, UL 506, and IEEE STD. 259, as applicable. Units installed outdoor or in wet locations as noted on plans, shall have an aluminum case and be UL listed for outdoor operations.
2. Electrical rating: Transformers shall be 480 volt, single phase, primary and 120/240 volt, single phase, secondary or 480 volt, 3 phase primary and 120/208 volt, 3 phase secondary as shown on the Drawings. KVA ratings shall be provided with a minimum of 4 taps, 2 above and 2 below nominal voltage.
3. Temperature classifications: Transformers shall be utilized 105°, 150°, or 185°C insulation systems. The transformer shall utilize an insulation system that has been properly temperature classified in accordance with the latest reversions of UL 506 and NEMA ST-20-1972.
4. Load rating: Transformers shall be capable of operating continuously at 100% of nameplate rating in an ambient temperature not exceeding 40°C. Transformers 5 KVA and above shall be capable of meeting overload requirements per the latest revision of ANSI C57.96 with normal life maintained.
5. Sound rating: Sound levels shall not exceed the following:

Transformer Rating (KVA)	**Maximum Sound Level Decibels per ANSI C89**
0-9	40
10-50	45
51-150	50
150-300	55
301-500	60

6. Tests: Each transformer shall be given the following production tests: Applied and induced overpotential, no load losses, polarity, and voltage ratio. Manufacturer shall furnish, upon request, the following test data on units identical in design to those supplied: Sound level, temperature rise tests, full load losses, regulation, and impedance.
7. Drawings: Drawings shall be submitted under Section 01300 showing transformer nameplate, electrical rating and connections, outline dimension, and weight.

N. Power Circuits:

1. The electrical power system shall be protected from voltage surges at the main power service point, and other point within the electrical as noted, in the form of a UL-1449 listed surge protector with a 10 year manufacturer's performance warranty. The protector unit shall be as manufactured by Surge Suppression Inc. or approved equal.

2. Performance Specifications

System Voltage	Model	Peak Surge Per Mode
120/240V, 1Φ,3W	SHDL1P1-21	200,000 A
120/240V, 3Φ,4W	SHDL3D1-21	200,000 A.
120/208V, 3Φ,4W	SHDL3Y1-21	200,000 A
277/480V, 3Φ,4W	SHDL3Y2-21	200,000 A.

1 X 10 Second Response Time.
L-L, L-N, L-G, N-G Protective Modes Inclusive.
Replaceable Status Lights.
NEMA 12 Enclosure with Encapsulated Interior.

O. Motor Starters

1. Motor starters shall be full voltage, non-reversing (FVNR), combination MCP motor starters. The starters shall be the NEMA sizes noted on the Drawings.
2. Surface mounted enclosure with door gaskets and corrosion protection per Section 16050, Part 1.2, of these Specifications. NEMA 12 enclosures for indoor and NEMA 4X for outdoor.
3. Motor circuit protector (MCP), with 22,000 sym I.C. at 480 volts.
4. Westinghouse, Square D, Cutler-Hammer, or equal.
5. Three, ambient temperature compensating, Class 20 bimetallic, thermal overload relays - automatic reset.
6. Starters for motors larger than 10 hp shall have ELAPSED TIME METERS (ETMs) and percent load indicators (ammeters).
7. 120-Volt motor and starter space heaters with NC interlock, where equipment is mounted outdoors or in unheated buildings.
8. 120-Volt control power transformer and fuses, push-to-test run light (red), on-off selector switch or start-stop push buttons as shown. Other control devices as shown on Drawings.
9. Options may be field or factory installed.

P. Surface Mounted Raceway - Surface mounted raceway shall be the product of a manufacturer of a complete system of components, fittings, and accessories. The installation shall utilize all components recommended in the manufacturer's application guide for the intended service. Raceway shall be Walkermold, Wiremold, or equal.

Q. Drains and Breathers - Drains and breathers shall be Appleton Type ECDB, Killark Type KDB-1, or equal. One drain and one breather shall be installed in each NEMA 3R, NEMA 4, or NEMA 4X enclosures furnished under this section or listed in the motor starter schedule shown on the Drawings.

R. Push Buttons and Control Stations - Push buttons shall be heavy duty, oiltight, 600 volt, AC/DC, 10 amperes continuous rating. "Start" pushbuttons and selector switches shall be color coded according to function, as approved by the Engineer. All "stop" push buttons shall be red and shall be furnished with an attachment to hold the button in the depressed position. The attachment shall accept a standard padlock. "Stop" push buttons not located in an MCC shall be the mushroom type, and shall be "push-pull" or "push-to-latch, turn-to-release." Pilot lights shall be transformer type, push-to-test with 6 volt, 3.3 watt lamps.

PART 3 EXECUTION

3.1 CONDUIT INSTALLATION

A. Minimum size conduit shall be $^{3}/_{4}$ inch above ground and 1 inch below ground except where noted otherwise.

B. During construction all installed conduits shall be temporarily plugged, capped, or otherwise protected from the entrance of dust, trash, moisture, etc., and any conduits which become clogged shall be replaced. No conductor shall be pulled in until all work that might cause damage to the conduit or conductors has been completed.

C. Conduit connections to sheet metal enclosures shall be securely fastened by double lock nuts inside and outside and shall have grounding bushings.

D. Conduit straps or brackets secured to concrete, brick, or masonry shall be by means of expansion bolts, toggle bolts, or approved drill anchors. No wood plugs will be permitted.

E. Conduits supported from building walls shall be installed with at least 1/4-inch clearance from the wall using conduit spacers equal to Appleton Electric Company, T & B Company, Steel City, or equal.

F. Unless otherwise shown or specified, exposed conduit shall be installed parallel or at right angles to structural members, surfaces, and building walls.

G. Two or more conduits in the same general routing shall be parallel with symmetrical bends.

H. Conduit installed horizontally shall allow headroom of at least 7 feet, except where it may be installed along structures, piping, equipment, or in other areas where headroom cannot be maintained because of other considerations.

I. Wherever necessary and where shown on the Drawings, conduit boxes and pulling elbows shall be inserted in the lines. Gaskets shall be used to ensure a dust and watertight installation on all conduit boxes and fittings.

J. All bends and turns in conduits shall have a bend radius of not less than six (6) times the internal diameter of the conduit. Bends shall be made using an approved bender to provide smooth bends with no kinks, dents, or flattening.

K. All conduit shall be run concealed unless impractical or shown otherwise.

L. All concealed conduit shall be placed in walls, floors, ceilings, or slabs at the proper time in accordance with the progress of the work. The Contractor shall cooperate in every respect in meeting schedules and shall not delay the structural work unnecessarily. Conduits embedded in concrete shall be blocked and braced in place by use of adequate conduit separators to prevent displacement during pouring of the concrete. Where conduit interferes with structural steel, steel reinforcement, or, in the opinion of the Engineer, occupies too much space in the slab, the conduits shall be rearranged or installed exposed as directed by the Engineer or required. No additional payment will be made for such rearrangement of conduit whether or not additional conduit or fittings might be required.

M. Terminations and connections of rigid conduit shall be threaded. Conduits shall be reamed free of burrs and terminated with insulated metallic conduit bushings.

N. Conduit threads shall be coated with a petroleum base corrosion-inhibitor with low electrical contact resistance before assembly equal to Burndy Engineering Company, Inc., Penetrax "A" or equal screw thread lubricant (zinc-petroleum or zincchromate compounds are permissible).

O. All conduits shall be suitable grounded to the plant ground grid using grounded type insulated bushings, P. Z. Electrical Manufacturing Company, Type BLG or IGB, T & B Company, Appleton Electric Company, or equal.

P. Conduit across structural joints where structural movement is allowed shall have bonded, weathertight expansion and deflection fitting the same size as the conduit.

Q. Support spacing for conduits one inch and smaller shall not exceed 6 feet. Supports shall be cadmium-plated steel or galvanized iron. Conduits 1-1/2 inches and smaller may be supported by one-hole conduit straps and 2 inches and larger shall be supported by two-hole conduit straps. Conduit racks shall be as manufactured by Unistrut, Kindorf, or equal.

R. Conduit joints shall be made up tight using a pipe wrench. Channel lock pliers will not be permitted, and unions shall be used as necessary to aid in the installation. Conduits shall be cut square and the ends reamed smooth after threading to prevent injury to conductors. Conduit joints in concrete or exposed to weather or damp locations shall be drawn up tight and coated with insulating paint before casting in concrete or painting exposed conduit system.

3.2 CUTTING AND PATCHING

A. Provide all cutting and patching required to perform this work.

B. Do not cut any major structural element without approval of Engineer.

C. Patching shall be of quality equal to, and of appearance matching, existing construction.

3.3 EQUIPMENT MOUNTING

Wherever any electrical component, such as panels, raceways, pipes and conduits, will be in contact with surfaces which may become damp or wet, mount using spacers to hold electrical work $^{1}/_{4}$" away from damp surfaces.

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SECTION 16111

CONDUIT

PART 1 GENERAL

1.1 SCOPE

A. The work covered by this section includes furnishing all labor, equipment, and materials required to install electrical conduit and fittings as specified herein and/or shown on Drawings.

B. The Contractor's attention is called to the fact that all conduits and conduit fittings are not necessarily shown completely on the Drawings, which are more or less schematic. However, the Contractor shall furnish and install all conduit and conduit fittings indicated or required for the proper connection and operation of all equipment and services requiring such conduit.

1.2 SHOP DRAWINGS AND ENGINEERING DATA

Shop drawings and engineering data shall be submitted in accordance with the requirements of the section entitled "Submittals" of these Specifications.

1.3 STORAGE AND PROTECTION

Store and protect conduit and fittings in accordance with the manufacturer's recommendations and the requirements of the section entitled "General Equipment Stipulations" of these Specifications. Conduit shall be stored aboveground and adequately supported.

1.4 GUARANTEE

Provide a guarantee against defective equipment and workmanship in accordance with the requirements of the section entitled "Guarantees and Warranties" of these Specifications.

PART 2 PRODUCTS

2.1 GENERAL

A. Unless otherwise shown or specified, all conduits shall be rigid metal or intermediate metal conduit.

B. Where specifically indicated on the Drawings, rigid nonmetallic conduit may be used for encased buried power and motor control wiring. Under no circumstances will rigid nonmetallic conduit be used for instrumentation and low-level signal wiring.

C. Conduits carrying instrumentation wiring and conduits carrying low voltage (less than 600 volts) power and control wiring may be run in the same trench if all conduits are rigid metal or intermediate metal.

D. Conduit terminations at electrical equipment such as electric motors and heaters shall be made using liquid-tight, flexible metal conduit.

E. Buried, nonencased rigid metal conduit run along the outside walls of concrete or masonry structures shall be plastic-coated.

F. Damaged, dented, flattened, or kinked conduit shall not be used.

2.2 RIGID METAL CONDUIT

Rigid metal conduit shall be heavy wall, mild steel conduit conforming to ANSI C80.1 and Federal Specification WW-C-581, hot dip galvanized both inside and out. All conduits shall bear the approved stamp of the Underwriters Laboratories and shall be as manufactured by Republic Steel, General Electric, General Cable, or equal.

2.3 RIGID NONMETALLIC CONDUIT

A. Rigid nonmetallic conduit for voltages 600 volts and less shall be SCH 40 heavy wall polyvinyl chloride (PVC) electrical conduit rated for 90EC conductors and conforming to NEMA TC-2, Type EPC-40-PVC. It shall be listed by Underwriters Laboratories in conformance with the National Electrical Code. Conduit fittings, elbows, and joint cement shall be produced by the same manufacturer as the conduit. Conduits shall be as manufactured by Carlon, Borg-Warner, or equal.

B. Rigid nonmetallic conduit for voltages higher than 600 volts shall be polyvinyl chloride (PVC) power duct rated for 90EC conductors and conforming to NEMA TC-6, Type DB. Conduit fittings, elbows, and joint cement shall be produced by the same manufacturer as the conduit. Conduit shall be as manufactured by Carlon, Olin, or equal.

2.4 PLASTIC-COATED RIGID METAL CONDUIT

A. Rigid metal conduit prior to application of plastic coating shall conform to Part 2.2, Rigid Metal Conduit, of this section.

B. Plastic coating shall be polyvinyl chloride (PVC) bonded to the metal a uniform thickness of 40 mils the full length of the conduit except the threads. The bond between the metal and PVC coating shall be equal or greater than the tensile strength of the PVC coating.

C. A coupling shall be furnished loose with each length of conduit and shall have a PVC sleeve extending one pipe diameter or 2 inches, whichever is least, beyond the end of the coupling. Elbows shall have the same thickness of PVC coating as on the conduit. All threaded conduit and elbow ends shall have plastic thread protectors.

D. The rigid steel galvanized PVC coated conduit and fittings shall be KorKap as manufactured by Plastic Applicators, Houston, Texas; Plasti-Bond as manufactured by Pittsburgh Std. Div. of Robroy Industies, Verone, Pennsylvania; or equal.

2.5 LIQUID-TIGHT FLEXIBLE METAL CONDUIT

Flexible conduit shall have an oil-resistant, liquid-tight jacket in combination with flexible metal reinforcing tubing and shall be designed for use with waterproof fittings. An integral ground wire shall be included. Flexible conduit shall be American Brass Sealtite Type UA as manufactured by Electric-Flex Company; Flexible Metallic Conduit as manufactured by Ideal Industries, Inc.; or equal. Only Underwriter's Laboratories approved fittings shall be used.

2.6 CONDUIT FITTINGS AND BUSHINGS

A. Wherever conduits terminate in sheet steel boxes, double bonding type locknuts and bushings shall be used except when terminating in cast hubs. All bushings shall be insulated metallic type, equal to O. Z. Electrical Manufacturing Company, Type B; T & B Company, 1200 Series; Appleton Electric Company, Type BU-I; or equal.

B. Where conduits terminate in steel or cast NEMA 4 enclosures with no factory-installed threaded hubs, a threaded hub shall be installed equal to Myers Electric Products, Inc., Type ST or STG; Appleton Electric Company, Type HUB; Crouse-Hinds, Type HUB; or equal.

C. All conduits terminating at motor control centers shall be suitably grounded to the motor control center ground bus using grounded type insulated bushings equal to O. Z. Electrical Manufacturing Company, BLB or IGB; Appleton, Type BIB; Thomas and Betts, 3800 Series; or equal.

D. Conduit expansion fittings shall be O. Z. Electrical Manufacturing Company, Type EX with Bonding Jumper, Type XJ; Appleton, Type SJ with Type XJB4 Bonding Jumpers; Crouse-Hinds, Type XJ with GC100 Bonding Jumper; or equal.

2.7 CONDUIT BOXES

Exposed conduit boxes and pulling elbows shall be of die-cast, copper-free aluminum with threaded body and removable neoprene-gasketed cover. Conduit boxes shall conform to Federal Specification W-C-586a and shall be Crouse-Hinds "Condulet," Appleton "Unilet Form 85," or equal.

PART 3 EXECUTION

3.1 GENERAL

A. Minimum size conduit shall be $^{3}/_{4}$ inch aboveground and 1 inch below ground except where noted otherwise, and no conduit shall have more than 40 percent of its internal area occupied by conductors.

B. During construction all installed conduits shall be temporarily plugged, capped, or otherwise protected from the entrance of dust, trash, moisture, etc., and any conduits which may become clogged shall be replaced. No conductor shall be pulled in until all work that might cause damage to the conduit or conductors has been completed.

C. Conduit connections to sheet metal enclosures shall be securely fastened by double lock nuts inside and outside and shall have grounding bushings.

D. Conduit straps or brackets secured to concrete, brick, or masonry shall be by means of expansion bolts, toggle bolts, or approved drill anchors. No wood plugs will be permitted.

E. Conduits supported from building walls shall be installed with at least $^{1}/_{4}$-inch clearance from the wall using pipe spacers equal to Appleton Electric Company, T&B Company, Steel City, or equal. Clamp back to prevent the accumulation of dirt and moisture behind the conduit.

F. Unless otherwise shown or specified, exposed rigid conduit shall be installed parallel or at right angles to structural members, surfaces, and building walls.

G. Two or more conduits in the same general routing shall be parallel with symmetrical bends.

H. Conduits shall be at least 12 inches from high temperature piping, ducts, and flues.

I. Conduit installed horizontally shall allow headroom of at least seven feet, except where it may be installed along structures, piping, equipment, or in other areas where headroom cannot be maintained because of other considerations.

J. Wherever necessary and where shown on the Drawings, conduit boxes and pulling elbows shall be inserted in the lines. Gaskets shall be used to ensure a dust and watertight installation on all conduit boxes and fittings.

K. All bends and turns in conduits shall have a bend radius of not less than six times the internal diameter of the conduit. Bends shall be made using an approved bender to provide smooth bends with no kinks, dents, or flattening.

L. All conduit shall be run concealed wherever practical. Unless otherwise shown or required, conduit 2 inches and larger shall be run exposed.

M. All concealed conduit shall be placed in walls, floors, ceilings, or slabs at the proper time in accordance with the progress of meeting schedules and shall not delay the structural work unnecessarily. Conduits embedded in concrete shall be blocked and braced in place by use of adequate conduit separators to prevent displacement during pouring of the concrete. Where conduit interferes with structural steel, steel reinforcement, or in the opinion of the Engineer occupies too much space in the slab, the conduits shall be rearranged or installed exposed as directed by the Engineer or required. No additional payment will be made for such rearrangement of conduit whether or not additional conduit or fittings might be required.

N. Conduit wall seals with water stops shall be installed in outside walls below grade for all incoming or outgoing underground conduit emerging directly into the building area. The conduit wall seals shall have a pressure ring and sealing grommet to ensure a watertight installation.

O. Conduit expansion fittings and ground bonding jumpers shall be installed on all conduits passing through building expansion joints to provide movement in the conduit system.

P. Where groups of conduits terminate together or pass through floors, provide template to hold conduits in proper relation to each other and to building.

Q. Conduits shall be plugged or capped with plastic caps during construction to protect threads and prevent entrance of dirt and water.

R. Conduits shall be adequately supported at intervals as required by the National Electrical Code. One to two exposed conduits running parallel to each other may be supported by strap anchors, or one-hole clamps (walls only). Exposed conduits larger than 2 inches or groups of more than two conduits run parallel shall be supported by means of minimum 12 gauge, slotted steel channels fitted with two-piece, bolted pipe clamps. All conduit supports, clamps, straps and brackets shall be heavily hot dip galvanized for corrosion resistance.

S. Runs of conduit shall not contain more than four 90-degree bends (360 degree total) between conduit boxes panelboards, or terminations. In general and to the extent practical length of conduit runs between conduit boxes or similar means of access shall not exceed 100 feet.

T. Exposed service entrance conduits and main feeder conduits shall be identified using stenciled letters at intervals not to exceed 20 feet. Size of letters shall be equal to one-half the diameter of the conduit or 2 inches, whichever is less.

3.2 INSTALLATION OF RIGID METAL AND INTERMEDIATE METAL CONDUIT

A. Terminations and connections of rigid and intermediate metal conduit shall be threaded. Conduits shall be reamed free of burrs and terminated with insulated metallic conduit bushings.

B. Conduit threads shall be coated with a petroleum base corrosion-inhibitor with low electrical contact resistance before assembly equal to Burndy Engineering Company, Inc., Penetrax "A" or equal screw thread lubricant (zinc-petroleum or zinc-chromate compounds are permissible).

C. All conduits shall be suitably grounded to the plant ground grid using grounded type insulated bushings, O. Z. Electrical Manufacturing Company, Type BLG or IGB; T & B Company; Appleton Electric Company, or equal.

D. Conduit across structural joints where structural movement is allowed shall have bonded, weathertight expansion and deflection fitting the same size as the conduit.

E. Support spacing for conduits 1 inch and smaller shall not exceed six feet, and conduits $1^{1}/_{4}$ inches and larger shall not exceed 10 feet. Supports shall be cadmium-plated steel or galvanized iron. Conduits $1^{1}/_{2}$ inch and smaller may be supported by one-hole conduit straps and 2 inch and larger shall be supported by two-hole conduit straps. Conduit racks shall be as manufactured by Unistrut, Kindorf, or equal.

F. Conduit joints shall be made up tight using a pipe wrench. Channel lock pliers will not be permitted, and unions shall be used as necessary to aid in the installation. Conduits shall be cut square and the ends reamed smooth after threading to prevent injury to conductors. Conduit

joints in concrete or exposed to weather or damp locations shall be drawn up tight and coated with insulating paint before casting in concrete or painting exposed conduit system.

3.3 INSTALLATION OF RIGID NONMETALLIC CONDUIT

A. Field bending of polyvinyl chloride conduit shall be made with appropriate equipment. No torches or flame-type devices shall be used.

B. When joints are to be made with polyvinyl chloride conduit, the conduit shall be cut with a fine-tooth saw and deburred. Conduit ends shall be wiped clean of dust, dirt, and shavings and shall be dry. A solvent cement shall be applied to bond the joint. The joint should be watertight.

C. Polyvinyl chloride conduit shall be installed in accordance with the manufacturers' specifications and recommendations.

3.4 INSTALLATION OF LIQUID-TIGHT FLEXIBLE METAL CONDUIT

A. Terminations at motors shall be made with flexible liquid-tight metal conduit from conduit stub to terminal box; flexible connection shall be made as short as possible. Flexible conduit shall be Type UA, black. Underwriter's Laboratories approved flexible liquid-tight conduit connectors shall be as manufactured by Thomas and Betts Company, Appleton Electric Company, or equal.

B. Uncoated flexible metal conduit may be used for short connections between junction boxes and lighting fixtures or speakers installed in suspended ceiling systems. Flexible metal conduit shall be connected using Underwriters Laboratories approved grounding connectors.

3.5 INSTALLATION OF PLASTIC-COATED RIGID METAL CONDUIT

A. Conduits shall be installed per manufacturer's recommendations.

B. Joints shall be drawn up tight using a strap wrench. Touch up any damage to the polyvinyl chloride coating with a liquid polyvinyl chloride patching compound.

C. Support spacings and spacers shall conform to Part 3.02 of this section.

3.6 INSTALLATION OF UNDERGROUND CONDUIT

A. All underground conduits shall be concrete-encased unless otherwise noted on the Drawings or directed by the Engineer. No conduit shall be concealed or encased until the Engineer has inspected the conduit for proper installation and accurate placement.

B. The Contractor shall be responsible for all excavating, draining, trenches forming of duct assembly and protective concrete envelope, backfilling, and removal of excess earth.

C. Underground conduit shall be installed with a minimum 3-inch per 100-foot downward slope for drainage. Drains shall be provided at all low points.

D. Bends and turns shall be made using long sweeps. Ninety-degree bends will be used only where required and shall be kept at a minimum.

E. Where rigid nonmetallic conduits emerge from underground, an adapter from rigid nonmetallic conduit to rigid metal conduit shall be installed and all exposed conduit shall be rigid metal conduit.

F. All rigid metal conduit risers shall be protected with two coats of a Bitumastic compound before concrete is poured from a point 12 inches below grade to a point not less than 6 inches above grade or surface of concrete. All stub-ups shall extend upward with one length of rigid metal conduit until after concrete is poured to assure vertical alignment.

G. Conduits shall be encased in concrete with 3-inch minimum concrete cover all around.

H. Concrete for concrete encasement shall be Class B concrete conforming with the requirements of the section entitled "Cast-In-Place Concrete," of these Specifications. Concrete on top of the encasement shall be dyed red by the addition of iron oxide or other suitable pigment for identification. Longitudinal and lateral steel reinforcement shall be provided as shown on the Drawings.

I. All underground conduit runs for voltages less than 600 volts shall be at least 24 inches below grade and shall have a minimum conduit separation of 3 inches.

J. All underground conduit runs for voltages over 600 volts shall be at least 36 inches below grade and shall have a minimum conduit separation of 6 inches. Conduit shall have a minimum 6-inch concrete cover on all sides.

K. All underground conduit runs shall be rodded and a mandrel drawn through followed by a swab to clean out any obstructions which may cause cable abrasions. The mandrel shall be 12 inches in length and the diameter $^1/_2$-inch less than the inside diameter of the conduit.

L. All underground conduit runs shall be marked by a strip of permanently-colored red polyethylene tape, 0.004 inch thick and 6 inches wide, buried above the conduit and 6 inches below finished grade.

M. Unless otherwise shown, at least 20 percent spare conduits, but not fewer than one, of each size required shall be provided with water-proof plugs at stub-ups and shall be furnished with No. 8 aluminum pulling wire.

END OF SECTION

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SECTION 16120

WIRE AND CABLE

PART 1 GENERAL

1.1 SCOPE

A. The work covered by this section includes furnishing all labor, equipment, and materials required to install, connect, and test all wire and cable, including splices, terminations, connectors, and accessories for a complete installation as shown on the Drawings and/or specified herein.

B. The Contractor's attention is directed to the fact that all wires and cables are not necessarily shown on the Drawings, which are more or less schematic. However, the Contractor shall be responsible for furnishing and installing all wire and cable indicated or required to properly connect and place into operation all equipment and services requiring such wiring and/or cable.

1.2 QUALITY ASSURANCE

A. Samples of all wire and cable, clearly marked and long enough to show complete identification, shall be submitted to the office of the Engineer for approval prior to wiring installation.

B. No defective or damaged wire and cable shall be incorporated into the work.

1.3 SIZING OF CONDUCTORS

A. Unless otherwise required or directed by the Engineer, conductors shall be furnished in the sizes shown on the Drawings. No wire for lighting, power, or motor control circuits shall be smaller than No. 12 AWG. Motor control circuits carrying less than eight amps may be No. 14 AWG. No wire for instrumentation and low-level signal transmission pairs shall be smaller than No. 16 AWG for single pairs or No. 20 AWG for bundled cable.

B. All wires and cables shall be of such size as to conform to the regulations of the current edition of the National Electrical Code for current carrying capacity where such regulations apply. Where such regulations do not apply, the wires and cables shall be of such size as to operate at a temperature which is safe for the insulation used, and the size shall be subject to the approval of the Engineer.

C. Where the size of lighting wiring is not given on the Drawings, it shall be of such size that the voltage drop from the main panel to the lighting panel is not more than one percent, and the drop in the branch circuit is not more than 2 percent. The voltage drop in motor feeder, when the wire size is not specified, shall not be more than 3 percent at full load from the Motor Control Center to the motor terminal.

1.4 SHOP DRAWINGS AND ENGINEERING DATA

Complete shop drawings and engineering data shall be submitted in accordance with the requirements of the section entitled "Submittals" of these Specifications.

1.5 STORAGE AND PROTECTION

A. Store and protect all wire and cable in accordance with the manufacturer's recommendations and the requirements of these Specifications.

B. Wire and cable shall be stored indoors in a dry and warm location and in its original packaging.

1.6 GUARANTEE

Provide a guarantee against defective materials and workmanship in accordance with the requirements of the section entitled "Guarantees and Warranties" of these Specifications.

PART 2 PRODUCTS

2.1 CONDUCTORS - GENERAL

A. Conductors shall be solid or Class B concentric stranded, soft or annealed, uncoated copper free from kinks and defects in accordance with ASTM B 3 or B 8.

B. Conductors should have a conductivity not less than 97 percent.

C. The wire and cable shall have size, grade of insulation, voltage, and manufacturer's name permanently marked on the outer covering at not more than 2-foot intervals.

D. All wires shall conform to the latest Standards of the ASTM and IPCEA and shall be tested for their full length by these standards.

E. Insulation thickness shall be not less than that specified by the latest revision of the National Electrical Code.

F. All control circuit wiring and all wiring No. 8 AWG and larger shall be stranded. Lighting branch circuits No. 12 and No. 10 AWG may be solid. Wiring shall be stranded as follows:
   1. No. 14 through No. 2 AWG shall have a minimum of 7 strands.
   2. No. 1 through No. 4/0 AWG shall have a minimum of 19 strands.
   3. No. 250 MCM through No. 500 MCM shall have a minimum of 37 strands.

G. All circuits except control and instrumentation circuits shall have a separate grounding conductor carried in the conduit.

2.2 CONDUCTORS FOR WIRE AND CABLE

A. For service entrance, motor branch, and feeder circuits operating at 240 and 480 volts, the conductors shall be a single-conductor, cable rated, 600 volts. The single-conductor cable shall consist of uncoated annealed copper, Class B stranded per ASTM B 8 and insulated with corona, ozone, heat and moisture resisting cross-linked polyethylene insulation rated to withstand a copper temperature of 75ºC, UL approved Type XHHW and shall be as manufactured by General Electric Company, Phelps Dodge Corporation, General Cable Corporation, Okonite Company or equal.

B. For general lighting and receptacle branch circuits operating at 115, 208 and 230 volts, the conductor shall be single-conductor cable rated 600 volts. The single-conductor shall be uncoated annealed copper. No. 12 and No. 10 AWG may be solid, or stranded; larger cables shall be stranded per ASTM B 8 and insulated with polyvinyl chloride insulation rated to withstand a copper temperature of 75°C, UL approved Type THWN, and shall be as manufactured by General Electric Company, Phelps Dodge Corporation, General Cable Corporation, Okonite Company, or equal.

C. For lighting fixture drop wire or for running in fluorescent units, the conductors shall be single-conductor cable rated 600 volts. The single conductor cable shall be stranded tinned copper with a 31 mil thick wall silicone insulation and a glass braid jacket overall rated to withstand a copper temperature of 150°C, Underwriter's approved silicone insulated fixture wire Type SFF-2, and shall be as manufactured by General Cable Corporation, General Electric Company, or equal.

D. For control circuits the conductors may be single or multi-conductor cable rated 600 volts. The conductors shall consist of uncoated annealed copper Class B stranded per ASTM B 8 and shall be No. 14 or No. 12 AWG, 7 strand, identified at each end using Brady wire markers B-500 vinyl cloth, Thomas and Betts "E-Z Code" wire markers, or equal.
   1. Single-conductor cable shall have 45-mil-thick wall of cross-linked polyethylene or polyvinyl chloride insulation, color red, to withstand a copper temperature of 75ºC, UL approved Type THHN-THWN, and shall be as manufactured by General Electric Company, Phelps Dodge, General Cable, Okonite, or equal.
   2. Multi-conductor cable shall consist of single-conductor cables rated 600 volts and insulated to withstand a copper temperature of 90°C cabled together to form a cable assembly which is UL approved for installation in conduit. The core shall be color coded in accordance with IPCEA, Method 1, with a plastic tape cover and a PVC or neoprene jacket overall.

E. Power and control tray cable shall consist of single-conductor cables rated 600 volts at 75°C conductor temperature cabled together to form a cable assembly that is UL listed as Type TC power and control tray cable. Individual conductors shall be copper stranded per ASTM B 8 and insulated with cross-linked polyethylene and UL listed as Type XHHW or THHN/THWN. Conductors shall be called together using flame and moisture resistant fillers and tape and shall be covered with a heavy PVC jacket that is resistant to sunlight, moisture, flame, and chemicals. Cable shall pass the UL Vertical Tray Flame Test No. 1277. Cable shall be approved for use in Class I, Division 2 hazardous locations and shall be suitable for

installation in trays or underground ducts, for aerial installation on messenger wire, and for direct burial.

1. Bare grounding conductor shall be Class A or B medium hard drawn, high conductivity bare copper, sized as shown on the Drawings. Conductors No. 6 AWG and smaller may be solid. Conductors No. 4 AWG and larger shall be stranded.
2. Flexible power cords shall be moisture-resistant, oil-resistant, neoprene-sheathed service cable designed for extra hard usage, Type SO, rated 600 volts at 75°C continuous conductor temperature. Flexible heater cords shall be moisture-resistant, oil-resistant, neoprene and cotton sheathed service cable designed for extra hard usage, Type HSO, rated 600 volts at 75°C continuous. Insulation shall be thermoplastic ethylene propylene conforming to IPCEA S-68-516. Neoprene shall conform to ASTM D 752. All flexible cords shall be UL listed.

2.3 INSTRUMENTATION AND THERMOCOUPLE EXTENSION WIRING

A. Instrumentation and low level DC signal wiring shall be shielded, twisted pair conductors. Single twisted pairs shall consist of two, Class B stranded, No. 16 AWG annealed copper conductors, one white and one black, with 15 mils of PVC insulation rated for 300 volts and 75ºC minimum continuous conductor temperature. Pairs shall be twisted to a lay of 1.5 to 2.5 inches. A 0.35 mil by 0.50 mil aluminum-mylar tape shield with stranded, bare No. 18 AWG, tinned copper drain wire in contact with the aluminum side of the shield shall be applied helically around the twisted pair. An overall jacket of 75°C black PVC at least 30 mils in thickness shall be applied to the outside. Shield coverage shall be full 100 percent. All instrumentation wiring shall be UL listed.

B. Bundled pair cable shall consist of multiple, individually-shielded, numbered twisted pairs as described above except that conductors and individual shield drain wires shall be No. 20 AWG and No. 22 AWG, respectively. Cable bundle shall include a stranded, No. 22 AWG, copper communication wire with 15-mil PVC insulation continuously rated for 75ºC. Flame-retardant, non-wicking fillers shall be provided for rounding out cable. Bundled core shall be wrapped in a 2.35-mil aluminum mylar tape shield with a bare, stranded No. 20 AWG tinned-copper drain wire applied helically to the outside of the bundle. Cable assembly shall be jacketed with a minimum 50-mil thick black PVC jacket rated for a continuous temperature of not less than 75ºC. A rip cord shall be provided under the jacket for stripping. Instrumentation cable shall conform to the requirements of IPCEA S-61-402.

C. Thermocouple extension wire shall be premium grade, consisting of a twisted shielded pair of No. 16 AWG solid conductors, one copper and one constantan, calibrated to ±2°F. Conductors shall be insulated with 15 mil PVC insulation rated 75°C continuous and shall conform to ANSI C 96.1. Pairs shall be twisted on a 2-inch lay and shall be color coded, one red (-) and one white (+). The twisted pair assembly shall be shielded with a full coverage wrap of aluminum-mylar tape with a bare No. 18 AWG tinned copper drain wire and shall be covered with a black PVC jacket. Cable shall conform to IPCEA S-61-402. Thermocouple wiring shall be isolated from all AC wiring by at least 12 inches and shall be run in rigid metal conduit.

2.4 AUDIO SIGNAL WIRING

Audio signal wiring for public address and sound systems shall be shielded, twisted pair instrumentation cable with two No. 16 AWG conductors constructed in accordance with the requirements of Part 2.3 of this section.

2.5 SPLICES AND TERMINATIONS

A. Splices, taps and attachment of fittings and lugs shall be electrically and mechanically secure, and approved solderless lugs and connectors shall be used. Lugs and connectors shall be top quality product of Burndy, O-Z, Thomas and Betts, or equal manufacturer. Conductors shall not bind at bushings. Lugs shall be of the correct sizes for the conductors joined and strands shall not be cut from a conductor.

B. Splices, taps, and terminations of cable rate 600 volts and less requiring tape shall be half lap and at least three layers. Taping shall be neatly done and form a permanent insulation equal in mechanical and electrical strength to the insulation of the conductor. Taping shall be as follows:
   1. Rubber Insulation
      a. Inner Layer: Okonite Rubber Tape, 3M "Scotchfil" Electrical Insulation Putty, Plymouth "Plysafe" Tape, or equal.
      b. Outer Layer: 3M "Scotch No. 88" Tape, Permacel No. 295 Tape, Slipknot Grey Tape, or equal.
   2. Thermoplastic Insulation: 3M "Scotch No. 88" Tape, Permacel No. 295 Tape, Slipknot Grey Tape, or equal.

   Terminations at motor junction boxes shall be sealed with 3M "Scotchkote" electrical coating over the outer layer of tape. All splices 600 volts and less in No. 8 AWG and larger sizes shall be made using approved bolted connectors properly taped as specified herein.

C. For No. 10 AWG and smaller branch circuit and fixture conductors operating at 277 volts or less, live spring pressure connectors rated for 600 volts may be used for splices and junctions. When installed in a fixture, connectors shall be rated for 1,000 volts.

2.6 GROUND RODS

A. Ground rods shall be Copperweld, sectional type. Ground rods shall be UL listed and REA approved and shall conform to ANSI C33.8.

B. Connections between grounding conductors and grounding rods shall be mechanical if above ground, thermal if underground.

PART 3 EXECUTION

3.1 INSTALLATION

A. All interconnecting wiring shall be installed in approved conduit or cable trays and connected as shown on the Drawings and/or specified herein. Unless otherwise shown or specified, all wiring shall be run in conduit.

B. Each instrumentation wiring conduit shall include at least 20 percent spare installed conductors. Each control wiring conduit shall include at least 20 percent spare installed conductors.

C. Unless otherwise shown on the Drawings, wiring shall be run by the most direct route keeping overall circuit length to a minimum.

D. Instrumentation and low level signal wiring shall not be located in the same conduit as motor wiring, feeder wiring, branch circuit wiring, or control wiring. Control wiring shall not be located in the same conduit as motor wiring, feeder wiring, or instrumentation wiring.

E. All control and circuit wiring in cabinets, boxes, gutters, etc. shall be neatly tied and held using nylon cable ties and mounting brackets.

F. After installation, conductors shall not have dents, scars, cuts, pressure indentations, abraded areas, etc.

G. Conductors 600 volts and below shall not be bent to a radius less than 12 times the cable diameter.

H. Wiring run in metallic conduits shall be arranged such that there are an equal number of conductors of each phase in each conduit. Under no circumstances shall metallic conduits contain one single conductor or several conductors of only one phase. This requirement shall not apply to single, bare grounding conductors run in conduit to grounding rods or grids.

I. Conductors may be coated with talc, soapstone, Ideal "Yellow 77" or "Wire Lube", Electro-Compound "Y-ER EAS," or equal, to facilitate pulling into raceways, but in no case may they be greased or coated with any substance injurious to conductor insulation and strongest component of conductors, normally the metallic conductors themselves and not on the insulation jacket. When installing cable in conduit with pulling eye attached to copper conductor, the tension shall not exceed 0.008 pound per circular mil area of the conductor not 5,000 pounds, whichever is smaller. When a basket grip is used over the outer jacket of the cable, the maximum pulling tension shall not exceed 0.008 pound per circular mil area of the conductor not 1,000 pounds, whichever is smaller. In no case shall pulling tensions recommended by the wire manufacturer be exceeded. The maximum sidewall pressure exerted on the insulation and sheath at a cable bend shall not exceed 300 pounds per foot of conduit bending radius. Conductors shall not be pulled "through" any outlet, condulet or box. Separate "pulls" shall be made on each side of such point.

J. Unless otherwise specified, splices shall be made at outlet or conduit boxes, pull or junction boxes, manholes, or vaults. No splice shall be drawn into a conduit. Splices in wiring rated 600 volts and below shall be made with enough spare wire for two splices to be remade with the wire at the same location.

K. All instrumentation wire shields shall be grounded. Shields on individual circuits shall be electrically continuous and shall be grounded at only one point in the circuit.

L. Surge Protectors shall be installed with the shortest line lead possible, but in no case longer than 18 inches.

M. All conductors are to be identified. Branch circuits, motor feeders, and lightning wiring shall be identified by color coding as follows:

	277/480V	12/208/240V
Phase A	Brown	Black
Phase B	Orange	Red
Phase C	Yellow	Blue
Neutral	Gray	White
Ground	Bare	Bare or Green

The color coding on No. 8 AWG and smaller conductors shall be continuous in length. No taping, painting or other means of coding will be acceptable. Conductors No. 6 AWG and larger and conductors operating above 600 volts shall be black with color coded tape visible at each point of access or view.

N. Conductors used for temporary construction power shall not be used for the permanent installation, and the permanent conductor system shall not be used for construction power unless authorized in writing by the Engineer. Circuit protective devices shall never be temporarily bypassed.

O. The grounding system equivalent resistance shall not exceed 10 Ohms for the entire system. After the grounding system has been installed and all connections made, tests shall be made by the Contractor to determine the resistance to earth. If the resistance of the entire system exceeds 10 Ohms, additional ground rods shall be driven to reduce the resistance to this value.

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SECTION 16450

GROUNDING

PART 1 GENERAL

1.1 STANDARDS

All electrical systems shall be grounded in accordance with the National Electrical Code, Local Codes, these Specifications and the contract drawings.

PART 2 PRODUCTS

2.1 CABLE AND EQUIPMENT

A. Use green colored and bare stranded copper conductors.

B. Use approved ground clamp manufactured for such purpose.

C. Use approved grounding electrodes and rod.

D. Make permanent ground connection with thermoweld method.

PART 3 EXECUTION

3.1 GENERAL

A. In general, alternating current circuits of 600 volts and below, surge suppressors, conductor raceway systems, and platform steel framework shall be effectively and permanently connected to a grounding system by means of copper conductors having cross section as required by the National Electrical Code and of capacity sufficient to ensure continuity and continued effectiveness of the ground connections under conditions of excess current. If some of the equipment to be grounded is not covered herein by detailed instructions or is not shown completely and clearly on the Drawings, such provisions of the National Electrical Code as may apply are to be considered minimum requirements for the work.

B. All metallic conduit systems, whether used for power or lighting wiring, shall be installed in such a manner as to produce electrical continuity and shall be bound together at one or more points and connected to the building system ground, except that isolated sections of conduit not exceeding 4 feet in length are not to be grounded or bonded unless specifically called for.

C. Rigid metal conduit systems made up with fittings, boxes, and apparatus housings having fully-threaded hubs need no additional provisions for continuity of ground. If the conduit system contains cutouts, pull boxes, junction boxes, switchboxes, etc., to which the conduit is fastened by means of locknuts and bushings, such interruptions in the grounding continuity shall be eliminated by bonding the conduit to the housings or by separately grounding each

box and conduit sections, etc., that are so isolated. Grounding wedge lugs shall be used between all bushing and metal boxes. Paint and other nonconducting material shall be removed from the surface of conduit, fittings, and metal housings prior to connecting grounding clamps, straps, or other devices.

D. Equipment Grounding: Panel, starters, lighting fixtures, motor control center, etc., for power and lighting constitute the fundamental center of the associated distribution systems. As such, the metallic enclosures, frames, and other noncurrent carrying metal parts of this equipment shall be connected by one or more grounding conductors to the grounding system. Install a ground connection from the ground bus of switchgears, MCCs, and other electrical panels with ground bus to the ground grid.

E. All motor frames shall be grounded. The ground conductor shall be run inside the conduit containing the power conductors. In the case of most 3-phase circuits, this means a fourth conductor in each branch circuit. The grounding conductor may be as large as the power conductor or as small as allowed by Section 250 of the NEC but shall not be smaller than No. 12 AWG. The grounding conductor shall be stranded, with green insulation through No. 4 AWG; larger sizes may be bare stranded. Ground connection at the motor shall be terminal lug or servit post inside motor conduit box and the other end connected to the ground bus in the motor control center.

F. Transformer Grounding: Bond the neutrals of distribution transformers to system ground network, and any additional grounding electrodes shown near the transformers. Connect the case of the transformer to the grounding system as well.

G. In making ground connections, the surfaces to all parts that will touch shall be thoroughly cleaned to ensure making good electrical contacts.

H. All clamped joints shall be made up firmly. Thermal joints shall be equal to Caldwell Type TA. Where exposed to mechanical injury, the grounding conductor shall be suitably protected by pipe or other substantial guard. If guards are iron pipe or other magnetic material, the grounding conductor shall be electrically connected to both ends of the guard to reduce impedance of the circuit.

I. Grounding conductors shall be without splice or joint if applicable and shall be straight and short except that when laid underground they shall be laid slack to prevent their being readily broken unless otherwise mechanically protected.

J. No fuse, switch, circuit breaker, or similar disconnecting devices shall be inserted in the grounding conductor or connection throughout the entire installation.

K. Grounding conductors shall be medium hard drawn, stranded bare copper wire sized as required by the National Electrical Code Article 250. Conductors Size No. 6 and smaller may be solid; Size No. 4 and larger shall be stranded. Ground wire shall be carried in conduit to the grounding point.

L. Ground rods where required, shall be of copper-clad steel not less than $^{3}/_{4}$-inch in diameter, 10 feet long or as shown on the Contract Drawings, and driven full length into the earth. The

maximum resistance of a single driven ground shall not exceed 5 ohms under normally dry conditions. If this resistance cannot be obtained with a single rod, a minimum of 2 additional rods shall be installed not less than 10 feet on center. Connections between grounding conductors and ground rods shall be mechanical if exposed, thermal if buried.

M. Except where specifically indicated otherwise, all exposed noncurrent-carrying metallic parts of electrical equipment, raceway systems, and neutral conductor of the wiring system shall be grounded. The ground connection shall be made at the main service equipment and shall be extended to driven rods on the exterior of the building.

N. All neutral conductor shall be continuous throughout the system and shall be grounded only at the point of origin of the service neutral.

O. All receptacles shall have provision for grounding conductor connection, and shall be grounded to the grounding conductor and outlet box.

P. All exposed steel columns, tanks, ladders, and elevated platform shall be effectively grounded using No. 2/0 or larger bare copper grounding conductors and driven ground rods. Where multiple columns or tanks must be grounded, ground points shall be interconnected by minimum No. 2/0 bare copper grounding conductors buried approximately 18 inches below finished grade.

Q. Anchor bolts securing exposed electrical equipment, structures, metal enclosures, and tanks located outdoors shall be electrically connected to the steel reinforcement in the concrete foundation or footing. Connection shall consist of minimum No. 2/0 bare copper conductors and mechanical grounding clamps.

R. Surge arrestor ground terminals shall be connected to the equipment ground bus. Ground paths for lightning and surge arresters and capacitors shall be kept as short and direct as practical. If possible, arresters shall be connected in direct shunt relationship to the equipment terminals. Supporting brackets shall be connected directly to the equipment frame.

S. Lightning and surge arresters used with grounded-wye systems which do not have effectively grounded neutrals as defined by IEEE Standard 100 shall have a voltage rating not less than the maximum phase-to-phase voltage of the system.

T. The grounding system equivalent resistance shall not exceed 5 ohms for the entire system under normally dry conditions unless otherwise specified. After the grounding system has been installed and all connections made, tests shall be made by the Electrical Contractor to determine the resistance to earth. If the resistance of the entire system exceeds the specified maximum, additional ground rods shall be driven to reduce the resistance to this value.

U. Gas piping or piping conveying flammable liquids shall not be used as grounding electrodes.

V. The use of salts or electrolytes to reduce earth resistance shall not be permitted.

W. Permanently connect the green ground conductor to each receptacle junction box (self-tapping screw).

X. Install a ground rod inside each manhole. Connect any metallic raceway and all noncurrent-carrying metal parts to the ground rod with a No. 6 AWG (min.) copper conductor. Similarly, provide a ground rod for every pole-mounted site lighting and make grounding connections.

Y. Ground metallic fences when used to enclose electrical equipment.

END OF SECTION

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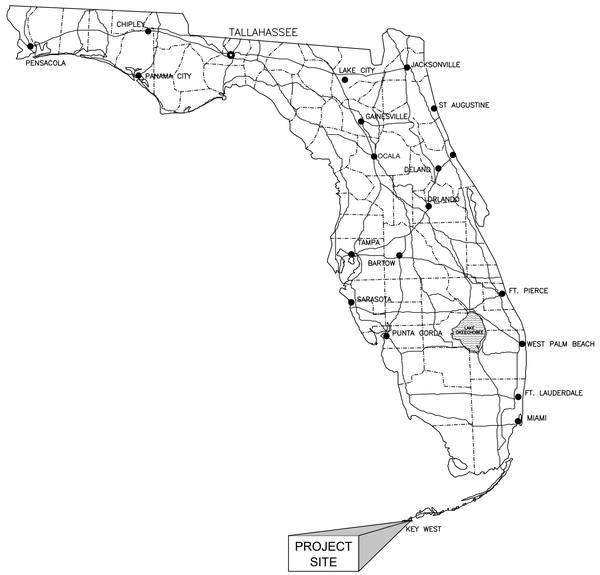
CONSTRUCTION PLANS

FOR

BLOWER & ELECTRICAL UPGRADES

KW RESORT UTILITIES

SECTION 35, TOWNSHIP 67 SOUTH, RANGE 25 EAST
STOCK ISLAND, FLORIDA



STATE OF FLORIDA LOCATION MAP

NOT TO SCALE

OWNER

KW RESORT UTILITES CORP

6630 FRONT ST.
STOCK ISLAND FL, 33040

PREPARED BY

THE WEILER ENGINEERING CORPORATION

6805 OVERSEAS HWY
MARATHON, FLORIDA 33050
PHONE - 305-289-4161

INDEX OF DRAWINGS

FOR BIDDING PURPOSES

Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

PRE-BID SUBMITTAL

THE CONTRACTOR SHALL VISIT THE PROJECT SITE PRIOR TO CONSTRUCTION TO FAMILIARIZE HIMSELF WITH THE CONDITIONS FOR CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL OBTAIN FROM THE OWNER A WRITTEN LIST OF ALL PERMITS AND COPIES THEREOF, AND CAREFULLY REVIEW ALL PLANS, SPECIFICATIONS, AND PERMITS PREVIOUSLY SECURED ON BEHALF OF THE OWNER. IN CASE OF ANY DISCREPANCY EITHER IN PERMIT DOCUMENTS, PLANS, DRAWINGS, OR SPECIFICATIONS, THE CONTRACTOR MUST PROMPTLY SUBMIT A "WRITTEN CLARIFICATION REQUEST" TO THE OWNER, WHO WILL PROMPTLY FORWARD SAME TO THE ENGINEER WHO WILL MAKE A DETERMINATION IN WRITING. THE CONTRACTOR MUST VERIFY EXISTING FACILITY INFORMATION, AND ALL DESIGN/PERMIT DATA REQUIRED FOR WORK THAT IS TO CONNECT WITH EXISTING FACILITIES. ANY DISCREPANCIES BETWEEN THE CONTRACT REQUIREMENTS AND THE EXISTING CONDITIONS MUST BE REFERRED TO THE OWNER, IN WRITING, FOR AN ENGINEERING DETERMINATION. ANY FUTURE ADJUSTMENT DUE TO FAILURE BY THE CONTRACTOR TO IDENTIFY THE RELATED DISCREPANCY, WILL BE AT THE CONTRACTOR'S EXPENSE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ANY LICENSES ADDITIONAL PERMITS, AND FOR COMPLYING WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL LAWS, CODES, AND REGULATIONS IN CONNECTION WITH THE PERFORMANCE OF THE WORK.

CONSTRUCTION SAFETY AND LIABILITY

THE CONTRACTOR MUST TAKE PROPER SAFETY AND HEALTH PRECAUTIONS TO PROTECT THE WORK, THE WORKERS, THE PUBLIC, AND THE PROPERTY OF OTHERS. THE CONTRACTOR IS RESPONSIBLE ALSO FOR ALL MATERIALS DELIVERED AND WORK PERFORMED UNTIL COMPLETION AND ALL ACCEPTANCES HAVE BEEN OBTAINED. THE CONTRACTOR IS RESPONSIBLE FOR ALL DAMAGE TO PERSONS OR PROPERTY THAT OCCURS AS A RESULT OF HIS NEGLIGENCE. THE CONTRACTOR MUST SAVE HARMLESS AND INDEMNIFY THE OWNER AND THE ENGINEER OF RECORD, ITS OFFICERS, REPRESENTATIVES AND EMPLOYEES FROM ALL CLAIMS, LOSS, DAMAGE, ACTIONS, CAUSES OF ACTION, AND/OR EXPENSES RESULTING FROM, BROUGHT FOR, OR ON ACCOUNT OF ANY PERSONAL INJURY OR PROPERTY DAMAGE RECEIVED OR SUSTAINED BY ANY PERSONS OR PROPERTY GROWING OUT OF OCCURRING, OR ATTRIBUTABLE TO ANY WORK PERFORMED UNDER OR RELATED TO THIS CONTRACT, RESULTING IN WHOLE OR IN PART FROM THE NEGLIGENT ACTS OR OMISSIONS OF THE CONTRACTOR, ANY SUBCONTRACTOR, OR ANY EMPLOYEE, AGENT, OR REPRESENTATIVE OF THE CONTRACTOR OR ANY SUBCONTRACTOR.

PRE-CONSTRUCTION

THE OWNER SHALL SECURE PRIOR TO CONSTRUCTION A PROFESSIONAL LAND SURVEYOR TO PERFORM AN "AS-BUILT" SURVEY OF ALL COMPLETED IMPROVEMENTS. THE OWNER SHALL ALSO SECURE PRIOR TO CONSTRUCTION A PROFESSIONAL ENGINEER TO PROVIDE THE APPROPRIATE SERVICES NEEDED IN ORDER TO CERTIFY TO ALL APPLICABLE REGULATORY AGENCIES THAT THE IMPROVEMENTS WERE CONSTRUCTED IN SUBSTANTIAL COMPLIANCE WITH ALL APPLICABLE PERMITS AND APPROVALS. THE OWNER SHALL COORDINATE A PRE-CONSTRUCTION MEETING WITH THE ENGINEER, SURVEYOR, CONTRACTOR, TESTING LAB, UTILITY COMPANIES, AND APPROPRIATE REGULATORY AGENCIES. THE CONTRACTOR SHALL PROVIDE A SHOP DRAWING SUBMISSION SCHEDULE FOR ALL PROJECT MATERIALS AND COMPONENTS. THE CONTRACTOR SHALL NOT INITIATE CONSTRUCTION OF ANY PORTION OF THE IMPROVEMENTS UNTIL THE SHOP DRAWINGS HAVE BEEN REVIEWED AND APPROVED FOR THAT PORTION BY THE ENGINEER. THE OWNER, CONTRACTOR, ENGINEER AND UTILITY COMPANY SHALL ALSO DISCUSS ALL DOCUMENTATION REQUIRED FOR CONTRIBUTED FACILITIES TRANSFER FROM THE OWNER/DEVELOPER TO THE UTILITY COMPANY UPON PROJECT COMPLETION, UNLESS OTHERWISE SPECIFIED BY THE UTILITY COMPANY, THE FOLLOWING DOCUMENTS SHALL BE PROVIDED:

1. UTILITY EASEMENT(S): MUST BE RECORDED AT COUNTY CLERK OF COURT OFFICE BEFORE SUBMITTING TO UTILITY.
2. EASEMENT ACKNOWLEDGMENT.
3. AFFIDAVIT.
4. RELEASE OF LIEN.
5. BILL OF SALE.
6. ASSIGNMENT OF RIGHTS UNDER UTILITY AGREEMENT: WHEN PROPERTY HAS BEEN TRANSFERRED TO A NEW OWNER.
7. RECORD DRAWINGS (AS-BUILT): MUST BE SIGNED AND SEALED BY ENGINEER OF RECORD, SUBMIT A REPRODUCIBLE MYLAR AND TWO COPIES OF PRINTS.
8. DETAILED COST OF CONSTRUCTION: MUST INCLUDE INDIVIDUAL ITEMS OR APPURTENANCES, UNIT COST AND TOTAL COST OF EACH. DO NOT INCLUDE WATER SERVICE LINES OR SEWER LATERALS.
9. DESCRIPTION OF FACILITIES: A SHORT EXPLANATION DEPICTING WHAT HAS BEEN CONSTRUCTED.
10. D.E.P. APPLICATION(S).
11. INSPECTION REPORT(S).
12. PRESSURE TEST REPORT(S).
13. INFILTRATION-EXFILTRATION TEST REPORT(S), INCLUDING VIDEO TAPES AND LAMPING REPORTS.
14. LIFT STATION INSPECTION (START-UP) REPORT(S) AND EQUIPMENT SHOP DRAWINGS.
15. BACTERIOLOGICAL TEST REPORT(S).
16. ENGINEER'S CERTIFICATE OF SUBSTANTIAL COMPLETION TO D.E.P.
17. SYSTEM(S) ACCEPTANCE LETTER(S) FROM D.E.P. NOTES: ITEM 1-6 & 8 TO BE SUPPLIED BY OWNER. ITEMS 7 & 9-17 TO BE SUPPLIED BY ENGINEER OF RECORD.

UNLESS OTHERWISE SPECIFIED BY THE UTILITY, THE CONTRACTOR SHALL NOTIFY THE SUPERINTENDENTS OF THE WATER, GAS, SEWER, TELEPHONE, AND POWER COMPANIES, 10 DAYS IN ADVANCE, THAT HE INTENDS TO START WORK IN A SPECIFIC AREA, THE OWNER AND ENGINEER DISCLAIM ANY RESPONSIBILITY FOR THE SUPPORT AND PROTECTION OF SEWERS, DRAINS, WATER LINES, GAS LINES, CONDUITS OF ANY KIND, UTILITIES OR OTHER STRUCTURES OWNED BY THE CITY, COUNTY, STATE OR BY PRIVATE OR PUBLIC UTILITIES LEGALLY OCCUPYING ANY STREET, ALLEY, PUBLIC PLACE, RIGHT-OF-WAY, OR EASEMENT.

PROJECT SIGN

THE CONTRACTOR SHALL PROVIDE AND MAINTAIN A CONSTRUCTION PROJECT SIGN AT A LOCATION DIRECTED BY THE OWNER. THE WEILER ENGINEERING CORPORATION SHALL PROVIDE A SEPARATE SIGN FOR INSTALLATION BY THE CONTRACTOR AT THIS LOCATION. THESE SIGNS SHALL BE ERECTED WITHIN 15 DAYS AFTER RECEIVING A NOTICE TO PROCEED. UPON PROJECT COMPLETION, THE CONTRACTOR SHALL REMOVE THESE SIGNS AND RETURN TO WEILER ENGINEERING CORPORATION THEIR SIGN.

ENVIRONMENTAL PROTECTION DURING CONSTRUCTION

PROTECTION OF LAND RESOURCES - EXCEPT IN AREAS IDENTIFIED ON THE PLANS TO BE CLEARED, THE CONTRACTOR MUST NOT DEFACE, INJURE, OR DESTROY TREES OR SHRUBS OR REMOVE OR CUT THEM WITHOUT WRITTEN AUTHORIZATION FROM THE OWNER. IN THE ABSENCE OF A CLEARING PLAN, AREAS SHOWN FOR IMPROVEMENTS SHALL BE CLEARED UNLESS NOTED OTHERWISE.

PROTECTION OF WATER RESOURCES - IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO INVESTIGATE AND COMPLY WITH ALL APPLICABLE FEDERAL, STATE, REGIONAL COUNTY AND MUNICIPAL LAWS CONCERNING POLLUTION OF WATER RESOURCES. ALL WORK MUST BE PERFORMED IN SUCH A MANNER THAT OBJECTIONABLE CONDITIONS WILL NOT BE CREATED IN PUBLIC WATERS RUNNING THROUGH, OR ADJACENT TO THE PROJECT AREA.

1. EROSION AND SEDIMENT CONTROL - ALL PRACTICABLE AND NECESSARY EFFORT SHOULD BE TAKEN DURING CONSTRUCTION TO CONTROL AND PREVENT EROSION AND THE TRANSPORT OF SEDIMENT TO SURFACE DRAINS, SURFACE WATER, OR ONTO OTHER PROPERTY BY ANY OR ALL OF THE FOLLOWING METHODS:
   A. STORMWATER FACILITIES ARE TO BE BUILT AS EARLY IN THE CONSTRUCTION PHASE AS POSSIBLE TO ENSURE THE TREATMENT OF STORMWATER RUNOFF. TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES, HOWEVER, SUCH AS BERMS, SEDIMENT BASINS, GRASSING, SODDING, SAND BAGGING, BALED HAY OR STRAW, FLOATING SILT, BARRIERS, STACKED SILT BARRIERS, ETC., MUST BE PROVIDED AND MAINTAINED UNTIL THE PERMANENT FACILITIES ARE COMPLETED AND OPERATIONAL.
   B. REVEGETATION AND STABILIZATION OF DISTURBED GROUND SURFACES SHOULD BE ACCOMPLISHED AS SOON AS POSSIBLE.
   C. FULL COMPACTION OF ANY FILL MATERIAL PLACED AROUND NEWLY INSTALLED STRUCTURES.
   D. PROHIBIT THE USE OF ANY CONSTRUCTION EQUIPMENT THAT LEAKS EXCESSIVE AMOUNTS OF FUEL OIL, OR HYDRAULIC FLUID.
2. ALL DISTURBED AREAS SHALL BE GRADED FOR POSITIVE DRAINAGE, EXCEPT RETENTION AREAS, AND SHALL BE STABILIZED BY SODDING, EXCEPT WHERE SEEDING AND MULCHING ARE CALLED FOR ON THE PLANS. THE LATEST VERSION OF THE F.D.O.T. ROAD AND BRIDGE SPECIFICATIONS SHALL BE USED UNLESS MORE RESTRICTIVE LOCAL SPECIFICATIONS EXIST.

CONTRACTOR RESPONSIBLE FOR STABILIZING AND MAINTAINING SLOPES AND SOD THROUGHOUT CONSTRUCTION UNTIL SUCH TIME AS APPROVED BY THE ENGINEER.

PROTECTION OF FISH AND WILDLIFE

THE CONTRACTOR MUST AT ALL TIMES PERFORM ALL WORK IN A WAY AND TAKE SUCH STEPS AS REQUIRED TO PREVENT ANY INTERFERENCE WITH OR DISTURBANCE TO FISH AND WILDLIFE. THE CONTRACTOR SHALL NOT ALTER WATER FLOWS OR OTHERWISE DISTURB NATIVE HABITATS AND JURISDICTIONAL WETLANDS LOCATED WITHIN AND/OR ADJACENT TO THE PROJECT AREA.

RECORDING AND PRESERVING HISTORICAL AND ARCHEOLOGICAL FINDS

ALL ITEMS HAVING ANY APPARENT HISTORICAL OR ARCHEOLOGICAL INTEREST THAT ARE DISCOVERED IN THE COURSE OF ANY CONSTRUCTION ACTIVITIES MUST BE CAREFULLY PRESERVED. THE CONTRACTOR MUST LEAVE THE ARCHEOLOGICAL FIND UNDISTURBED AND MUST IMMEDIATELY REPORT THE FIND TO THE OWNER SO THAT THE PROPER AUTHORITY MAY BE NOTIFIED.

EARTHWORK

I. GENERAL

1.01 SUBMITTALS
- A. EROSION AND CONTROL MEASURES
- B. COMPACTION TESTS
- C. SOIL CLASSIFICATION TESTS
- D. PRESERVATION PLANS

1-02 SITE EXAMINATION
- A. CONTRACTORS, BEFORE SUBMITTING BIDS, SHALL INFORM THEMSELVES AS TO LOCATION AND NATURE OF THE WORK, CHARACTER OF EQUIPMENT AND FACILITIES NEEDED FOR PERFORMANCE OF THE WORK, GENERAL AND LOCAL CONDITIONS PREVAILING AT THE SITE, AND OTHER MATTERS WHICH MAY IN ANY WAY, AFFECT THE WORK UNDER CONTRACT.
- B. EXAMINE SOURCES OF INFORMATION CONCERNING GROUND WATER LEVEL, WHETHER SURFACE OR SUBSURFACE. EACH BIDDER TO DRAW HIS OWN CONCLUSION CONCERNING GROUND WATER LEVELS AND HOW WATER AFFECTS HIS WORK.

1-03 SUBSURFACE INVESTIGATIONS
- A. SUBSURFACE DATA, INCLUDING GROUND WATER ELEVATIONS OR CONDITIONS, IF SHOWN ON THE DRAWINGS OR ATTACHED TO THESE SPECIFICATIONS, ARE PRESENTED ONLY AS INFORMATION THAT IS AVAILABLE WHICH INDICATED CERTAIN CONDITIONS FOUND AND LIMITED TO THE EXACT LOCATIONS, SHALL NOT BE INTERPRETED AS AN INDICATION OF CONDITIONS THAT MAY ACTUALLY BE DEVELOPED THROUGH THE PERIOD OF CONSTRUCTION. BIDDERS SHALL EXAMINE THE SITE OF THE WORK AND MAKE THEIR OWN DETERMINATION OF THE CHARACTER OF MATERIALS AND THE CONDITIONS TO BE ENCOUNTERED ON THE WORK, AND THEIR PROPOSAL SHALL BE BASED UPON THEIR OWN INVESTIGATIONS. THE OWNER AND ENGINEER SHALL NOT BE HELD RESPONSIBLE FOR VARIATIONS FOUND TO EXIST BETWEEN THE ATTACHED DATA ABOVE REFERRED TO AND ACTUAL FIELD CONDITIONS THAT DEVELOP THROUGH THE PERIOD OF CONSTRUCTION.
- B. WHERE EXISTING GRADES, UTILITY LINES AND SUBSTRUCTURES ARE SHOWN ON THE DRAWINGS, THE OWNER AND ENGINEER ASSUME NO RESPONSIBILITY FOR CORRECTNESS OF EXISTING CONDITIONS INDICATED. THE CONTRACTOR SHALL ASCERTAIN EXACT LOCATIONS OF UTILITIES AND SUBSTRUCTURES THAT MAY BE AFFECTED BY THIS PROJECT, AND SHALL BE RESPONSIBLE FOR ANY DAMAGE OR INJURY THAT MAY RESULT FROM WORKING ON OR NEAR THOSE UTILITIES, SUBSTRUCTURES WHICH ARE NOT TO BE REMOVED OR DEMOLISHED.
- C. THE CONTRACTOR SHALL MAKE HIS OWN DEDUCTIONS OF THE SUBSURFACE CONDITIONS WHICH MAY AFFECT METHODS OR COST OF CONSTRUCTION AND HE AGREES THAT HE WILL MAKE NO CLAIM FOR DAMAGES OR OTHER COMPENSATION EXCEPT SUCH AS ARE PROVIDED FOR IN THE AGREEMENT, SHOULD HE FIND CONDITIONS DURING THE PROGRESS OF THE WORK DIFFERENT FROM THOSE AS CALCULATED OR ANTICIPATED BY HIM.

1-04 BENCH MARKS AND MONUMENTS
- A. MAINTAIN CAREFULLY EXISTING BENCH MARKS, MONUMENTS, AND OTHER REFERENCE POINTS IF DISTURBED OR DESTROYED, REPLACE AS DIRECTED.

1-05 JOB CONDITIONS
- A. CONDITION OF PREMISES: ACCEPT SITE AS FOUND AND EXCAVATE, FILL, COMPACT, AND BACKFILL SITE AS HEREINAFTER SPECIFIED.

B. PROTECTION
1. EXISTING STRUCTURES AND PROPERTY: TAKE PRECAUTIONS TO GUARD AGAINST MOVEMENT OR SETTLEMENT OF ADJACENT STRUCTURES AND FACILITIES; PROVIDE AND PLACE BRACING OR SHORING AS NECESSARY OR PROPER IN CONNECTION THEREWITH; BE RESPONSIBLE FOR SAFETY AND SUPPORT OF SUCH STRUCTURES; BE LIABLE FOR ANY MOVEMENT OR SETTLEMENT, ANY DAMAGE OR INJURY CAUSED THEREBY OR RESULTING THEREFROM. IF AT ANY SAFETY OR ANY ADJACENT STRUCTURES APPEARS TO BE ENDANGERED, CEASE OPERATION, TAKE PRECAUTIONS TO SUPPORT SUCH STRUCTURES AND NOTIFY THE OWNER. RESUME OPERATIONS ONLY AFTER PERMISSION HAS BEEN CHANGED BY THE OWNER.
2. SIDEWALKS AND STREETS: TAKE PRECAUTIONS TO GUARD AGAINST MOVEMENT, SETTLEMENT OR COLLAPSE OF ANY SIDEWALKS, CURBS OR STREET PASSAGES ON ADJOINING SITE; BE LIABLE FOR ANY SUCH MOVEMENT, SETTLEMENT OR COLLAPSE; REPAIR PROMPTLY SUCH DAMAGE WHEN SO ORDERED; INSTALL SUCH SHORING, INCLUDING SHEET PILING, AS MAY BE REQUIRED DURING EXCAVATION, TO PROTECT BANKS, ADJACENT PAVING, STRUCTURES AND UTILITIES.
3. RESPONSIBILITY: BE RESPONSIBLE FOR ANY DAMAGE TO EXISTING STRUCTURES OR TO EQUIPMENT AND FURNISHINGS HOUSED THEREIN WHICH ARE DUE DIRECTLY OR INDIRECTLY TO CONSTRUCTION OPERATIONS, EXCEPT WHERE REMOVAL IS NECESSITATED BY SITE GRADING OR LOCATION OF NEW BUILDING. USE EVERY POSSIBLE PRECAUTION TO PREVENT INJURIES TO LANDSCAPING, DRIVES, CURBS AND WALKS ON OR ADJACENT TO SITE OF THE WORK AND REPLACE, AT NO EXPENSE TO OWNER, ANY OF SUCH DESTROYED.

II. EXECUTION

2-01 GENERAL
- A. ACCOMPLISH IN A MANNER THAT PROVIDES FOR THE SAFETY OF THE PUBLIC AND WORKMEN AND PROVIDE FOR THE PROTECTION OF ALL PROPERTY.
- B. CONSTRUCTION: DO NOT CLOSE, OBSTRUCT OR STORE MATERIAL OR EQUIPMENT IN STREETS, SIDEWALKS, ALLEYS OR PASSAGEWAYS WITHOUT A PERMIT IN ACCORDANCE WITH LOCAL ORDINANCES, REGULATIONS AND CODES.
- C. INTERFERENCE: CONDUCT OPERATIONS WITH MINIMUM INTERFERENCE WITH ROADS, STREETS, DRIVEWAYS, ALLEYS, SIDEWALKS AND OTHER FACILITIES.
- D. PNEUMATIC TOOLS: WORK WITH PNEUMATIC OR VIBRATORY TOOLS WILL BE PERMITTED ONLY IN A MANNER WHICH CAUSES NO RELATED DAMAGES.
- E. REMOVAL: UNLESS OTHERWISE NOTED OR SPECIFIED TO BE RELOCATED OR STORED, ALL MATERIALS REMOVED BECOME THE PROPERTY OF THE CONTRACTOR AND ARE TO BE REMOVED COMPLETELY AWAY FROM THE SITE BY HIM. DO NOT STORE OR PERMIT DEBRIS TO ACCUMULATE ON THE SITE.
- F. TEMPORARY STRUCTURES: REMOVE ALL TEMPORARY STRUCTURES WHEN THEY ARE NO LONGER REQUIRED.
- G. REPAIR: CLEAN UP, REPAIR OR REPLACE AT NO COST TO OWNER ALL PROPERTY DAMAGED BY REASON OF REQUIRED WORK. ALL PATCHWORK SHALL MATCH EXISTING AND BE PERFORMED IN A NEAT AND WORKMANLIKE MANNER BY CRAFTSMEN SKILLED IN THE TRADE INVOLVED. IN NEWLY GRADED AREAS TAKE EVERY PRECAUTION AND TEMPORARY MEASURE NECESSARY, TO PREVENT DAMAGE FROM EROSION OF FRESHLY GRADED AREA, WHERE ANY SETTLEMENT OR WASHING MAY OCCUR PRIOR TO ACCEPTANCE OF THE WORK, REPAIR AND RE-ESTABLISH GRADES TO THE REQUIRED ELEVATIONS AND SLOPES AT NO ADDITIONAL COST TO THE OWNER. THIS APPLIES TO DAMAGE TO THE NEWLY GRADED AREAS WITHIN THE CONSTRUCTION LIMITS AND DAMAGE TO ADJACENT PROPERTIES BY ERODED MATERIAL.

2-02 LOCATIONS AND ELEVATIONS
- A. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SURVEYS, MEASUREMENTS AND LAYOUTS REQUIRED FOR PROPER EXECUTION OF THE WORK. LAY OUT LINES AND GRADES FROM EXISTING SURVEY CONTROL SYSTEM AND AS SHOWN ON DRAWINGS.

2-03 CLEARING AND GRUBBING
- A. WITHIN LIMITS OF AREAS DESIGNATED FOR GRADING AND SITE CONSTRUCTION WORK, REMOVE TREES, BRUSH, STUMPS, WOOD, DEBRIS AND OTHER DELETERIOUS MATERIALS NOT REQUIRED TO REMAIN AS PART OF FINISHED WORK.
- B. REMOVE ALL GRASS, PLANTS, VEGETATION AND ORGANIC MATERIAL FROM SAME AREA.

2-04 STRIPING
- A. STRIP ALL TOPSOIL ORGANIC MATERIAL SURFACE LITTER, RUBBLE, AND OVERBURDEN FOR ENTIRE DEPTH OF ROOT SYSTEM OF GRASS OR OTHER VEGETATION OVER THE LIMITS OF CONSTRUCTION.
- B. STOCKPILE TOPSOIL ON SITE WHERE DIRECTED.

2-05 EXCAVATION
- A. BEGIN EXCAVATION AFTER STRIPPING, CLEARING AND GRUBBING WHERE APPLICABLE, HAS BEEN COMPLETED.
- B. EXCAVATE TO GRADES REQUIRED TO ACCOMMODATE THE PROPOSED CONSTRUCTION. DEWATER AS NEEDED.
- C. REMOVE "UNSATISFACTORY MATERIALS" ENCOUNTERED FROM THE BUILDING AREAS, AND OTHER NON-LANDSCAPED AREAS.
- D. EXCAVATE IN SUCH A MANNER THAT QUICK AND EFFICIENT DRAINAGE OF STORMWATER WILL BE AFFECTED.
- E. CLASSIFY EXCAVATED MATERIALS AND STOCKPILE SEPARATELY SUITABLE SOILS FOR USE AS BACKFILL MATERIALS. IF SUFFICIENT QUANTITIES OF EXCAVATED MATERIALS MEETING REQUIREMENTS FOR BACKFILL ARE NOT AVAILABLE ON SITE, PROVIDE MATERIALS MEETING THESE REQUIREMENTS.
- F. STOCKPILE EXCAVATED MATERIAL SUITABLE FOR USE AS FILL AND BACKFILL.

2-06 FILLING, BACKFILLING AND COMPACTING.
- A. THE WORK CONSISTS OF COMPACTION OF EXISTING EARTH (EXCLUDE ROCK), SURFACES AFTER EXCAVATION, FILLING AND COMPACTION OF SAID AREA TO LEVELS REQUIRED WITH SUITABLE BACKFILL MATERIAL.
- B. MATERIALS: "SATISFACTORY FILL MATERIALS" AASHTO CLASSIFICATION A-3 OR BETTER SHALL BE USED IN FILLS AND BACKFILLS.
- C. FILLING AND BACKFILLING: PLACE "SATISFACTORY FILL MATERIAL" IN HORIZONTAL LAYERS NOT EXCEEDING 6 INCHES IN LOOSE DEPTH. COMPACT AS SPECIFIED HEREIN NO MATERIAL SHALL BE PLACED ON SURFACES THAT ARE MUDDY.
- D. COMPACTION: COMPACTION SHALL BE WITH EQUIPMENT SUITED TO SOIL BEING COMPACTED. MOISTEN OR AERATE MATERIAL AS NECESSARY TO PROVIDE MOISTURE CONTENT THAT WILL READILY FACILITATE OBTAINING SPECIFIED COMPACTION WITH EQUIPMENT USED. COMPACT EACH LAYER TO NOT LESS THAN PERCENTAGE OF MAXIMUM DENSITY SPECIFIED BELOW DETERMINED IN ACCORDANCE WITH AASHTO T-180. INSURE THAT THE COMPACTION OF PREVIOUSLY PREPARED FILL AREAS HAS BEEN MAINTAINED PRIOR TO PLACING NEW LAYERS.
- E. RECONDITIONING OF SUBGRADE: WHERE APPROVED COMPACTED SUBGRADES ARE DISTURBED BY THE CONTRACTOR'S SUBSEQUENT OPERATIONS OR ADVERSE WEATHER SUBGRADE SHALL BE SCARIFIED AND COMPACTED AS SPECIFIED HEREIN BEFORE TO REQUIRED DENSITY PRIOR TO FURTHER CONSTRUCTION THEREON. RE-COMPACTION OVER UNDERGROUND UTILITIES SHALL BE BY POWER-DRIVEN HAND TAMPERS.
- F. COMPACTION REQUIREMENTS
  1. FILL UNDER LAWNS AND PLANTED: 95%
  2. BELOW SLABS ON GRADE AND CONCRETE WALKS: 98%
  3. UNDER PAVING PARKING AREAS: 98%

2-07 TESTING
- A. THE CONTRACTOR WILL PROVIDE THE SERVICES OF A TESTING LABORATORY TO PERFORM SPECIFIED TESTS, INSPECTIONS, INSTRUMENTATION AND INSPECTION OF THE WORK.
- B. TESTS OF MATERIALS SHALL BE AS FOLLOWS:
  1. SOIL CLASSIFICATION: ONE TEST FROM EACH TYPE OF MATERIAL ENCOUNTERED AND OR PROPOSED TO BE USED.
  2. LABORATORY TESTS FOR MOISTURE-CONTEST AND DENSITY ACCORDING TO AASHTO T-180: ONE TEST FOR EACH MATERIAL ENCOUNTERED AND/OR PROPOSED TO BE USED.
  3. FIELD TESTS FOR MOISTURE CONTEST AND DENSITY: ONE TEST PER LAYER OF FILL PER 5,000 SQUARE FEET OF AREA.

SUPPLEMENTAL SPECIFICATIONS

GENERAL

THE CONTRACTOR SHALL BECOME FAMILIAR WITH AND ADHERE TO THE SPECIFICATIONS AND STANDARDS OF THE UTILITY COMPANIES WHICH ARE SERVING THE PROJECT SITE. THE CONTRACTOR SHALL BECOME FAMILIAR WITH AND COMPLY WITH ALL SITE DEVELOPMENT STANDARDS AND CODES OF THE REGULATORY AGENCIES ASSOCIATED WITH THIS PROJECT.

POTABLE WATER DISTRIBUTION/WASTEWATER COLLECTION INSTALLATION

UNLESS OTHERWISE NOTED ON THE PLANS, THE STANDARDS AND SPECIFICATIONS OF THE ASSOCIATED UTILITY COMPANY SERVING THE PROJECT SITE SHALL BE ADHERED TO FOR ALL MATERIALS, INSTALLATION, TESTING, AND CERTIFICATION ACTIVITIES FOR ALL PUMP STATIONS, MAIN LINES, SERVICES, AND APPURTENANCES. IF STANDARDS AND SPECIFICATIONS ARE NOT AVAILABLE, THE CONTRACTOR SHALL CONFORM WITH THE LATEST STANDARDS AND SPECIFICATIONS ADOPTED BY MONROE COUNTY UTILITIES, LOCAL GOVERNMENTAL REGULATIONS, OR THE MANUFACTURERS RECOMMENDED INSTALLATION PROCEDURES, WHICHEVER IS SPECIFICALLY THE MOST RESTRICTIVE. A COPY OF THE MONROE COUNTY UTILITIES SPECIFICATIONS CAN BE REVIEWED AT THE OFFICE OF THE WEILER ENGINEERING CORPORATION.

STORMWATER PIPE INSTALLATION AND MISCELLANEOUS EXCAVATIONS

UNLESS OTHERWISE NOTED ON THE PLANS OR SPECIFICATIONS, THE CONTRACTOR SHALL PERFORM THE EXCAVATION, BEDDING, JOINTS, AND BACKFILLING OPERATIONS IN ACCORDANCE WITH THE POTABLE WATER/ WASTEWATER INSTALLATION SPECIFICATIONS, LOCAL GOVERNMENTAL REGULATIONS OR STANDARDS, F.D.O.T. STANDARDS AND SPECIFICATIONS OR MANUFACTURER'S RECOMMENDED INSTALLATION PROCEDURES, WHICHEVER IS SPECIFICALLY THE MOST RESTRICTIVE.

UNSUITABLE MATERIALS

IF UNSUITABLE MATERIAL IS ENCOUNTERED WITHIN THE ROADWAY AREA AND/OR UTILITY AREAS IT SHALL BE REMOVED TO A DEPTH OF THREE (3) FEET BELOW THE SUB-BASE OR TRENCH BOTTOM AND SHALL BE BACKFILLED WITH THE A-3 MATERIAL OR BETTER WITH PLACEMENT AND COMPACTION METHODS IN ACCORDANCE WITH THE LATEST EDITION OF THE FLORIDA DEPARTMENT OF TRANSPORTATION'S STANDARD SPECIFICATIONS OR AS OTHERWISE NOTED ON THE PLANS. UNSUITABLE MATERIALS SHALL BE REMOVED FROM SITE, UNLESS THE ENGINEER APPROVES USE WITHIN LANDSCAPED AREAS.

DEWATERING

1.01 GENERAL
- A. DEWATERING CONSISTS OF PERFORMING ALL WORK NECESSARY TO REMOVE SURFACE WATER AND/OR CONTROL THE GROUND WATER LEVELS AND HYDROSTATIC PRESSURES IN ORDER TO PERMIT ALL EXCAVATION AND CONSTRUCTION UNDER THIS CONTRAST TO BE PERFORMED IN THE DRY.
- B. WORK OF THIS SECTION INCLUDES INSTALLATION, OPERATIONS, MAINTENANCE, SUPERVISION, SUPPLY, DISMANTLING, AND REMOVAL FROM THE SITE OF THE DEWATERING EQUIPMENT.
- C. THE CONTRACTOR MUST FAMILIARIZE HIMSELF WITH THE POTENTIAL FOR EXCESSIVE RAINFALL, THE GROUND CONDITIONS, AND THE GROUND WATER CONDITIONS, GROUND WATER ELEVATION CAN FLUCTUATE. IT IS ANTICIPATED THAT ANY EXCAVATIONS MAY ENCOUNTER THE GROUND WATER TABLE.
- D. DRAINAGE OF THE SITE: AT ALL TIMES THE CONTRACTOR SHALL MAINTAIN AND OPERATE ADEQUATE SURFACE AND SUBSURFACE DRAINAGE METHODS IN ORDER TO KEEP THE CONSTRUCTION SITE DRY AND IN SUCH CONDITION THAT PLACEMENT AND COMPACTION OF FILL MAY PROCEED UNHINDERED BY SATURATION OF THE AREA DURING CONSTRUCTION, THE SURFACE OF THE BACKFILL AREA SHALL BE LEFT IN SUCH CONDITION THAT PRECIPITATION AND/OR SURFACE WATER WILL RUN OFF WITHOUT PONDING.

1-02 METHOD
- A. THE CONTROL OF ALL SURFACE AND SUBSURFACE WATER IS PART OF THE DEWATERING REQUIREMENTS, MAINTAIN ADEQUATE CONTROL SO THAT THE STABILITY OF EXCAVATED AND CONSTRUCTION SLOPES IS NOT ADVERSELY AFFECTED BY WATER, THAT EROSION IS CONTROLLED, AND THE FLOODING OF EXCAVATIONS OR DAMAGE TO STRUCTURES DOES NOT OCCUR, DRAIN SURFACE WATER AWAY FROM THE EXCAVATION.
- B. DISPOSE OF ALL WATER REMOVED FROM THE EXCAVATION IN A MANNER THAT WILL NOT ENDANGER PUBLIC HEALTH, PROPERTY, OR PORTIONS OF THE WORK UNDER CONSTRUCTION OR COMPLETED. DISPOSE OF WATER IN A MANNER THAT WILL CAUSE NO INCONVENIENCE WHATSOEVER TO THE OWNER OR TO OTHERS ENGAGED IN WORK AT THE SITE.
- C. DISPOSE OF WATER RESULTING FROM DEWATERING OPERATIONS IN ACCORDANCE WITH CITY, COUNTY, STATE AND FEDERAL REGULATIONS.
- D. CONDUCT OPERATIONS SO THAT STORMWATER RUNOFF, SEDIMENT IS NOT DISCHARGED TO THE ADJACENT WATER BODIES, SEWERS, STREETS AND ADJACENT PROPERTIES.
- E. DEWATERING SYSTEM SHALL BE SO DESIGNED AS TO PREVENT REMOVAL OF SOIL FINES FROM THE SITE DURING THE DEWATERING OPERATION.

PORTLAND CEMENT CONCRETE PAVING

1-01 QUALITY ASSURANCE
- A. COMPLY WITH ACI STANDARDS RECOMMENDED PRACTICES FOR CONSTRUCTION OF CONCRETE PAVEMENTS AND CONCRETE BASES (ACI316, LATEST EDITION)

1-02 REFERENCE STANDARDS
- A. THE FOLLOWING REFERENCE STANDARDS OF THE ISSUES LISTED BELOW BUT REFERRED TO THEREAFTER BY BASIC DESIGNATION ONLY, FORM A PART OF THIS SPECIFICATION TO THE EXTENT INDICATED BY THE REFERENCES THERETO. TESTS SHALL BE PERFORMED IN ACCORDANCE WITH HEREINAFTER SPECIFIED STANDARDS.
  1. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM).
  2. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) STANDARD.
  3. FLORIDA DEPARTMENT OF TRANSPORTATION (FDOT) 1991 STANDARDS AND SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION - SECTION 350 - "CEMENT CONCRETE PAVEMENT".
  4. T-180 MOISTURE-DENSITY RELATIONS OF SOILS.

1-03 SUBMITTALS

THE CONTRACTOR SHALL SUBMIT TWO COPIES OF TEST REPORTS PREPARED BY AN INDEPENDENT TESTING LABORATORY AND CERTIFIED BY A PROFESSIONAL ENGINEER REGISTERED TO PRACTICE IN THE STATE OF FLORIDA. THESE REPORTS SHALL INDICATE ALL TESTS PERFORMED AND SHALL INCLUDE A CERTIFICATION STATEMENT OF COMPLIANCE WITH THE PROJECT SPECIFICATIONS. TESTS SHALL BE PERFORMED AS SPECIFIED UNDER THIS SECTION.

1. SUBMIT FOR REVIEW THE FOLLOWING;
   - 1.1. CONCRETE DESIGN MIX AND PROVING FLEXURAL STRENGTH (MODULUS OF RUPTURE) TESTS
   - 1.2. EXPANSION JOINT FILLER DATE
   - 1.3. JOINT SEALER DATE
   - 1.4. PROPOSED PAVING CONSTRUCTION PLAN WHICH SHALL SHOW THE CONCRETE PAVING JOINT TYPES AND LOCATIONS AND SHALL INCLUDE A STATEMENT OF PROPOSED SEQUENCE AND SCHEDULE OF PAVING OPERATIONS
   - 1.5. RESULTS OF CONCRETE TESTS
   - 1.6. RESULTS OF FIELD TESTS OF LBR AND COMPACTION OF STABILIZED SUBGRADE.

1-04 MATERIALS
- A. STABILIZED SUBGRADE: PROVIDE 12 INCH STABILIZED SUBGRADE (LBR 40 MIN) COMPACTED TO A MINIMUM DENSITY OF 98% AS DETERMINED BY AASHTO T-180
- B. CONCRETE: CONCRETE FOR CONCRETE PAVEMENT SHALL HAVE A COMPRESSIVE STRENGTH OF 3000 PSI AT 28 DAYS. A SLUMP RANGE BETWEEN 2 TO 4 INCHES AND A 28 DAY MODULES OR RUPTURE OF 650 PSI AS DETERMINED BY THE REQUIREMENTS OF PARAGRAPH TESTING SPECIFIED HEREINAFTER.
- C. JOINT SEALER: JOINT SEALING SHALL CONFORM TO FEDERAL SPECIFICATIONS SS-S401 OR SS-S-2009 (COLD APPLIED)
- D. PREMOLDED EXPANSION JOINT FILLER: PREMOLDED EXPANSION JOINT FILLER SHALL CONFORM TO ASTM D1751-73

1-05 EXECUTION.
- A. COMPLY WITH AC STANDARD 316-74 AND SECTION 350, FDOT STANDARDS AND SPECIFICATIONS, UNLESS OTHERWISE SPECIFIED HEREIN.
- B. FINAL GRADING: ALL CONCRETE PAVEMENT SHALL HAVE A MAXIMUM DEVIATION OF 1/8 INCH (PLUS/MINUS) FROM THE SPECIFIED SURFACE PLANE AND PLAN GRADES.
- C. THE SURFACE FINISH SHALL BE APPROVED BY THE OWNER OR HIS REPRESENTATIVE, IN GENERAL THE TEXTURE IS OF A MEDIUM BROOM FINISH AFTER FLOATING.
- D. JOINTS
  1. CONTRACTION JOINTS INDICATED ON DRAWINGS, OR AS REQUIRED, SHALL BE PLACED PERPENDICULAR TO THE FINISH GRADE OF THE CONCRETE. JOINTS SHALL BE CUT TO A DEPTH OF 1/4 OF THE SLAB THICKNESS BY CUTTING WITH AN EDGING TOOL HAVING A 1/4 INCH RADIUS OR BY SAWING WITH A BLADE PRODUCING A CUT NOT LESS THAN 1/8 INCH IN WIDTH. SAW JOINTS WITHIN 4 TO 6 HOURS OF CONCRETE PLACEMENT.
  2. EXPANSION JOINTS SHALL BE PLACED WHERE INDICATED ON DRAWINGS, OR AS REQUIRED, USING 1/2 INCH THICK PREFORMED EXPANSION JOINT MATERIAL ANCHOR WITH APPROVED DEVICES TO PREVENT DISPLACEMENT DURING PLACEMENT AND FINISHING. EDGES SHALL BE ROUNDED WITH AN EDGING TOOL. JOINTS SHALL BE FULL DEPTH OF CONCRETE EXCEPT THAT TOP EDGES SHALL BE 1/2 INCH BELOW THE FINISH CONCRETE SURFACE. EXPANSION JOINTS SHALL BE SEALED TO THE SURFACE BY FILLING WITH JOINT SEALING COMPOUND. JOINTS SHALL BE CLEAN AND DRY BEFORE SEALING COMPOUND IS PUT IN PLACE.
  3. CONSTRUCTION JOINTS ARE TO BE USED AT CONTRACTION JOINT LOCATIONS TO STOP CONCRETE POURS.
- E. CURING: CONCRETE SHALL BE CURED BY PROTECTING IT AGAINST LOSS OF MOISTURE AND MECHANICAL INJURY FOR AT LEAST THREE DAYS AFTER PLACEMENT. A PIGMENTED LIQUID CURING MEMBRANE SHALL BE APPLIED IMMEDIATELY AFTER FINISHING; OPERATION AT THE RATE OF ONE GALLON TO NOT MORE THAN 200 SQUARE FEET.
- F. CLEANING AND SEALING JOINTS: JOINTS SHALL BE FILLED WITH JOINT-SEALING MATERIAL NO LESS THAN 8 HOURS AND WITHIN 2 WEEKS AFTER JOINTS ARE BUT. JUST PRIOR TO SEALING, EACH JOINT SHALL BE THOROUGHLY CLEANED OF ALL FOREIGN MATERIAL INCLUDING ANY MEMBRANE CURING COMPOUND.
- G. TESTING: LABORATORY AND FIELD TESTING SHALL BE AT THE CONTRACTOR'S EXPENSE. IN ADDITION, ALL RETESTING SHALL BE DONE AT CONTRACTOR'S EXPENSE.
  1. DESIGN MIXES AND TESTING REQUIREMENTS FOR THE CONCRETE PAVEMENT SHALL BE AS FOLLOWS;
     - 1.1. FLEXURAL STRENGTH TESTS OF CONCRETE AS BASIS FOR DESIGN
     - 1.2. SLUMP, MODULES OF RUPTURE AND 7-AND 20 DAY COMPRESSIVE STRENGTH TESTS SHALL BE PERFORMED ON SAMPLES TAKEN AT THE SITE AT A FREQUENCY OF TWO PER ACRE.
  2. WHERE THE FLEXURAL STRENGTH OF THE CONCRETE IS SPECIFIED, MAKE ONE STRENGTH TEST AND ONE FLEXURAL TEST FOLLOWING (ASTM C192 AND ASTM C78) FOR EACH 100 CUBIC YARDS OR FRACTION THEREOF PLACED PER DAY. NUMBER OF CYLINDERS SHALL BE THREE FOR STRENGTH TEST AND THREE FOR FLEXURAL TEST. TEST ONE AT THREE DAYS, ONE AT SEVEN DAYS AND ONE AT 28 DAYS

PAVEMENT MARKING

1-01 QUALITY ASSURANCE
- A. WORK SHALL BE PERFORMED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS IN A NEAT AND ACCURATE MANNER.
- B. ALL EQUIPMENT SHALL BE OF A TYPE AND DESIGN WHICH WILL READILY OBTAIN THE REQUIRED UNIFORMITY OF APPLICATION OF THE PAVEMENT.

PORTLAND CEMENT CONCRETE

CONCRETE SHALL BE TESTED FOR THE FOLLOWING PARAMETERS: SLUMP, MODULES OF RUPTURE, AND 7 AND 28 DAY COMPRESSIVE STRENGTH TESTS SHALL BE PERFORMED ON SAMPLES TAKEN AT THE SITE AT A FREQUENCY OF TWO PER ACRE. A PROFESSIONAL ENGINEER'S CERTIFICATION OF COMPLIANCE SHALL BE PROVIDED BY THE TESTING LAB.
RETENTION/DETENTION FACILITIES - IF INCLUDED WITHIN THE PROJECT, THE CONTRACTOR SHALL COORDINATE WITH THE ENGINEER AND PERFORM A DRAW DOWN AND CAPACITY TEST OF THE FACILITIES. THE CONTRACTOR SHALL PROVIDE SUFFICIENT WATER AND ACCEPTABLE MEANS TO MEASURE THE WATER VOLUMES PROVIDED, IF REQUIRED BY THE ENGINEER, IF A FILTRATION SYSTEM IS INCLUDED WITHIN THE PROJECT, THE FILTER MEDIA SHALL BE TESTED FOR COMPLIANCE WITH ALL CURRENT SPECIFICATIONS OF THE WATER MANAGEMENT DISTRICT. A PROFESSIONAL ENGINEER'S CERTIFICATION OF COMPLIANCE SHALL BE PROVIDED BY THE TESTING LAB.

IN ADDITION TO THE ENVIRONMENTAL PROTECTION DURING CONSTRUCTION SPECIFICATIONS, THE CONTRACTOR SHALL PERFORM THE FOLLOWING IN THE ORDER LISTED:

1. PRIOR TO COMMENCEMENT, PROVIDE NOTIFICATION TO THE LOCAL WATER MANAGEMENT DISTRICT AND LOCAL GOVERNMENT OFFICES.
2. ERECT A TURBIDITY SCREEN ON ANY DOWNSTREAM SYSTEM WHICH RECEIVES RUNOFF FROM THE PROJECT. INSTALL OUTFALL CONTROL STRUCTURE AND FILTRATION SYSTEM IF INCLUDED
3. PROVIDE A TEMPORARY FILTER CLOTH COVERED WITH GRAVEL OVER ANY PROPOSED FILTERS.
4. INSTALL A TEMPORARY TURBIDITY SCREEN AT ALL CONTROL STRUCTURES.
5. CONSTRUCT A TEMPORARY PERIMETER BERM AS NECESSARY TO DIRECT ALL RUNOFF WITHIN ANY AREA PLANNED FOR CLEARING.
6. MAINTAIN FILTER DURING CONSTRUCTION TO PROVIDE CONTINUOUS OPERATION.
7. UPON PERFORMING FINAL GRADING, THE CONTRACTOR SHALL REMOVE ALL SILTS, CLAYS AND OTHER DELETERIOUS MATERIAL FROM THE BOTTOM OF ALL STORMWATER MANAGEMENT AREAS PRIOR TO GRASSING.
8. AFTER ACHIEVING A NON-ERODIBLE COVER OF GRASS, REMOVE TEMPORARY FILTER CLOTH AND GRAVEL OVER FILTERS AND REPLACE WITH NEW FILTER CLOTH AND COVER MATERIAL IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS.
9. NOTIFY THE OWNER FOR FINAL INSPECTION.
10. UPON FINAL APPROVAL FROM OWNER, REMOVE ALL TEMPORARY EROSION AND SEDIMENT CONTROL FACILITIES.

PIPING

- A. ALL VALVE OPERATORS AND HAND WHEELS, ETC. SHALL FACE AND BE ACCESSIBLE TO PLATFORMS OR OPERATING AREAS. THE CONTRACTOR IS RESPONSIBLE FOR PROPER ORIENTATION TO MEET THIS REQUIREMENT.
- B. PIPING PLANS DO NOT PURPORT TO SHOW ALL FITTINGS, SPECIALS, ETC., WHICH MAY BE NECESSARY TO ACCOMMODATE FIELD LAYING CONDITIONS. THE CONTRACTOR SHALL FURNISH AND INSTALL EXTRA PIPE FITTINGS TO AFFORD PROPER PIPE CLEARANCES AND ALIGNMENT WHERE NECESSARY AT NO ADDITIONAL COST TO THE OWNER.
- C. ALL HYDRAULIC STRUCTURES SHALL HAVE WALL PIPES AT PIPE PENETRATIONS.
- D. ALL BENDS, TEES, PLUGS, ETC. ON PRESSURE MAINS SHALL BE RESTRAINED IN ACCORDANCE WITH SPECIFICATIONS.
- E. ALL TRENCHES FOR NEW PIPING AND CONDUIT SHALL BE BACKFILLED WITH SUITABLE MATERIAL AND BE THOROUGHLY COMPACTED, UNLESS OTHERWISE SPECIFIED.
- F. WHERE DRAINING AND CLEANING OF EXISTING TANKS IS REQUIRED TO PERFORM WORK UNDER THIS CONTRACT, IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO OPERATE ALL VALVES, GATES, AND PUMPS TO ACCOMPLISH BY-PASS OF THE UNIT, TO DRAIN WASTEWATER BACK TO HEAD OF PLANT AND TO CLEAN AND DISPOSE OF ALL SLUDGE REMOVED.
- G. ALL EXISTING EQUIPMENT, PIPING, VALVES AND OTHER ITEMS REMOVED AND DEEMED REUSEABLE DURING CONSTRUCTION OPERATIONS SHALL REMAIN THE PROPERTY OF THE OWNER AND SHALL BE STRORED ON THE SITE IN THE LOCATION DESIGNATED BY THE OWNER.
- H. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING FLOWS THROUGH EXISTING PIPING AND STRUCTURES AND DIVERSION OF FLOWS AS NECESSARY DURING CONSTRUCTION UNDER THIS CONTRACT. TO INSURE CONTINUATION OF PLANT OPERATION WITHOUT INTERRUPTION. ALL WORK WHICH AFFECTS PLANT OPERATIONS SHALL BE COORDINATED AND SCHEDULED TO THE SATISFACTION OF PLANT PERSONNEL PRIOR TO BEGINNING. ALL WORK ON EXISTING SYSTEM SHALL BE COORDINATED A MINIMUM OF 72 HOURS PRIOR WITH THE OWNER.
- I. DIMENSION, ELEVATIONS, AND LOCATIONS SHOWN ON THESE DRAWINGS FOR EXISTING STRUCTURES, PIPING, ETC., MAY BE FROM RECORD DRAWINGS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY ALL INFORMATION PRIOR TO BEGINNING HIS CONSTRUCTION OPERATIONS IN EACH AREA AND AT NO ADDITIONAL COST TO THE OWNER. MAKE ALL NECESSARY ADJUSTMENTS TO PERFORM THE INTENT OF WORK UNDER THIS CONTRACT.

Project Information

Approved By:	SJS	Design:	YF
Scale:	AS NOTED	Drawn:	YF
Job No.:	23013.011	Checked:	SJS
Date Issued:	9/04/2024		

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GENERAL NOTES & SPECIFICATIONS

BLOWER & ELECTRICAL UPGRADES KWRU

STOCK ISLAND, FLORIDA

Revisions		Description
1	... ...	...
2	... ...	...
3	... ...	...
4	... ...	...
5	... ...	...
6	... ...	...

FOR BIDDING PURPOSES

Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. G-2.0

GENERAL NOTES:

1. CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND DETAILS AND SHALL NOTIFY ENGINEER IMMEDIATELY OF ANY ERRORS, OMISSIONS OR DISCREPANCIES PRIOR TO COMMENCEMENT OF WORK.
2. ALL MATERIALS, EQUIPMENT, CONNECTORS, AND WORK SHALL MEET OR EXCEED THE DESIGN DATA AND COMPLIANCE CODE CITED.
3. ENGINEER IS NOT RESPONSIBLE FOR ANY SUPERVISION DURING CONSTRUCTION.
4. CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS PRIOR TO COMMENCING WORK AND DETERMINE THE LOCATION OF ALL ADJACENT UNDERGROUND UTILITIES PRIOR TO COMMENCING EXCAVATION AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO CONSTRUCTION.
5. THE CONTRACTOR MAINTAINS THE RESPONSIBILITY FOR ALL CONSTRUCTION MEANS, METHODS AND TECHNIQUES REQUIRED FOR THE CONNECTIONS OF ALL ROOF, WALL AND FLOOR SYSTEMS. ALL WORK SHALL BE PERFORMED IN A WORKMANLIKE MANNER.
6. THE STRUCTURAL INTEGRITY OF THE STRUCTURES SHOWN ON THESE PLANS IS DEPENDENT UPON COMPLETION ACCORDING TO PLANS AND SPECIFICATIONS. STRUCTURAL MEMBERS ARE NOT SELF SUPPORTING DURING CONSTRUCTION AND REQUIRE TEMPORARY BRACING UNTIL PERMANENTLY APPLIED TO STRUCTURE AS DIRECTED. THE STRUCTURAL ENGINEER ASSUMES NO LIABILITY FOR THE STRUCTURE DURING CONSTRUCTION UNLESS THE CONSTRUCTION METHOD AND BRACING ARE INCLUDED IN THE PLANS AND SPECIFICATIONS, OR ARE SUPERVISED BY THE STRUCTURAL ENGINEER DURING CONSTRUCTION.
7. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SAFETY PRECAUTIONS AND THE METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES REQUIRED TO PERFORM THE WORK. THE STRUCTURAL ENGINEER HAS NO OVERALL SUPERVISION / AUTHORITY OR ACTUAL AND/ OR DIRECT RESPONSIBILITY FOR THE SPECIFIC WORKING CONDITIONS AT THE SITE AND/ OR FOR ANY HAZARDS RESULTING FROM THE ACTIONS OF ANY TRADE CONTRACTOR. THE STRUCTURAL ENGINEER HAS NO DUTY TO INSPECT, SUPERVISE, NOTE, CORRECT, OR REPORT ANY HEALTH OR SAFETY DEFICIENCIES OF THE OWNER, CONTRACTORS, OR OTHER ENTITIES OR PERSONS AT THE PROJECT SITE.
8. IN ADDITION TO THE DEMOLITION WORK INDICATED ON THE DRAWINGS, MINOR LOCAL DEMOLITION OF EXISTING ELEMENTS MAY BE REQUIRED TO PERFORM THE STRUCTURAL WORK AS INDICATED ON THE PLANS, SECTIONS, AND DETAILS.
9. DISCHARGE ALL DRAIN LINES, CONDENSATE LINES, DOWN SPOUT, ETC. AT LEAST 1' FROM BUILDINGS.
10. ANY CHANGES OR SUBSTITUTIONS SHALL BE APPROVED BY THE ENGINEER.
11. DISSIMILAR METALS SHALL BE ISOLATED TO PREVENT GALVANIC ACTION.
12. FIELD VERIFY ALL EXISTING ABOVE AND BELOW GROUND CONDITIONS PRIOR TO FABRICATION AND CONSTRUCTION.
13. THE STRUCTURAL DESIGN OF BUILDING IS BASED ON THE FULL INTERACTION OF ALL ITS COMPONENT PARTS, WITH NO PROVISION FOR CONDITION OCCURRING DURING CONSTRUCTION. THEREFORE, CONTRACTOR SHALL PROVIDE ADEQUATE BRACING DURING CONSTRUCTION.
14. STRUCTURAL DRAWINGS INDICATE TYPICAL AND CERTAIN SPECIFIC CONDITIONS ONLY. SHOP DRAWINGS SHALL DETAIL ALL CONDITIONS IN ACCORDANCE WITH SPECIFIED STANDARDS AND SPECIFIC REQUIREMENTS OF THIS PROJECT AS INDICATED ON THE DRAWINGS.

STRUCTURAL LOADS

1. GOVERNING BUILDING CODE: 2020 FLORIDA BUILDING CODE
2. DESIGN LOADS:

STRUCTURAL LOADS (PER FBC TABLE 1607.1):

FLOOR LOADS
- LIVE LOAD: ..... 50 PSF
- CONCENTRATED LIVE LOAD: ..... 2000 LB
- DEAD LOAD: ..... 50 PSF

STAIR DESIGN LOADS
- LIVE LOAD: ..... 60 PSF
- CONCENTRATED LIVE LOAD: ..... 300 LB

HANDRAIL AND GUARDRAIL DESIGN LOADS
- CONCENTRATED LOAD: ..... 200 LB
- UNIFORM LINEAR LOAD: ..... 50 PLF

WIND LOADS (PER ASCE 7-16):
- BASIC WIND SPEED (1609.3.1)
  - Ultimate (V_{ult}) (THREE SECOND GUST): ..... 200 MPH
  - Nominal (V_{asd}) ..... 159 MPH
- RISK CATEGORY (1604.5): ..... Category III
- WIND LOAD IMPORTANCE FACTOR: 1.0
- WIND EXPOSURE (1609.4.): ..... EXPOSURE D
- INTERNAL PRESSURE COEFFICIENT (GC_{pi}): ..... ±0.0 (OPEN)
- COMPONENTS & CLADDING WIND PRESSURES: ..... PER PLAN

FLOOD DESIGN DATA (PER FBC 1612.1):

AREA 3
- BASE FLOOD ELEVATION: ..... ZONE AE-08 NGVD (PER FEMA)
- BASE FLOOD ELEVATION: ..... ZONE AE-10 NAVD (PER COM PRELIMINARY COASTAL FLOOD MAPS)

AREA 4
- BASE FLOOD ELEVATION: ..... ZONE AE-06 NGVD (PER FEMA)
- BASE FLOOD ELEVATION: ..... ZONE AE-09 NAVD (PER COM PRELIMINARY COASTAL FLOOD MAPS)

REMOTE STATION
- BASE FLOOD ELEVATION: ..... ZONE AE-08 NGVD (PER FEMA)
- BASE FLOOD ELEVATION: ..... ZONE AE-10 NAVD (PER COM PRELIMINARY COASTAL FLOOD MAPS)

AREA 5
- BASE FLOOD ELEVATION: ..... ZONE AE-07 NGVD (PER FEMA)
- BASE FLOOD ELEVATION: ..... ZONE AE-10 NAVD (PER COM PRELIMINARY COASTAL FLOOD MAPS)

AREA 6
- BASE FLOOD ELEVATION: ..... ZONE AE-07 NGVD (PER FEMA)
- BASE FLOOD ELEVATION: ..... ZONE AE-10 NAVD (PER COM PRELIMINARY COASTAL FLOOD MAPS)

AREA 7
- BASE FLOOD ELEVATION: ..... ZONE AE-09 NGVD (PER FEMA)
- BASE FLOOD ELEVATION: ..... ZONE VE-11 NAVD (PER COM PRELIMINARY COASTAL FLOOD MAPS)

SHOP DRAWINGS

1. SHOP DRAWINGS SHALL BE SUBMITTED TO THE STRUCTURAL ENGINEER FOR REVIEW. NO MODIFICATIONS OR SUBSTITUTION OF DRAWINGS AND SPECIFICATIONS WILL BE ACCEPTED VIA SHOP DRAWINGS REVIEW. THE FOLLOWING SHOP DRAWINGS SHALL BE SUBMITTED FOR REVIEW:
   - 1.1. ALL PRE-FABRICATED GUARDRAILS AND HANDRAILS
   - 1.2. SUBMIT CONCRETE MIX DESIGN PER SPECIFICATIONS IN "CAST IN PLACE CONCRETE" ITEM 26.1
   - 1.3. SUBMIT REBAR SHOP DRAWINGS PER SPECIFICATIONS IN "CAST IN PLACE CONCRETE" ITEM 26.2
   - 1.4. ANY PROPOSED ALTERNATIVES TO PRODUCTS SPECIFIED IN PLANS
2. CONTRACTOR SHALL REVIEW AND STAMP SHOP DRAWINGS PRIOR TO SUBMISSION TO THE STRUCTURAL ENGINEER. CONTRACTOR SHALL REVIEW FOR COMPLETENESS AND COMPLIANCE WITH CONTRACT DOCUMENTS.
3. SUBMIT SHOP DRAWINGS TO THE STRUCTURAL ENGINEER AS INDICATED OR SPECIFIED FOR REVIEW PRIOR TO FABRICATION. REVIEW WILL BE FOR GENERAL CONFORMANCE WITH THE DESIGN INTENT CONVEYED IN CONTRACT DOCUMENTS.
4. WHEN ENGINEER IS REQUIRED TO SIGN AND STAMP SHOP DRAWINGS AND CALCULATIONS, ENSURE SEAL INDICATES ENGINEER AS REGISTERED IN THE STATE WHERE PROJECT SITE OCCURS.
5. SHOP DRAWINGS ARE NOT PART OF CONTRACT DOCUMENTS. THEREFORE, STRUCTURAL ENGINEER'S REVIEW DOES NOT CONSTITUTE ON AUTHORIZATION TO DEVIATE FROM THE TERMS AND CONDITIONS OF THE CONTRACT.
6. SHOP DRAWINGS WILL BE REJECTED FOR INCOMPLETENESS, LACK OF COORDINATION WITH OTHER PORTIONS OF CONTRACT DOCUMENTS, LACK OF CALCULATIONS (IF REQUIRED), OR WHERE MODIFICATIONS OR SUBSTITUTIONS ARE INDICATED WITHOUT PRIOR REVIEW PER PARAGRAPH ABOVE 6. - SUBMIT SHOP DRAWINGS AND CALCULATIONS TO GOVERNING CODE AUTHORITY WHEN SPECIFICALLY INDICATED OR REQUESTED.
7. MAINTAIN A COPY OF ALL SHOP DRAWINGS ACCEPTED BY THE STRUCTURAL ENGINEER AT SITE DURING CONSTRUCTION PERIOD.
8. STRUCTURAL ENGINEER REQUIRES 10 WORKING DAYS AFTER RECEIPT OF SHOP DRAWINGS AND CALCULATIONS FOR PROCESSING.

FOUNDATION SOIL & TREATMENT

1. FOUNDATION AND SLAB NOTES: SUB-GRADE PREPARATION INCLUDING DRAINAGE, EXCAVATION, COMPACTION, AND FILLING REQUIREMENTS, SHALL CONFORM STRICTLY WITH RECOMMENDATIONS GIVEN IN THE SOILS REPORT OR AS DIRECTED BY THE PROJECT REPRESENTATIVE.
2. ALL FILL SHALL BE CLEAN SELECT MATERIAL FREE OF DELETERIOUS MATERIALS SUCH AS WOOD, ROOTS, TRASH, OR OTHER EXTRANEOUS MATERIALS. PLACE FILL IN 8" LIFTS, MEASURED LOOSE, AND COMPACT EACH LIFT TO 95% MAXIMUM DENSITY AT OPTIMUM MOISTURE CONTENT AS MEASURED BY ASTM D698.
3. FOUNDATION CONCRETE SHALL BE PLACED BEFORE DETERIORATION OF THE SUBGRADE DUE TO WEATHER, GROUND WATER SEEPAGE, FOOT TRAFFIC, OR CONSTRUCTION OPERATIONS. ANY PORTIONS OF THE SUBGRADE PERMITTED TO DETERIORATE SHALL BE REMOVED AND REPLACED WITH AN APPROVED COMPACTED BACKFILL OR LEAN CONCRETE (FLOWABLE FILL) WITHOUT ADDITIONAL COMPENSATION TO THE CONTRACTOR.

CAST IN PLACE CONCRETE

1. CONCRETE TO BE NORMAL WEIGHT WITH THE FOLLOWING MINIMUM COMPRESSIVE STRENGTHS AT 28 DAYS:
   - FOUNDATIONS, MISC. CONCRETE ..... 5,000 PSI
2. CONCRETE SHALL BE READYMIX PER ASTM C94:
   - PORTLAND CEMENT - ASTM C150
   - AGGREGATES - ASTM C33 (3/4" MAX.)
   - NO CALCIUM CHLORIDE
   - AIR ENTRAINING - ASTM C260
   - WATER REDUCING - ASTM C494
   - FLYASH -ASTM C618 CLASS F (20% MAXIMUM BY WEIGHT)
   - WATER - CLEAN AND POTABLE
3. REINFORCING STEEL:
   FOUNDATION SLABS, FOOTINGS, CMU WALLS & TIE-BEAMS, :..... ASTM A615, GRADE 60, fy = 60,000 psi
4. REQUIRED SLUMP RANGE: = 3" TO 5".
5. WELDED WIRE FABRIC: ASTM A-185. FURNISH SHEETS, NOT ROLLS.
6. MOISTURE BARRIER: 6 MIL POLYETHYLENE. LAP 6" AND TAPE ALL JOINTS.
7. CODES AND STANDARDS: (CURRENT EDITIONS)
   ACI 301 "SPEC FOR STRUCTURAL CONCRETE FOR BUILDINGS."
   ACI 305 "RECOMMENDED PRACTICE FOR HOT WEATHER CONCRETING."
   ACI 318 "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE."
   ACI 315 (SP66-04) "DETAILS AND DETAILING OF CONCRETE REINFORCEMENT."
8. MINIMUM LAP SPLICES = CLASS 'B'
9. PROVIDE PROPERLY TIED SPACERS, CHAIRS, BOLSTERS, ETC., AS REQUIRED AND NECESSARY TO ASSEMBLE, PLACE AND SUPPORT ALL REINFORCING IN PLACE. USE WIRE BAR TYPE SUPPORTS COMPLYING WITH CRSI RECOMMENDATIONS. USE PLASTIC TIP LEGS ON ALL EXPOSED SURFACES.
10. ALL BEAMS AND SLABS SHALL BE POURED MONOLITHICALLY, EXCEPT FOR REQUIRED CONSTRUCTION JOINTS. PROPOSED CONSTRUCTION JOINT LOCATION SHALL BE SUBMITTED TO ENGINEER FOR APPROVAL.
11. CONTRACTOR SHALL VERIFY LOCATIONS OF ALL OPENINGS, SLEEVES, AND SLAB RECESSES AS REQUIRED BY OTHER TRADES BEFORE CONCRETE IS PLACED. NO SLEEVE, OPENING, OR INSERT MAY BE PLACED IN BEAMS, JOISTS, OR COLUMNS UNLESS APPROVED BY THE ENGINEER.
12. CONTRACTOR SHALL VERIFY EMBEDDED ITEMS, INCLUDING BUT NOT LIMITED TO ANCHOR BOLTS, BOLT CLUSTERS, WELD PLATES, ETC..., BEFORE PLACING CONCRETE. NOTIFY ENGINEER OF ANY CONFLICTS WITH REBAR.
13. SEE PROJECT PLANS AND SPECIFICATIONS FOR REQUIRED CONCRETE FINISHES. ALL FINISHES TO BE APPROVED B Y OWNER PRIOR TO FINISHING.
14. ALL CONCRETE SHALL BE CURED IMMEDIATELY AFTER FINISHING OPERATIONS IN ACCORDANCE WITH ONE OF THE FOLLOWING METHODS:
    * APPLY A LIQUID MEMBRANE FORMING CHEMICAL CURING COMPOUND IN ACCORDANCE WITH ASTM C309.
    * PROVIDE CONTINUOUS MOISTURE TO CONCRETE IN ACCORDANCE WITH ACI 301.
15. GENERAL CONTRACTOR IS RESPONSIBLE FOR THE PROPER DESIGN AND CONSTRUCTION OF ALL FORM WORK, SHORING, AND RESHORING. DESIGN SHALL BE PERFORMED BY A LICENSED FLORIDA ENGINEER.
16. A QUALIFIED TESTING LABORATORY SHALL BE RETAINED TO PERFORM THE FOLLOWING CONCRETE TESTS ON SITE:
    * CYLINDER STRENGTH TESTS - ASTM C39; ONE SET OF FOUR CYLINDERS FOR EACH 50 CUBIC YARDS OR FRACTION THEREOF. TEST ONE CYLINDER AT 7 DAYS AND TWO AT 28 DAYS. HOLD THE FINAL CYLINDER IN RESERVE.
    * SLUMP TESTS - ASTM C143.
17. ONE COPY OF ALL TEST REPORTS SHALL BE SENT DIRECTLY TO OWNER, STRUCTURAL ENGINEER, AND GENERAL CONTRACTOR.
18. RESTRICT THE ADDITION OF MIX WATER AT THE JOB SITE. DO NOT ADD WATER WITHOUT THE APPROVAL OF THE GENERAL CONTRACTOR AND DO NOT EXCEED SLUMP LIMITATIONS OR TOTAL ALLOWABLE WATER TO CEMENT RATIO. USE COLD WATER FROM THE TRUCK TANK AND RE-MIX TO ACHIEVE CONSISTENCY, TEST REPORTS SHALL INDICATE QUANTITY OF WATER ADDED AT THE JOB SITE. ALL TESTS SHALL BE PREPARED AFTER THE ADDITION OF WATER TO THE MIX.
19. CONCRETE SHALL BE PLACED WITHIN 90 MINUTES OF BATCH TIME.
20. WHERE BAR LENGTHS ARE GIVEN ON DRAWINGS, LENGTH OF HOOK, IF REQUIRED IS NOT INCLUDED.
21. PROVIDE COMMERCIAL FORM COATING COMPOUNDS THAT WILL NOT BOND, STAIN, OR ADVERSELY AFFECT CONCRETE SURFACES. WET FORMS BEFORE PLACING CONCRETE.
22. ALL CONCRETE SHALL BE CONSOLIDATED IN PLACE USING INTERNAL VIBRATORS.
23. REPAIR AND PATCH DEFECTIVE AREAS WITH CEMENT MORTAR IMMEDIATELY AFTER REMOVAL OF FORMS, EXCEPT WHERE REINFORCING IS VISIBLE. CONTACT STRUCTURAL ENGINEER FOR EVALUATION OF EXPOSED REINFORCING.
24. STRUCTURES ABOVE GRADE TO BE FULLY PARGED AFTER FORMS ARE REMOVED.
25. PROVIDE 3/4" CHAMFERS ON ALL EXPOSED CORNERS OF COLUMNS, BEAMS, AND WALLS UNLESS NOTED OTHERWISE ON DRAWINGS OR SPECIFICATIONS.
26. PROVIDE CORNER BARS AT ALL BEAM AND WALL FOOTING CORNERS TO MATCH HORIZONTAL BARS.
27. SUBMITTALS:
    - 27.1. SUBMIT PROPOSED CONCRETE MIX DESIGN PRIOR TO CONSTRUCTION, INCLUDING BACK UP DATA IN ACCORDANCE WITH ACI 301 CHAPTER 4, SECTION 4.2.3, EXCLUDING SECTION 4.2.3.4B.
    - 27.2. SUBMIT DETAILED SHOP DRAWINGS OF REINFORCING BARS SHOWING NUMBER, SIZES, AND LOCATION. INCLUDE BAR LISTS AND BEND DIAGRAMS.

LUMBER

1. STRUCTURAL WOOD COMPONENTS (BEAMS, JOISTS, RAFTERS, STUDS, ETC...) SHALL HAVE THE FOLLOWING MINIMUM ALLOWABLE FIBER STRESSES OF SOUTHERN PINE CONFORMING TO THE LATEST EDITION OF NDS, AS FOLLOWS:
   - 1.1. SHEAR F/V = 175 PSI
   - 1.2. BENDING2x4 F/b = 1,500 PSI (No.1), 1,100 PSI (No.2)
   - 1.3. BENDING2x6 F/b = 1,350 PSI (No.1), 1,000 PSI (No.2)
   - 1.4. BENDING2x8 F/b = 1,250 PSI (No.1), 925 PSI (No.2)
   - 1.5. BENDING2x10 F/b = 1,050 PSI (No.1), 800 PSI (No.2)
   - 1.6. BENDING2x12 F/b = 1,000 PSI (No.1), 750 PSI (No.2)
     (MEMBER SIZES SHOWN ARE NOMINAL UNLESS NOTED OTHERWISE.)
2. ALL WOOD IN CONTACT WITH CONCRETE, MASONRY, OR SOIL, EXPOSED TO WEATHER, OR AT OTHER LOCATIONS AS SHOWN ON STRUCTURAL DRAWINGS, SHALL BE PROTECTED OR PRESSURE TREATED IN ACCORDANCE WITH AWPA REQUIREMENTS. PRESSURE TREATMENT APPROPRIATE FOR LUMBER IN CONTACT WITH SOIL SHALL BE PROVIDED WHERE APPLICABLE.
3. WALL STUDS SHALL BE CAPPED WITH A DOUBLE PLATE, INSTALLED TO PROVIDE OVERLAPPING AT CORNERS AND INTERSECTIONS WITH BEARING PARTITIONS.
4. ENGINEERED WOOD TRUSS SYSTEMS SHALL BE DESIGNED BY SUPPLIER'S DELEGATED ENGINEER TO CONFIGURATION AND LOAD-CARRYING CAPACITY SHOWN ON DRAWINGS AND SPECIFICATIONS. ALTERNATE TRUSS LAYOUTS ARE ACCEPTABLE ONLY AS A CHANGE ORDER WHICH WILL INCLUDE ENGINEERING CHARGES FOR REDESIGN OF THE STRUCTURE BY THE ENGINEER OF RECORD. SUBMIT SHOP DRAWINGS FOR REVIEW PRIOR TO FABRICATION. SHOP DRAWINGS SHALL SHOW AND SPECIFY ALL CONNECTOR TYPES UTILIZED WITHIN TRUSSES, AS WELL AS CONNECTORS UTILIZED IN ALL OTHER CONNECTIONS AND ATTACHMENTS BETWEEN TRUSSES OR COMPONENTS SUPPLIED AS PART OF THE ENGINEERED TRUSS SYSTEM. A PLACING PLAN SHALL BE INCLUDED, IDENTIFYING ALL TRUSS SYSTEM COMPONENTS, AS WELL AS ALL PERMANENT BRACING REQUIRED FOR TRUSS DESIGN.
5. ENGINEERED SHOP DRAWINGS SHALL BEAR THE SIGNATURE AND IMPRESSED SEAL OF A FLORIDA REGISTERED PROFESSIONAL ENGINEER AS THE SPECIALTY ENGINEER. THE FOLLOWING LOAD DURATION FACTORS SHALL BE USED:
   - 5.1. DEAD LOAD 0.90
   - 5.2. DEAD LOAD + FLOOR LIVE LOAD 1.00
   - 5.3. DEAD LOAD + ROOF LIVE LOAD 1.25
   - 5.4. DEAD LOAD + WIND LOAD 1.33
6. PLYWOOD FLOOR, WALL, AND ROOF SHEATHING ARE DESIGNED AS DIAPHRAGMS AND SHALL COMPLY WITH APPLICABLE PROVISIONS OF CHAPTER 23 OF THE FLORIDA BUILDING CODE. UNLESS SHOWN OTHERWISE SPAN RATED PANELS SHALL BE FASTENED TO NOMINAL 2X SOUTHER PINE FRAMING SPACED UP TO 24" O/C IN ACCORDANCE WITH THE FOLLOWING:
   - 6.1. PANELS UP TO 5/8" THICK: 10d NAILS AT 6" O/C ALONG SUPPORTED PANEL EDGE, 6" O/C ELSEWHERE, U.N.O.
   - 6.2. PANELS UP TO 3/4" THICK: 12d NAILS AT 6" O/C ALONG SUPPORTED PANEL EDGE, 6" O/C ELSEWHERE, U.N.O.
7. NAILING, JOIST BLOCKING, AND RAFTER BLOCKING SHALL MEET THE MINIMUM REQUIREMENTS OF CHAPTER 23 OF THE FLORIDA BUILDING CODE UNLESS MORE STRINGENT REQUIREMENTS ARE INDICATED ON THE PLANS.
8. ALL CONNECTORS SHALL BE STAINLESS. CONNECTOR MODEL NUMBERS SHOWN ARE STRONG-TIE CONNECTORS AS MANUFACTURED BY SIMPSON STRONG-TIE CO, 4120 DUBLIN BLVD. #400, DUBLIN, CA 94568. SUBSTITUTIONS ARE ACCEPTABLE WITH THE APPROVAL OF THE STRUCTURAL ENGINEER. UNLESS SHOWN OTHERWISE, INSTALL SIZE AND NUMBER OF FASTENERS SHOWN IN THE LATEST SIMPSON CATALOG. ALL CONNECTORS TO PRESSURE TREATED LUMBER SHALL BE TRIPLE GALVANIZED (Z MAX) OR STAINLESS STEEL.

WELDING

1. ALL WELDING SHALL CONFORM TO AWS SPECIFICATIONS, LATEST EDITION.
2. WELDING SHALL BE DONE BY WELDERS WITH CERTIFICATION USING E70XX SERIES LOW HYDROGEN ELECTRODES FOR ALL WELDING OF HIGH STRENGTH STEELS AND FOR FIELD WELDING.
3. WELDS SHOWN ON STRUCTURAL DRAWINGS ARE MINIMUM DESIGN REQUIREMENTS. THE FABRICATOR'S SHOP DRAWINGS SHALL SHOW WELDS IN ACCORDANCE WITH AISC/AWS REQUIREMENTS.

STRUCTURAL STEEL

1. FABRICATE AND ERECT STRUCTURAL STEEL IN ACCORDANCE WITH AISC "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS," LATEST EDITION.
2. CHANNEL SHAPES SHALL CONFORM TO ASTM A-36 AND THE "SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS" BY THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC. OR BETTER.
3. STRUCTURAL TUBING SHALL CONFORM TO ASTM A-500, GRADE B, F_y=42 KSI STRUCTURAL PIPE SHALL CONFORM TO ASTM A-53 GRADE B, TYPE E OR S. F_y=35 KSI.
4. ALL MISCELLANEOUS OR STRUCTURAL STEEL AND FASTENERS EXPOSED TO WEATHER SHALL BE GALVANIZED (G90 MIN) OR STAINLESS STEEL. ALL OTHER STRUCTURAL STEEL SHALL BE SHOP PRIMED WITH RED OXIDE PAINT, UNLESS NOTED OTHERWISE IN ARCHITECTURAL SPECIFICATIONS. ANY DAMAGED GALVANIZING OR PAINT SHALL BE RECOATED IN THE FIELD.
5. STIFFENER PLATES SHALL BE A MINIMUM THICKNESS OF 3/8". GUSSET PLATES AND BRACING CONNECTIONS SHALL HAVE A MINIMUM THICKNESS OF 3/8" AND A MINIMUM OF (2) HIGH STRENGTH BOLTS PER EACH END OF MEMBER FOR A BOLTED CONNECTION.
6. FABRICATOR SHALL SUBMIT SHOP DRAWINGS AND CALCULATIONS TO THE ENGINEER FOR REVIEW PRIOR TO FABRICATION. SHOP DRAWINGS SHALL BEAR THE SIGNATURE AND SEAL OF A FLORIDA REGISTERED PROFESSIONAL ENGINEER.

ALL COLUMN BASEPLATES AND BEARING PLATES SHALL BEAR ON 7000 PSI MINIMUM NON-SHRINK GROUT WHERE REQUIRED.

WIND BORNE DEBRIS REGION REQUIREMENTS

1. ALL WINDOWS, DOORS, AND OTHER COMPONENTS AND CLADDING AS REQUIRED SHALL BE DESIGNED BY THE MANUFACTURER IN ACCORDANCE WITH SECTION 1609 OF THE 2020 FLORIDA BUILDING CODE FOR DESIGN PRESSURES GENERATED BY AN ULTIMATE DESIGN WIND VELOCITY OF 180MPH (3-SECOND GUST).
2. THE BUILDER SHALL PROVIDE NECESSARY COPIES OF DETAILS, CERTIFICATIONS, ETC... TO THE BUILDING DEPARTMENT TO SHOW COMPLIANCE WITH THIS PARAGRAPH.
3. THE ENGINEER OF RECORD DOES NOT CERTIFY THE STRUCTURAL INTEGRITY OF THESE ITEMS.
4. DESIGN WIND PRESSURES ARE BASED ON AN ENCLOSED STRUCTURE CLASSIFICATION, THEREFORE, IMPACT RESISTANT GLASS OR COVERING PER SECTION 1609.1.2 IS REQUIRED.
5. IMPACT GLASS SHALL MEET THE REQUIREMENTS OF THE LARGE MISSILE TEST AND/OR THE SMALL MISSILE TEST DEPENDING UPON THE LOCATION OF THE OPENING.

CHEMICAL (ADHESIVE) ANCHORS

SHALL BE AN EQUAL TWO PART EPOXY POLYMER INJECTION SYSTEM, SUCH AS RED-HEAD EPCON, SIMPSON SET EPOXY, OR HILTI HSE2411 EPOXY DOWELING SYSTEM, OR ENGINEER APPROVED SUBSTITUTION, INSTALLED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS. INSTALLERS SHALL BE TRAINED BY THE MANUFACTURER'S REPRESENTATIVE. MINIMUM EMBEDMENT SHALL BE TWELVE (12) TIMES FASTENER DIAMETER UNLESS NOTED OTHERWISE.

EXISTING STRUCTURE

1. DRAWINGS FOR THE EXISTING STRUCTURE WERE NOTE AVAILABLE. ALL OF THE EXISTING CONDITIONS WERE NOT VERIFIABLE WITHIN THE SCOPE OF ENGINEERING SERVICES; THEREFORE, IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE CONDITIONS RELATING TO THE EXISTING STRUCTURE AND TO NOTIFY THE ENGINEER IMMEDIATELY OF ANY DISCREPANCIES OR CONFLICTS.
2. THE EXISTING STRUCTURE HAS NOT BEEN REVIEWED OR IMPROVED TO MEET THE REQUIREMENTS OF THE 2017 FLORIDA BUILDING CODE.

TENSION LAP SPLICE SCHEDULE (CLASS B)

f'_c = 5000 psi ; f_y = 60,000 psi

BAR SIZE	#3	#4	#5	#6	#7	#8	#9	#10	#11
TOP BAR	24"	32"	40"	48"	70"	80"	90"	102"	113"
OTHER BAR	19"	25"	31"	37"	54"	62"	70"	79"	87"

NOTE:
1. LAP SPLICES ARE IN ACCORDANCE WITH ACI 318
2. CLEAR SPACING OF BARS IS 2db AND ALL CLEAR COVER IS NOT LESS THAN db OR CLEARANCES AND TIES PER ACI 318, SECTION 12.2.2
3. TOP BAR SPLICE IS REQUIRED WHERE MORE THAN 12 INCHES OF CONCRETE IS CAST IN THE MEMBER BELOW HORIZONTAL REINFORCEMENT

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STRUCTURAL NOTES

BLOWER & ELECTRICAL UPGRADES
KWRU

STOCK ISLAND, FLORIDA

Revisions

Description	
1	...
2	...
3	...
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THIS SHEET IS NOT VALID WITHOUT THE SIGNATURE AND ORIGINAL SEAL OF A FLORIDA LICENSED ENGINEER.

FOR BIDDING PURPOSES

Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. G-3.0

GENERAL ELECTRICAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE, FLORIDA BUILDING CODE AND OTHER APPLICABLE CODES AND STANDARDS.

2. THE DRAWINGS ARE DIAGRAMMATIC AND DO NOT SHOW ALL OFFSETS, BENDS AND BOXES REQUIRED TO MAKE A COMPLETE NEAT INSTALLATION IN ACCORDANCE WITH N.E.C.
   2.1. WHEN CONFLICTS ARISE IN LOCATIONS WIRING DEVICES, ELECTRICAL EQUIPMENT, DISCONNECTS, PANELBOARDS, ETC. DUE TO FIELD CONDITION OR IMPROPER FIELD COORDINATION CONTRACTOR SHALL BRING IT TO THE ENGINEER'S ATTENTION AND AT NO EXTRA COST RELOCATE, AND OR EXTEND WITHIN A REASONABLE DISTANCE SUCH ITEM WHICH IS IN CONFLICT. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATING LOCATION OF ALL COMPONENTS PRIOR TO ROUGH IN WITH ALL TRADES NO EXTRAS WILL BE ALLOWED FOR FAILURE TO DO SO.

3. THE CONTRACTOR IS RESPONSIBLE FOR EVALUATING FIELD CONDITIONS BY VISITING THE SITE PRIOR TO COMMENCING / BIDDING WORK.

4. THE CONTRACTOR SHALL SATISFACTORILY REPAIR / REPLACE EQUIPMENT OR PART OF STRUCTURE DAMAGED AS A RESULT OF HIS WORK. SURFACES AND FINISHED AREAS SHALL BE RESTORED TO MATCH ADJACENT AREAS.

5. APPROVAL SHALL BE OBTAINED FROM A STRUCTURAL ENGINEER PRIOR TO CUTTING OR DRILLING ANY STRUCTURAL SUPPORT MEMBER.

6. INSTALL POWER AND CONTROL WIRING AND REQUIRED CONTROL COMPONENTS FOR ALL EQUIPMENT IN ORDER TO HAVE A FUNCTIONING SYSTEM.

7. ALL MATERIAL REMOVED SHALL BE DISPOSED OF AS DIRECTED BY OWNER.

8. MINIMUM WIRE SIZE SHALL BE # 10 THHN / THWN UNLESS OTHERWISE NOTED ON PLANS.

9. ALL CONDUCTORS SHALL BE COPPER RUN IN CONDUIT.

10. IF PVC SCHEDULE 80 IS USED FOR UNDERGROUND AND SCHEDULE 80 IS USED FOR ABOVE GROUND CIRCUITS, AN EQUIPMENT GROUND CONDUCTOR SIZED IN ACCORDANCE WITH N.E.C. 250-122 MUST BE INSTALLED AND CONDUIT SIZE INCREASED AS REQUIRED.

11. ALL MATERIALS SHALL BE U.L. APPROVED.

12. NEW TYPEWRITTEN PANEL TALLY SHALL BE FURNISHED AFTER JOB IS COMPLETED.

13. ALL BRANCH CIRCUITS SHALL BE PROPERLY PHASE BALANCED.

14. ALL CONTROL WIRING SHALL RUN IN 3/4" MINIMUM CONDUIT.

15. ALL BRANCH CIRCUITS TO HAVE A GREEN EQUIPMENT GROUNDING CONDUCTOR SIZED AS PER N.E.C. 250.122.

16. ALL EMPTY CONDUITS TO BE PROVIDED WITH NYLON PULL STRINGS.

17. FUSES SHALL BE DUAL ELEMENT, TIME DELAY TYPE UNLESS OTHERWISE NOTED.

18. EQUIPMENT WIRING AND BREAKER SHALL BE BASED ON EQUIPMENT MANUFACTURER RECOMMENDATIONS. CONTRACTOR IS RESPONSIBLE FOR PROVIDING ALL WIRING, BREAKER AND FUSES SIZES IN ACCORDANCE WITH MFRER NAMEPLATE REQUIREMENTS IF DIFFERENT FROM THAT SPECIFIED ON DRAWINGS, AS WELL AS ANY FEEDER CHANGES BEING AFFECTED BY THIS CHANGE CONTRACTOR SHALL MAKE ABOVE MENTIONED CHANGES AT NO EXTRA COST. ALL LUMINARIES SHALL BE PROPERLY SUPPORTED IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS AND LOCAL CODE REQUIREMENTS.

19. RISERS ARE DIAGRAMMATIC ONLY. THEY DO NOT SHOW EVERY BEND REQUIRED FOR THE INSTALLATION.

20. THIS DRAWING IS A GUIDE FOR THE ELECTRICAL INSTALLATION. THE ELECTRICAL CONTRACTOR IS RESPONSIBLE TO PROVIDE A FUNCTIONING SYSTEM.

21. ALL CABLES SHALL BE RUN WITH OUT SPLICES EXCEPT IF OTHERWISE INDICATED.

22. ALL PULL AND JUNCTION BOXES SHALL BE ACCESSIBLE AT ALL TIMES.

23. EXACT POINT AND METHODS OF CONNECTION SHALL BE DETERMINED IN FIELD.

24. ALL WORK SHALL BE DONE IN A NEAT AND WORKMANLIKE MANNER.

25. ALL RACEWAY ROUTED, INSULATED CONDUCTORS SYSTEM SHALL BE COLOR CODED AS FOLLOWS:

	120/208 V SYSTEM
PHASE 'A'	BLACK
PHASE 'B'	RED
PHASE 'C'	BLUE
NEUTRAL	WHITE
GROUND	GREEN
	277/480 V SYSTEM
PHASE 'A'	BROWN
PHASE 'B'	PURPLE
PHASE 'C'	YELLOW
NEUTRAL	GRAY
GROUND	GREEN

26. COORDINATE LOCATION OF ALL EQUIPMENT WITH ENGINEER OF RECORD IN THE FIELD PRIOR TO INSTALLATION.

WIRE SIZING NOTES

20A, 120V CIRCUITS: 0-80 FT - #12 AWG - 1/2"C
81-140 FT - #10 AWG - 3/4"C
141-200 FT - #8 AWG - 3/4"C
201-250 FT - #6 AWG - 1"C
ABOVE 250 FT - #4 AWG - 1 1/4"C

ELECTRICAL SYMBOL LEGEND

$ — 120/277 V., 20 AMP., SINGLE POLE LIGHT SWITCH.

$3 — 3-WAY LIGHT SWITCH, 120/277V, 20A

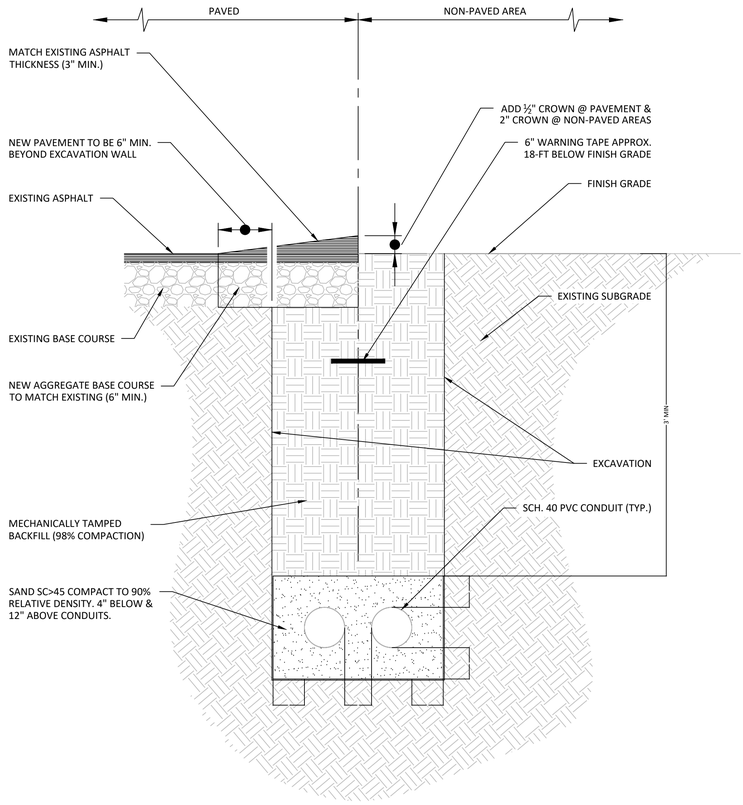
DISCONNECT SWITCH SIZED PER EQUIPMENT NAMEPLATE.

SAFETY DISCONNECT WITH MAGNETIC MOTOR STARTER - OVERLOAD RELAY, CONTACTOR & CONTROLS.

20 A., 120., V., DUPLEX RECEPTACLE, GROUNDING TYPE,

(J) JUNCTION BOX.

WP: WEATHER PROOF
GFI: GROUND FAULT CIRCUIT INTERRUPTER



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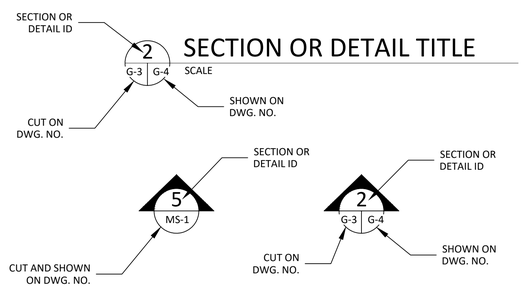
ABBREVIATIONS

A	A/C	Air Conditioner
	ACP	Asbestos Cement Pipe
	AL, ALUM	Aluminum
	ALT	Alternate
	AMP	Ampere
	ARV	Air Release Valve
	ASB	Asbestos
	AUX	Auxiliary
	AWL	Average Water Level
B	BFP	Backflow Preventer
	BFV	Butterfly Valve
	BHP	Brake Horsepower
	BL, B_L	Baseline
	BLDG	Building
	BM	Bench Mark
	BPS	Booster Pump Station
	BPV	Back Pressure Valve
	BSMT	Basement
	BV	Ball Valve
	BYP	Bypass
C	CCC	Chlorine Contact Chamber
	CB	Catch Basin
	CA	Compressed Air
	CCB	Chlorine Contact Basin
	CEM	Cement
	CF	Cubic Foot
	CFS	Cubic Feet Per Second
	CFM	Cubic Feet Per Minute
	CI	Cast Iron
	CIP	Cast Iron Pipe
	CIPC	Cast-in-Place Concrete
	CL, C_L	Centerline
	CLR	Clear
	CMU	Concrete Masonry Unit
	CO	Clean Out
	COL	Column
	CONC	Concrete
	CONT	Continuous
	CTR	Center
	CV	Check Valve
	CWR	Cold Water Return
	CWS	Cold Water Supply
D	DEG, °	Degree
	DI	Ductile Iron
	DIA, ⌀	Diameter
	DIP	Ductile Iron Pipe
	DN	Down
	DO	Dissolved Oxygen
	DS	Digested Sludge
E	E	East
	ECC	Eccentric
	EF	Each Face
	EFF	Effluent
	EL	Elevation
	ELEV	Elevator
	EMER	Emergency
	EO	Electrically Operated
	EOP	Edge Of Pavement
	EQ	Equal or Equalization
	EQUIP	Equipment
	EW	Each Way
	EXH	Exhaust
	EXP	Expansion
F	FE	Flow Element or Fire Extinguisher
	FFE	Finished Floor Elevation
	FH	Fire Hydrant
	FIN	Finished
	FLG	Flange
	FLM	Flow Meter
	FM	Force Main
	FPS	Feet Per Second
	FRP	Fiber Reinforced Plastic
	FT	Foot
	FTG	Footing
G	GA	Gauge
	GAL	Gallon
	GALV	Galvanized
	GLV	Globe Valve
	GPD	Gallons Per Day
	GPH	Gallons Per Hour
	GPM	Gallons Per Minute
	GV	Gate Valve
H	HB	Hose Bibb
	HDWR	Hardware
	HORZ	Horizontal
	HP	Horsepower
	HR	Handrail
	HT	Height
	HWL	High Water Level
	HZ	Hertz
I	ID	Inside Diameter
	IN, "	Inch
	INF	Influent
	INV	Invert
	IPF	Iron Pin Found
	IPS	Injection Pump Station
	IW	Injection Well
J	JCT	Junction
K	KG	Kilogram
	KSI	Kips Per Square Inch
	KGV	Knife Gate Valve
	KW	Kilowatt
L	LAB	Laboratory
	LB	Pound
	LF	Linear Foot
	LH	Left Hand
	LWFC	Lightweight Concrete Fill
	LWL	Low Water Level
M	MAX	Maximum
	MBR	Membrane Batch Reactor
	MCC	Motor Control Center
	MECH	Mechanical
	MEMB	Membrane
	MFM	Magnetic Flow Meter
	MG	Million Gallons
	MGD	Million Gallons Per Day
	MH	Manhole
	MIN	Minute or Minimum
	MISC	Miscellaneous
	MJ	Mechanical Joint
	MM	Millimeter
	MO	Motor Operated
	MSL	Mean Sea Level
	MW	Megawatt or Monitoring Well
	MWL	Maximum Water Level
N	N	North
	NA	Not Applicable
	NG	Natural Gas
	NO, #	Number
	NOM	Nominal
	NPT	National Pipe Thread
	NPW	Non-Potable Water
	NTS	Not To Scale
O	OC	On Center
	OD	Outside Diameter
	ODC	Odor Control
P	PC	Porous Concrete
	PD	Plant Drain
	PG	Pressure Gauge
	PI	Plant Influent
	PL, P_L	Property Line
	PLC	Programmable Logic Center
	PLV	Plug Valve
	PPS	Plant Pump Station
	PRDV	Pressure Reducing Valve
	PRIM	Primary
	PRV	Pressure Relief Valve
	PSS	Pressure Safty Switch
	PSW	Pressure Switch
	PVC	Polyvinyl Chloride
	PVMT	Pavement
	PW	Potable Water
Q	QTY	Quantity
R	RAD, R	Radius
	RC	Reinforced Concrete
	RCC	Roller Compacted Concrete
	REF	Reference
	REQD	Required
	REV	Revision
	RH	Right Hand
	RM	Room
	RPM	Revolution Per Minute
	RFG	Refridgerator
S	S	South
	SBR	Sequencing Batch Reactor
	SCH	Schedule
	SECT	Section
	SD	Storm Drain
	SF	Square Feet
	SHWR	Shower
	SOV	Solenoid Valve
	SPEC	Specification
	SS	Stainless Steel
	STO	Storage
	STD	Standard
	SWW	Storm Water Well
	SYM	Symbol
T	T &P	Time and Pressure
	TB	Thurst Block
	TDH	Total Dynamic Head
	TEMP	Temperature
	TOP	Top of Pavement
	TOS	Top of Slab
	TOW	Top of Wall
	TYP	Typical
U	UON	Unless Otherwise Noted
V	V	Volt
	VAC	Vacuum
	VAL	VALVE
	VAT	Vinyl Asbestos Tile
	VCP	Vitrified Clay Pipe
	VCT	Vitrified Clay Tile
	VEL	Velocity
	VIF	Verify In Field
	VERT	Vertical
	VOL	Volume
W	W	Watt or West
	W/D	Washer / Dryer
	WAS	Waste Activated Sludge
	WS	Waste Sludge or Water Stop
	WT	Weight
	WW	Wastewater
	WWF	Welded Wire Fabric
	WWTP	Wastewater Treatment Plant
Y	YH	Yard Hydrant
	YR	Year

SECTION CUTS & DETAIL CALLOUTS



GENERAL SYMBOL LEGEND

303	EXISTING CONTOUR		OVERHEAD ELECTRIC WIRE
303	FINISHED CONTOUR	PP	EXISTING POWER POLE
20.5	SPOT ELEVATION		PROPOSED PIPING
	ELEVATION DESIGNATION		EXISTING PIPING
	HOSE BIBB		
	EXISTING ELECTRICAL		YARD HYDRANT - PROPOSED
X X	EXISTING FENCE		YARD HYDRANT - EXISTING
X X	NEW FENCE		FIRE HYDRANT - PROPOSED
P	PROPERTY LINE		FIRE HYDRANT - EXISTING
R/W	RIGHT-OF-WAY LINE	CO	CLEAN OUT - PROPOSED
	BALL VALVE	DB-MOV-15	VALVE DESIGNATION
	REDUCER	DB-DLS-5	EQUIPMENT LABEL
	CHECK VALVE		FIELD MOUNTED
	GATE VALVE		FIELD PANEL MOUNTED
	PLUG VALVE		
	BALANCING VALVE	I	INTERLOCK
	BUTTERFLY VALVE		PUMP
	ISOLATION VALVE	XXX OOO	INSTRUMENT (FIELD MTD.)
S	SOLENOID VALVE	XXX OOO	INSTRUMENT (MTD. IN PRIMARY LOCATION)
	PNEUMATIC CONTROL VALVE	S	SCADA
PR	PRESSURE REGULATING VALVE		FLOAT SWITCH
PR	SURGE RELIEF VALVE	XXX OOO	PILOT LIGHT
	AIR RELEASE VALVE		
	NEEDLE VALVE		
	3-WAY ACTUATED VALVE		
	UNDERGROUND ELECTRIC		
FE	FLOW METER		
	CITY WATER LINE (POTABLE)		
	PROPOSED CHEMICAL LINE		
CHL	EXISTING CHLORINE		
S	EXISTING SANITARY SEWER LINE		
	LIQUID CALIBRATION TUBE		

NOTE:
LEGEND APPLIES WHERE INADEQUATE DESCRIPTION AVAILABLE. VERIFY CONFLICTS WITH ENGINEER.

HATCH PATTERNS

CONCRETE
EARTH
GRATING
VEGETATION
GROUT
STONE/GRAVEL
DIAMOND PLATE
DECKING
WOOD
STEEL

Project Information

Approved By:	SJS
Design:	YF
Scale:	AS NOTED
Drawn:	YF
Job No.:	23013.011
Checked:	SJS
Date Issued:	9/04/2024

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(941) 505-1700

ABBREVIATIONS & SYMBOL LEGEND
BLOWER & ELECTRICAL UPGRADES
KWRU
STOCK ISLAND, FLORIDA

Revisions	Description
1	...
2	...
3	...
4	...
5	...
6	...

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FOR BIDDING PURPOSES

Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. G-5.0

0' 200' 400' 600'

1" = 200'

N

PROJECT DATA:

PROJECT:	KWRU BLOWER & ELECTRICAL UPGRADES
OWNERSHIP:	KEY WEST RESORT UTILITIES 6630 FRONT ST STOCK ISLAND, FL 33040
ENGINEER:	THE WEILER ENGINEERING CORPORATION (WEC) STEPHEN J. SUGGS, P.E. NO. 85237 6805 OVERSEAS HIGHWAY MARATHON, FLORIDA 33050 (941) 505-1700

GENERAL INFORMATION:

CONSTRUCTION PHASING:	PROJECT TO BE CONSTRUCTED IN ONE PHASE
DATUM:	N.A.V.D. 1988
FLOOD ZONE:	ZONE "AE 9", AS SHOWN ON: F.E.M.A. FLOOD INSURANCE RATE MAP: #12087C1528K COMMUNITY 125129 EFFECTIVE DATE: FEB 18, 2005
EXISTING ZONING:	MARITIME INDUSTRIES
FUTURE LAND USE:	MIXED USE / COMMERCIAL

Project Information

Approved By:	SJS
Design:	YF
Scale:	AS NOTED
Drawn:	YF
Job No.:	23013.011
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Date Issued:	9/04/2024

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2022 AERIAL PHOTOGRAPH

BLOWER & ELECTRICAL UPGRADES KWRU

STOCK ISLAND, FLORIDA

	Description	Revisions
1	...	...
2	...	...
3	...	...
4	...	...
5	...	...
6	...	...

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Professional Engineer
State of Florida
Registration No. 85237

Sheet No. C-1.0

NOTE:
1. EXISTING CONDITIONS ARE BASED ON BEST AVAILABLE DATA PROVIDED TO WEC FROM PREVIOUS AS-BUILTS. WEC DOES NOT IN ANY MANNER GUARANTEE THE ACCURACY IF THIS INFORMATION. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING THE LOCATIONS OF FIELD CONFLICTS PRIOR TO CONSTRUCTION. NO ADDITIONAL COMPENSATION WILL BE GIVEN FOR EXPLORATORY EXCAVATION OR SIMILAR WORK

0' 16' 32' 48'
1" = 16'

S 47°13'25" E

S.47°13'30"E. 510.80' (D)

510.74' (M)

UN-PLATTED PARCEL
SECTION 35, TOWNSHIP 67 SOUTH
RANGE 23 EAST

304.83' (M)

N 09°10'14" E

N.09°16'30"E. 304.20' (D)

N 09°10'14" E

10.3'

10.1'

ASPHALT/SHELL DRIVE

KWRU OFFICE

NORTH TREATMENT TANK

NORTH TANK HEADWORKS

NORTH TANK BLOWERS & EQUIPMENT

6"CLF

6"PVC

6"PVC

6"PVC

WELL #4

WELL #3

WELL #2 6"PVC @ 28'(NGVD 29')

WELL #1

CONC. WALK

DRYING BED

DRYING BED

DRYING BED

DRYING BED

MIDWELL

(4) FILTER CELLS

(2) FILTER CELLS & CCC

(2) FILTER CELLS & CCC

RELUSE WATER PUMP SYSTEM

EAST & WEST PLANT BLOWERS

EAST TREATMENT TANK

WEST TREATMENT TANK

STAND ALONE CLARIFIER/DIGESTER

CLARIFIER BLOWERS

CHEMICAL SKIDS & ELECTRICAL EQUIPMENT

CHEMICAL FEED SYSTEM

GENERATOR & FUEL

STORAGE SHED

VACUUM PUMP BUILDING

VAC. & SEWAGE

OHW

WTLY R/W

E.O.P.

R/W

SHELL DRIVE

GATE

FRONT STREET

S 06°01'50" W

PROJECT AREA

EXISTING STRUCTURE AND BLOWER EQUIPMENT/PIPING TO BE REMOVED AND REPLACED WITH ELECTRICAL UPGRADE
SEE SHEET S2.0 FOR STRUCTURAL DETAILS. SEE SHEET E1.0 ELECTRICAL SITE PLAN. SEE SHEET E1.1 FOR PROPOSED RISER DIAGRAM

EXISTING ELECTRICAL EQUIPMENT LOCATED INSIDE SHED TO BE REMOVED AND RELOCATED
SEE SHEET E1.0 FOR ELECTRICAL SITE PLAN.

EXISTING 6" AIR PIPING TO BE REMOVED
SEE SHEET P1.0 FOR OVERALL PIPING PLAN.

EXISTING CONCRETE LANDING PAD AND HANDRAIL TO BE REMOVED
SEE SHEET S1.0 FOR STRUCTURAL DETAIL. SEE SHEET D3.0 FOR HANDRAIL DETAILS

EXISTING 8" AIR HEADER AT TANKS TO REMAIN
SEE SHEET P1.0 FOR OVERALL PIPING PLAN.

EXISTING PLATFORM TO REMAIN
PLATFORM TO BE EXTENDED. EXISTING BLOWERS TO BE REMOVED. SEE SHEET S1.0 FOR STRUCTURAL DETAILS. SEE SHEET P1.2 FOR BLOWER PIPING PLAN. SEE SHEET D1.0 FOR BLOWER DETAILS

EXISTING CLARIFIER PIPE TO BE REROUTED
SEE SHEET P1.0 FOR PROPOSED PIPING PLAN

6"CLFC 0.3'W
P.O.B.
FIPC
ILLEGIBLE

6"CLFC 0.5'E
FIPC
ILLEGIBLE

N 57°30'39" W

N.57°15'03"W. 234.83' (D)

235.81' (M)

S 70°13'38" W

S.70°27'50"W. 240.30' (D)

238.64' (M)

PRIVATE ROAD

UN-PLATTED PORTION OF
SECTION 35, TOWNSHIP 67 SOUTH
RANGE 23 EAST

UN-PLATTED PARCEL
SECTION 35, TOWNSHIP 67 SOUTH
RANGE 23 EAST

Project Information

Approved By:	SJS
Scale:	AS NOTED
Job No.:	23013.011
Date Issued:	9/04/2024
Design:	YF
Drawn:	YF
Checked:	SJS

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EXISTING CONDITIONS/DEMO PLAN

BLOWER & ELECTRICAL UPGRADES
KWRU

STOCK ISLAND, FLORIDA

Revisions	Description
1	...
2	...
3	...
4	...
5	...
6	...

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Professional Engineer
State of Florida
Registration No. 85237

Sheet No. C-2.0

PROPOSED EXTENSION TO PLATFORM
SEE SHEET S1.0 FOR STRUCTURAL DETAILS

PRE-ENGINEERED ALUMINUM STAIRS & HANDRAILS
PROVIDED BY CONTRACTOR TO BE ENGINEERED TO MEET FLORIDA BUILDING CODE. FINAL DIMENSIONS WILL BE COORDINATED DURING SUBMITTAL PHASE. LOCATION TO BE ADJUSTED PER SITE PLAN LOCATION. SEE SHEET D3.0 FOR HANDRAIL DETAILS

PRE-ENGINEERED ALUMINUM STAIRS & HANDRAILS ALONG ELEVATED WALKWAY
PROVIDED BY CONTRACTOR TO BE ENGINEERED TO MEET FLORIDA BUILDING CIDE. FINAL DIMESNIONS WILL BE COORDINATED DURING SUBMITTAL PHASE. LOCATION OT BE ADJUSTED PER SITE PLAN LOCATION. SEE SHEET D3.0 FOR HANDRAIL DETAILS.

PROPOSED PRE-ENGINEERED/FABRICATED PLATFORM
SEE SHEET S2.0 FOR STRUCTURAL DETAILS

PROPOSED ELECTRICAL EQUIPMENT
SEE SHEET E1.0 FOR ELECTRICAL SITE PLAN. SEE SHEET E1.1 FOR PROPOSED RISER DIAGRAM.

PROPOSED BLOWER EQUIPMENT
KAESER 60 HP EBS 410L ROTARY SCREW BLOWERS
78" H x 57" W x 75" D
WEIGHT: 3188 POUNDS
SEE SHEET D1.0 FOR DETAILS. SEE SHEET C4.2 FOR PIPING DETAILS

EXISTING PLATFORM
SEE SHEET S1.0 FOR STRUCTURAL DETAILS.

N

0' 4' 8' 12'
1" = 4'

NOTE:
1. EXISTING CONDITIONS ARE BASED ON BEST AVAILABLE DATA PROVIDED TO WEC FROM PREVIOUS AS-BUILTS. WEC DOES NOT IN ANY MANNER GUARANTEE THE ACCURACY IF THIS INFORMATION. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING THE LOCATIONS OF FIELD CONFLICTS PRIOR TO CONSTRUCTION. NO ADDITIONAL COMPENSATION WILL BE GIVEN FOR EXPLORATORY EXCAVATION OR SIMILAR WORK.
2. IT IS THE CONTRACTORS RESPONSIBILITY TO VERIFY ALL MATERIAL LENGTHS, PIPE DIAMETERS, NECESSARY COMPONENTS, ETC. PRIOR TO CONSTRUCTION IN ORDER TO MEET THE DESIGN INTENT OF THIS PROJECT.
3. PIPING PLANS ARE DIAGRAMMATIC AND DO NOT PURPORT TO SHOW ALL FITTINGS, SPECIALS, ETC., WHICH MAY BE NECESSARY TO ACCOMMODATE FIELD LAYING CONDITIONS. THE CONTRACTOR SHALL FURNISH AND INSTALL EXTRA PIPING FITTINGS TO AFFORD PROPER PIPE CLEARANCES AND ALIGNMENT WHERE NECESSARY AT NO ADDITIONAL COST TO THE OWNER.

Project Information

Approved By:	SJS	Design:	YF
Scale:	AS NOTED	Drawn:	YF
Job No.:	23013.011	Checked:	SJS
Date Issued:	9/04/2024		

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PROPOSED SITE PLAN
BLOWER & ELECTRICAL UPGRADES KWRU
STOCK ISLAND, FLORIDA

Revisions	Description
1	...
2	...
3	...
4	...
5	...
6	...

FOR BIDDING PURPOSES

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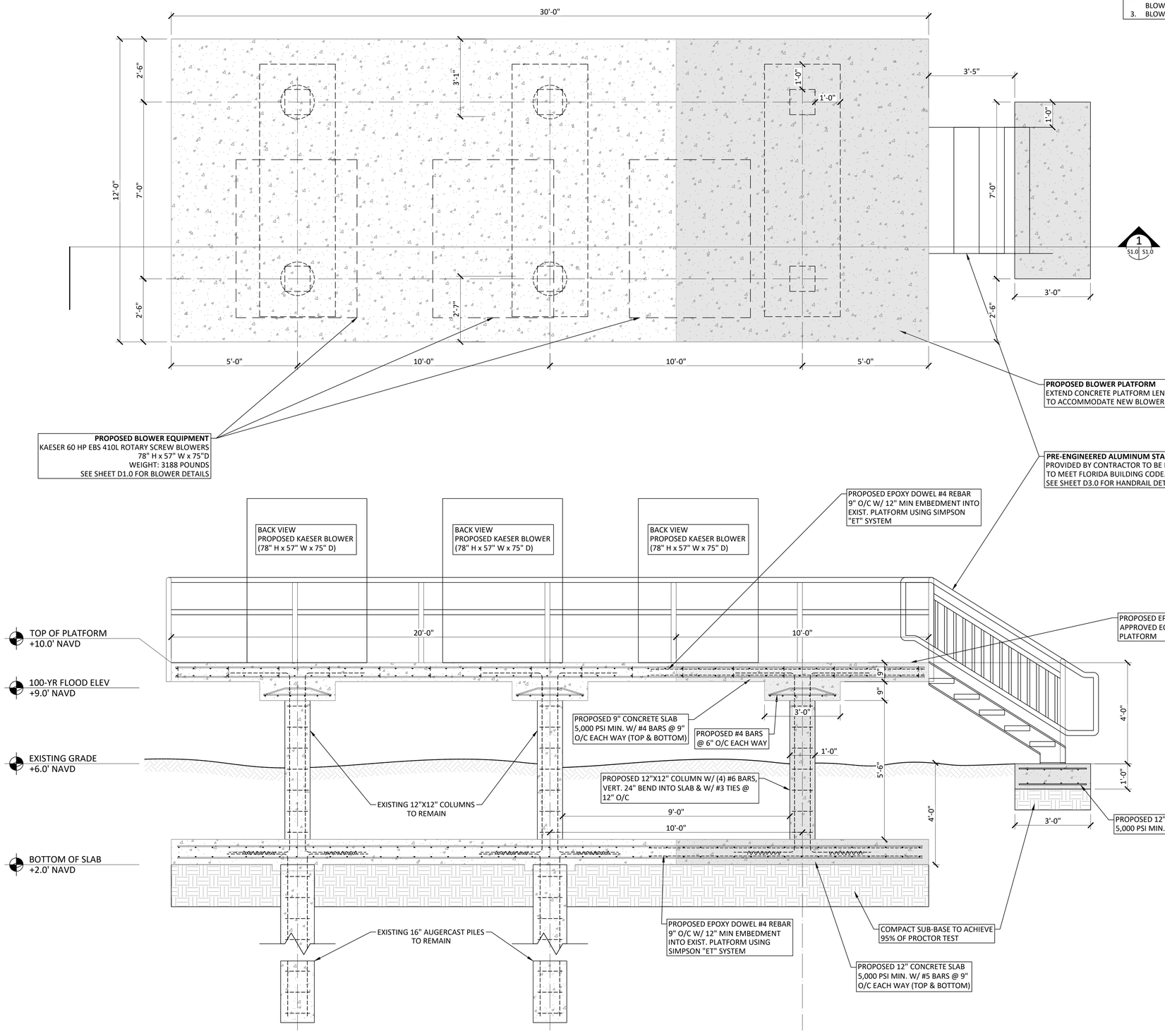
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. C-3.0

NOTE:
1. METHOD OF ANCHORING BLOWERS TO THE PAD SHALL BE APPROVED BY AN ENGINEER.
2. THE THREE (3) 60 HP BLOWERS SHALL BE KAESER EBS 410L. SEE SHEET D1.0-D2.4 FOR BLOWER DETAILS
3. BLOWER MOUNTING WILL BE IN ACCORDANCE WITH DETAIL ON SHEET D5.0



1 S1.0 S1.0 PROPOSED PLATFORM - PROFILE VIEW
SCALE: 1/2" = 1'-0"

Project Information

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BLOWER PLATFORM PLAN & PROFILE

BLOWER & ELECTRICAL UPGRADES KWRU

STOCK ISLAND, FLORIDA

Revisions	Description
1	...
2	...
3	...
4	...
5	...
6	...

FOR BIDDING PURPOSES

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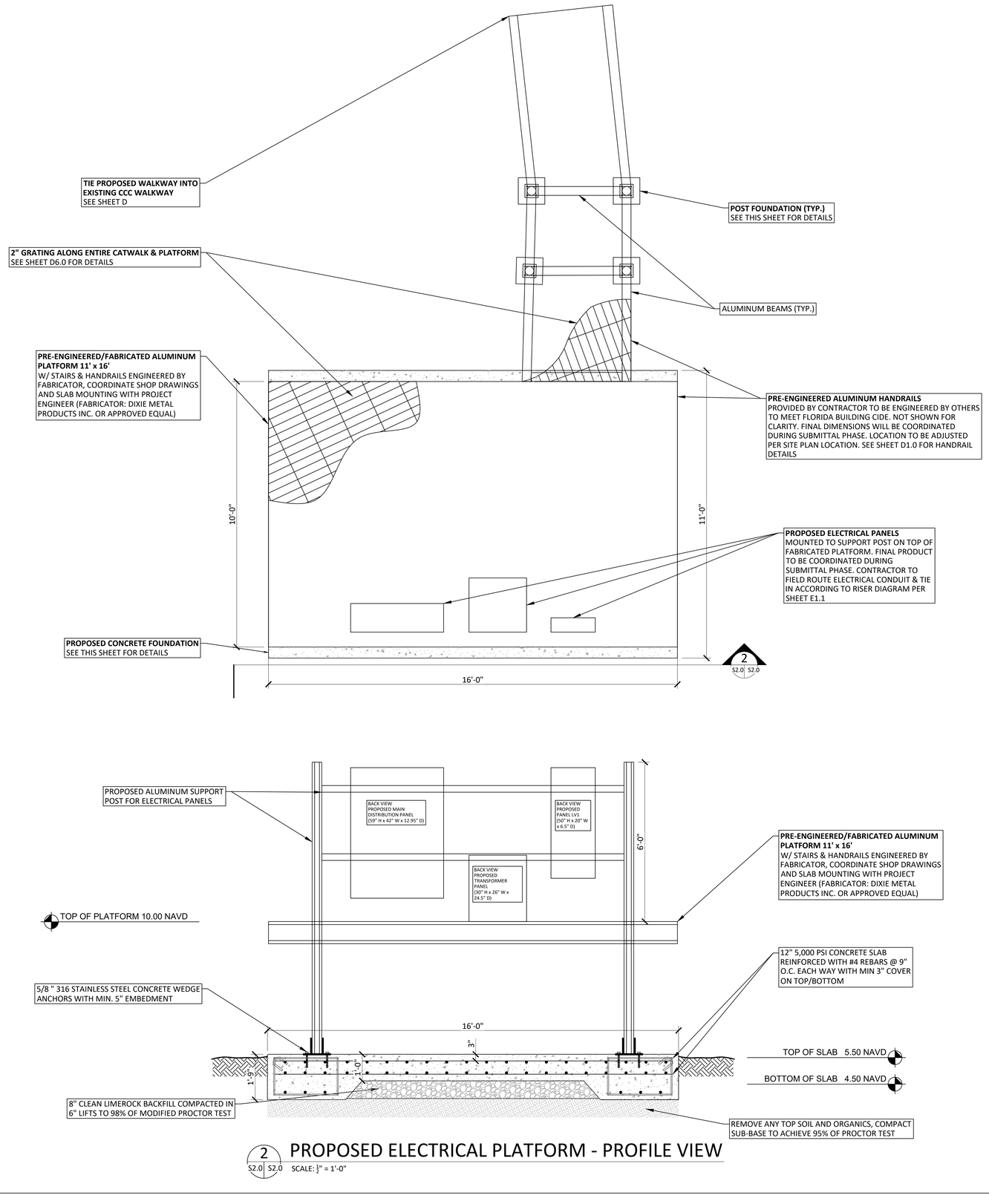
Professional Engineer
State of Florida
Registration No. 85237

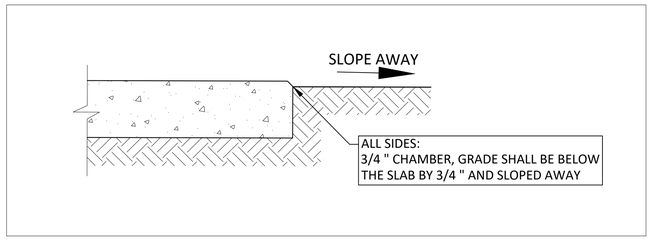
Sheet No. S-1.0



2 S2.0 S2.0 PROPOSED ELECTRICAL PLATFORM - PROFILE VIEW

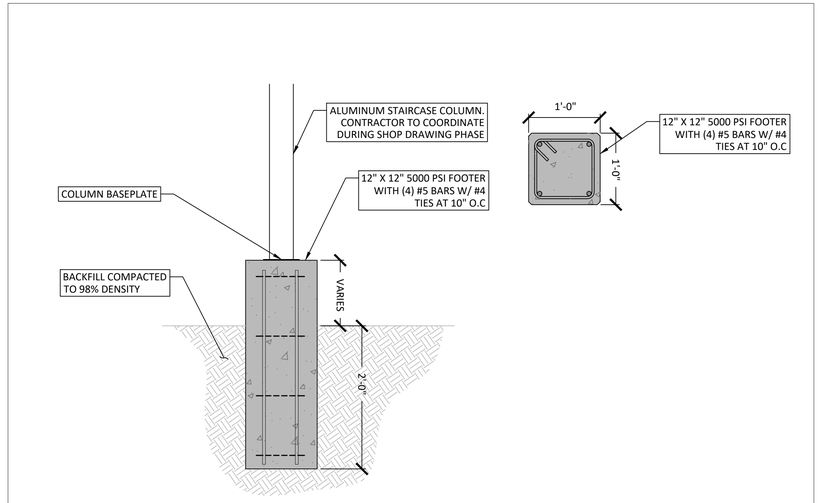
SCALE: $\frac{1}{2}$" = 1'-0"

NOTE:
1. ALL ELECTRICAL WORK SHALL BE FON EINA CCORDANCE WITH FKEC AND NEC REQUIREMENTS AND SPECIFICATIONS. CONTRACTOR TO COORINDATE ALL WORK WITH FKEC AND KWRU.
2. ANY GALVANIZED AND STAINLESS STEEL INTERACTION SHALL BE SEPARATED WITH NEOPRENE OR APPROVED EQUAL.
3. CONTRACTOR IS RESPONSIBLE TO CONFIRM ALL DIMENSIONS PRIOR TO CONSTRUCTION.
4. NOT ALL ASPECTS OF CONSTRUCTION ARE SHOWN. IT IS THE CONTRACTORS RESPONSIBILITY TO PROVIDE ANY NECESSARY FITTINGS, SPECIALS, ETC. REQUIRED TO COMPLETE THE PROJECT AND MAKE IT OPERATIONAL AS INTENDED.
5. EXISTING CONDITIONS ARE BASED ON BEST AVAILABLE DATA PROVIDED TO WEC FROM PREVIOS AS-BUILTS. WEC DOES NOT IN ANY MANNER GUARANTEE THE ACCURACY OF THIS INFORMATION. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING LOCATIONS OF FIELD CONFLICTS



PROPOSED SLOPE AWAY

SCALE: $\frac{3}{4}$" = 1'-0"



STAIRCASE FOOTER DETAIL

SCALE: 1" = 1'-0"

Project Information

Approved By:	SJS
Design:	YF
Scale:	AS NOTED
Drawn:	YF
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ELECTRICAL PLATFROM PLAN & PROFILE

BLOWER & ELECTRICAL UPGRADES KWRU

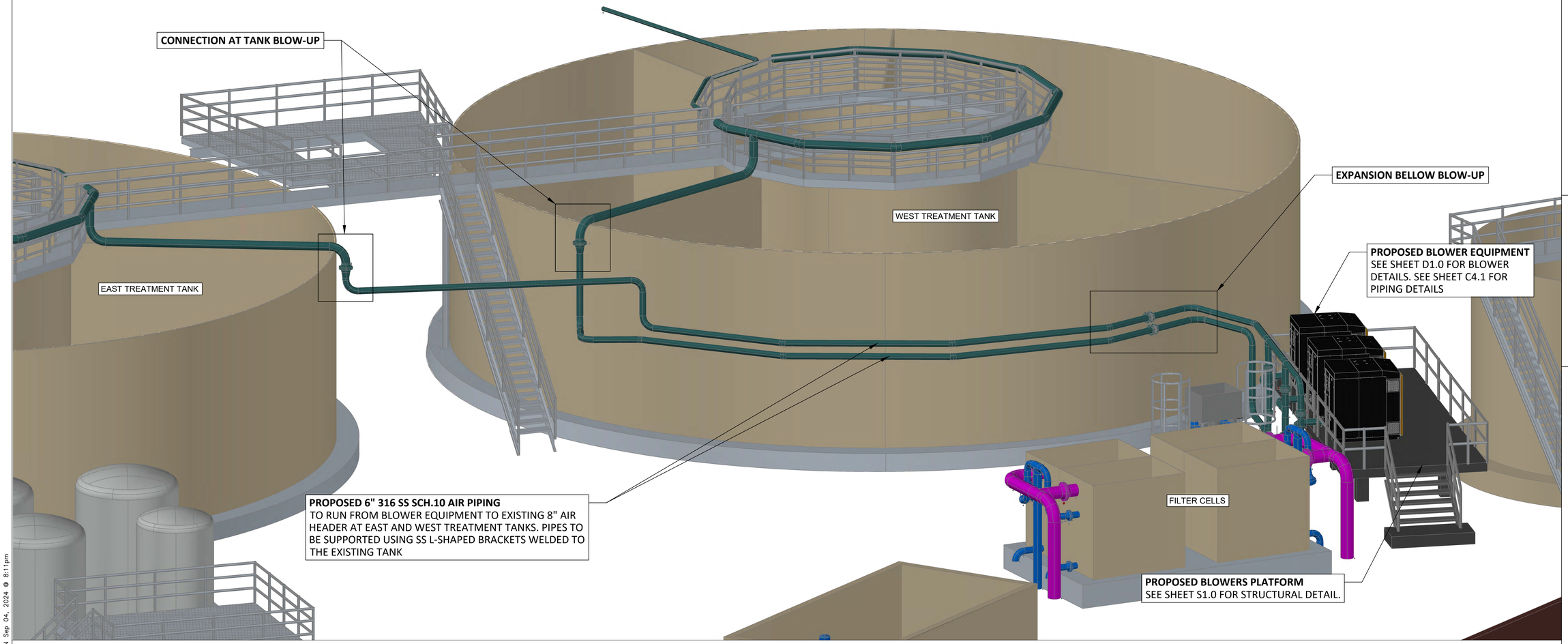
STOCK ISLAND, FLORIDA

Revisions	Description
1	...
2	...
3	...
4	...
5	...
6	...

FOR BIDDING PURPOSES

Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. S-2.0



OVERALL BLOWER PIPING PLAN

SCALE: $\frac{1}{4}$ " = 1'-0"

NOTE:
1. PIPING PLANS ARE DIAGRAMMATIC AND DO NOT PURPORT TO SHOW ALL FITTINGS, SPECIALS, ETC., WHICH MAY BE NECESSARY TO ACCOMMODATE FIELD LAYING CONDITIONS. THE CONTRACTOR SHALL FURNISH AND INSTALL EXTRA PIPING FITTINGS TO AFFORD PROPER PIPE CLEARANCES AND ALIGNMENT WHERE NECESSARY AT NO ADDITIONAL COST TO THE OWNER.
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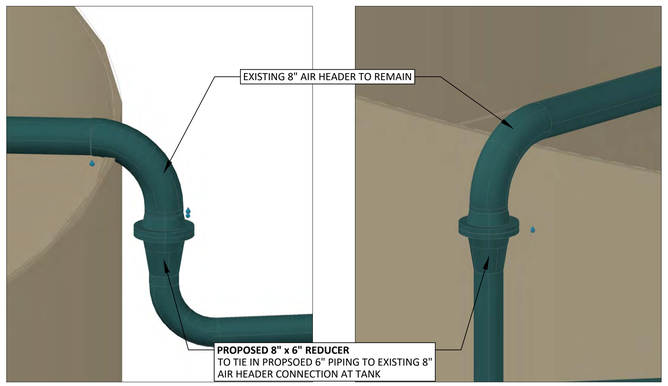
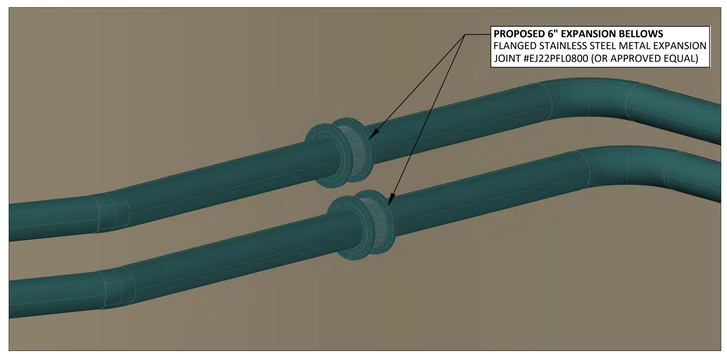


CONNECTION AT TANK BLOW-UP

SCALE: $\frac{3}{4}$ " = 1'-0"



EXPANSION BELLOW BLOW-UP

SCALE: 1 " = 1'-0"

Project Information

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Design:	YF
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OVERALL PIPING PLAN
EAST & WEST BLOWER UPGRADES KWRU
STOCK ISLAND, FLORIDA

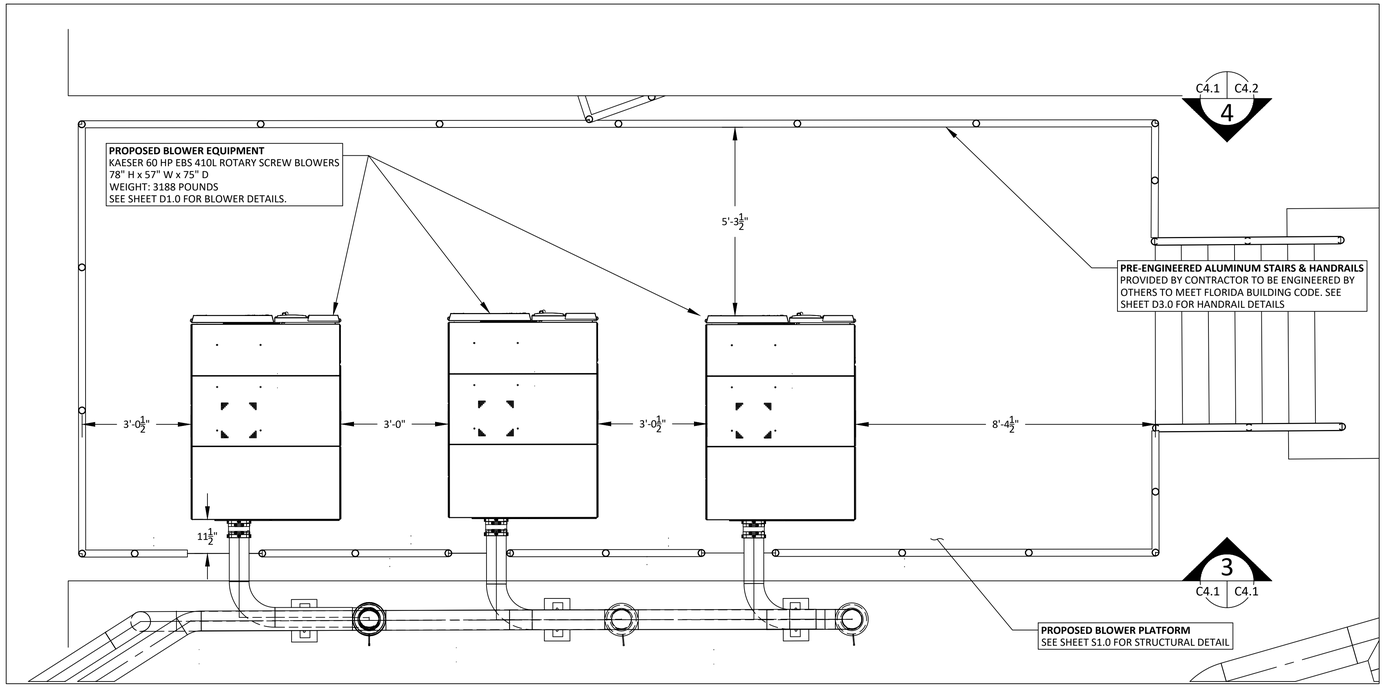
Revisions

	Description
1	...
2	...
3	...
4	...
5	...
6	...

FOR BIDDING PURPOSES

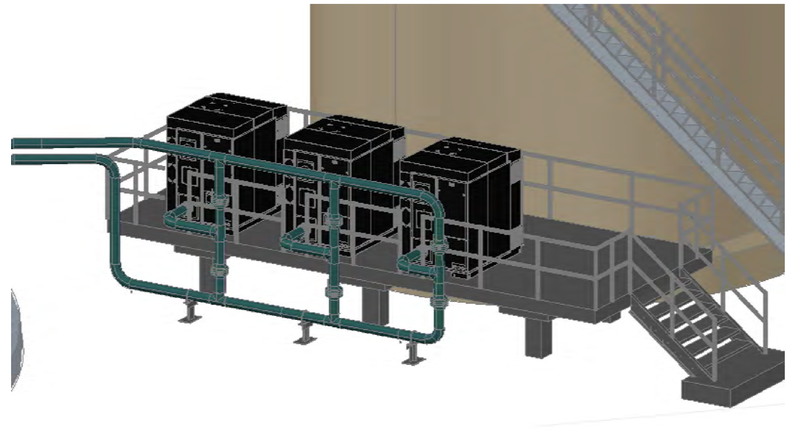
Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. C-4.0



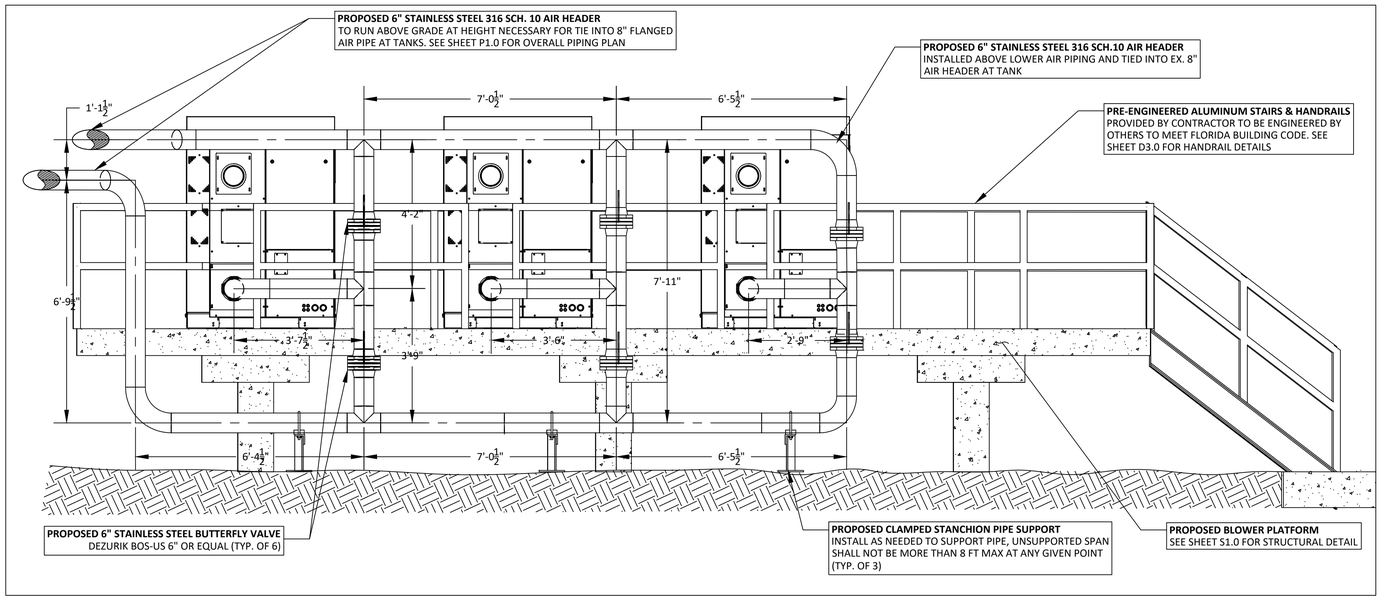
PROPOSED PIPING PLAN - TOP VIEW

SCALE: ½" = 1'-0"



PIPING ISO VIEW

SCALE: NTS



3 PROPOSED PIPING PLAN - BACK VIEW

C4.1 C4.1 SCALE: ½" = 1'-0"

NOTE:
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PIPING PLAN 1

BLOWER & ELECTRICAL UPGRADES
KWRU

STOCK ISLAND, FLORIDA

Revisions

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1	...
2	...
3	...
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FOR BIDDING PURPOSES

Stephen J. Suggs
Professional Engineer
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Sheet No. C-4.1

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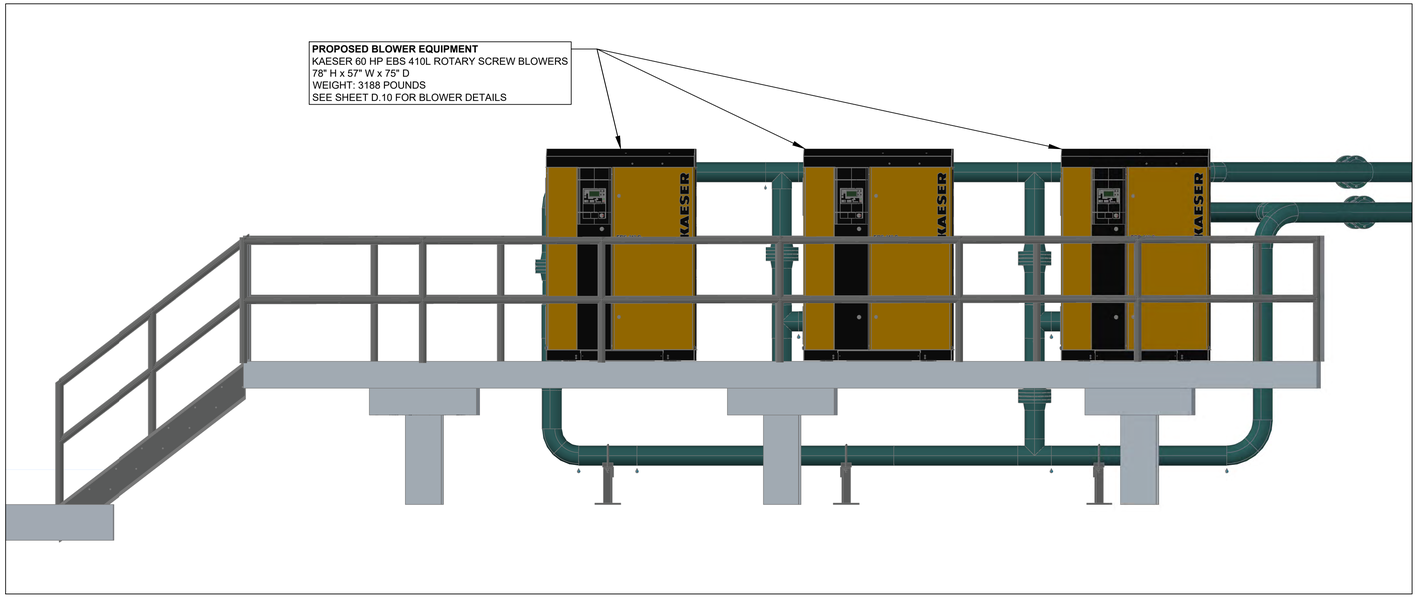
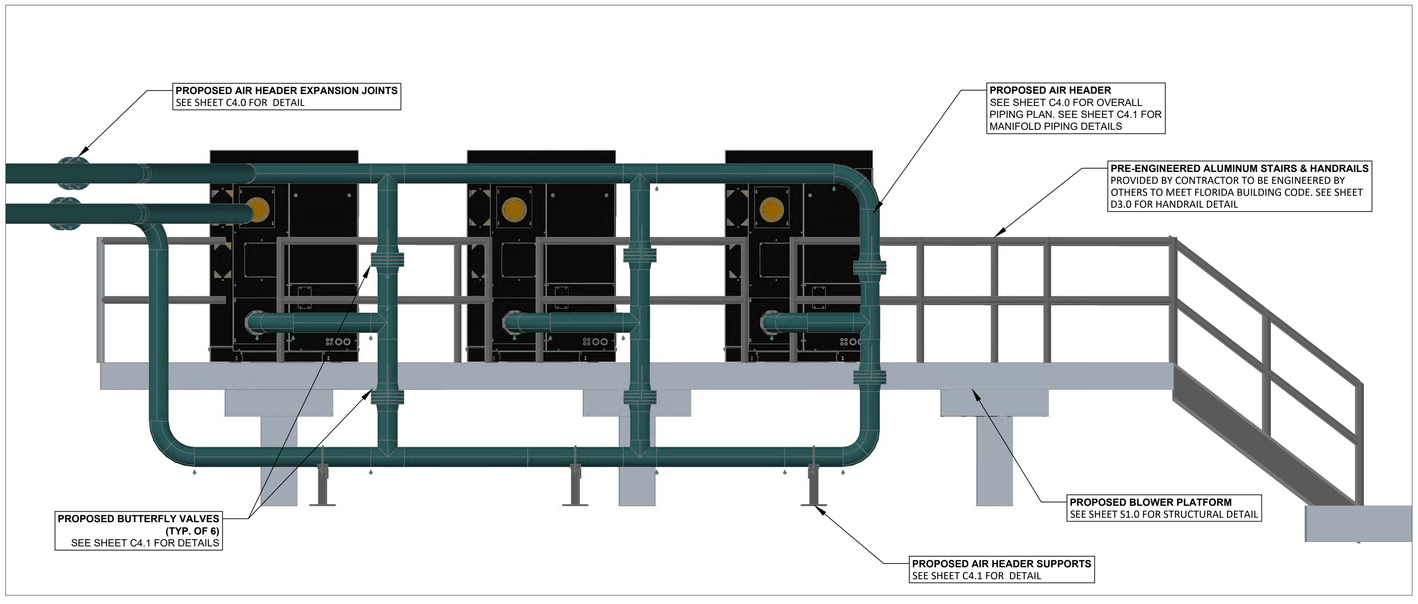


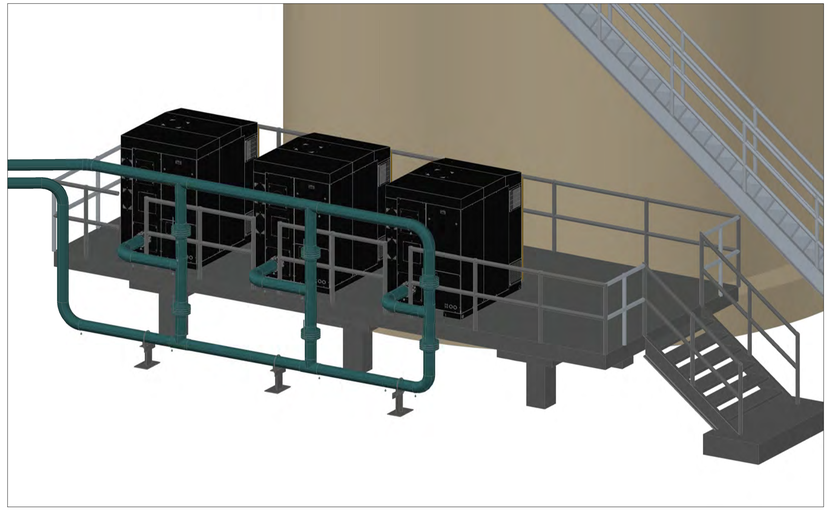
4 PROPOSED PIPING PLAN - FRONT VIEW

C4.2 C4.1 SCALE: $\frac{3}{4}$" = 1'-0"



3 PROPOSED PIPING PLAN - BACK VIEW

C4.2 C4.1 SCALE: $\frac{3}{4}$" = 1'-0"



PIPING ISO VIEW

SCALE: NTS

Project Information

Approved By:	SJS
Design:	YF
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MARATHON, FLORIDA 33050
(941) 505-1700

Revisions

	Description
1	...
2	...
3	...
4	...
5	...
6	...

PIPING PLAN 2

EAST & WEST BLOWER UPGRADES KWRU

STOCK ISLAND, FLORIDA

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FOR BIDDING PURPOSES

Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. C-4.2

PROPOSED ELECTRICAL CONDUIT
TO RUN FROM PANEL B TO WWTP OFFICE

MUDWELL

CHEM. SKID & ELECTRICAL EQUIP.

GENERATOR & FUEL

CHEMICAL FEED SYSTEM

STORAGE SHED

(4) FILTER CELLS

(2) FILTER CELLS & CCC

(2) FILTER CELLS & CCC

PRE-ENGINEERED HANDRAILS
PROVIDED BY CONTRACTOR TO BE ENGINEERED TO MEET FLORIDA BUILDING CODE. FINAL DIMENSIONS WILL BE COORDINATED DURING SUBMITTAL PHASE. LOCATION TO BE ADJUSTED PER SITE PLAN LOCATION. SEE SHEET D3.0 FOR HANDRAIL DETAILS

EXISTING RAW WATER WELL

REUSE WATER PUMP SYSTEM

VACUUM PUMP BUILDING

PRE-ENGINEERED STAIRS & HANDRAILS
PROVIDED BY CONTRACTOR TO BE ENGINEERED TO MEET FLORIDA BUILDING CODE. FINAL DIMENSIONS WILL BE COORDINATED DURING SUBMITTAL PHASE. LOCATION TO BE ADJUSTED PER SITE PLAN LOCATION. SEE SHEET D3.0 FOR HANDRAIL DETAILS

PROPOSED EXTENSION TO PLATFORM
SEE SHEET S1.0 FOR STRUCTURAL DETAILS

PROPOSED PRE-ENGINEERED/FABRICATED PLATFORM
SEE SHEET S2.0 FOR STRUCTURAL DETAILS.

EAST TREATMENT TANK

PROPOSED MAIN DISTRIBUTION PANEL
316 SS NEMA 3R OR 4X. MOUNTED TO PROPOSED PLATFORM. CONTRACTOR TO FIELD ROUTE ELECTRICAL CONDUIT & TIE IN ACCORDING TO RISER DIAGRAM PER SHEET E1.1

PROPOSED BLOWER EQUIPMENT
KAESER 60 HP EBS 410L ROTARY SCREW BLOWERS
78" H x 57" W x 75" D
WEIGHT: 3188 POUNDS
SEE SHEET D1.0 FOR BLOWER DETAIL. SEE SHEET P1.2 FOR PIPING DETAILS. SEE SHEET E2.0 FOR ELECTRICAL DETAIL

STAND ALONE CLARIFIER/DIGESTER

WEST TREATMENT TANK

PROPOSED PANEL LV1
316 SS NEMA 3R OR 4X. MOUNTED TO PROPOSED PLATFORM. CONTRACTOR TO FIELD ROUTE ELECTRICAL CONDUIT & TIE IN ACCORDING TO RISER DIAGRAM PER SHEET E1.1

PROPOSED TRANSFORMER PANEL
316 SS NEMA 3R OR 4X. MOUNTED TO PROPOSED PLATFORM. CONTRACTOR TO FIELD ROUTE ELECTRICAL CONDUIT & TIE IN ACCORDING TO RISER DIAGRAM PER SHEET E1.1

S.70°27'50"W. 240.30' (D)

238.64' (M)

N

0' 4' 8' 12'
1" = 4'

NOTE:
1. EXISTING CONDITIONS ARE BASED ON BEST AVAILABLE DATA PROVIDED TO WEC FROM PREVIOUS AS-BUILTS. WEC DOES NOT IN ANY MANNER GUARANTEE THE ACCURACY IF THIS INFORMATION. THE CONTRACTOR IS RESPONSIBLE FOR CONFIRMING THE LOCATIONS OF FIELD CONFLICTS PRIOR TO CONSTRUCTION. NO ADDITIONAL COMPENSATION WILL BE GIVEN FOR EXPLORATORY EXCAVATION OR SIMILAR WORK.
2. IT IS THE CONTRACTORS RESPONSIBILITY TO VERIFY ALL MATERIAL LENGTHS, PIPE DIAMETERS, NECESSARY COMPONENTS, ETC. PRIOR TO CONSTRUCTION IN ORDER TO MEET THE DESIGN INTENT OF THIS PROJECT.
3. PIPING PLANS ARE DIAGRAMMATIC AND DO NOT PURPORT TO SHOW ALL FITTINGS, SPECIALS, ETC., WHICH MAY BE NECESSARY TO ACCOMMODATE FIELD LAYING CONDITIONS. THE CONTRACTOR SHALL FURNISH AND INSTALL EXTRA PIPING FITTINGS TO AFFORD PROPER PIPE CLEARANCES AND ALIGNMENT WHERE NECESSARY AT NO ADDITIONAL COST TO THE OWNER.

Project Information

Approved By:	SJS
Design:	YF
Scale:	AS NOTED
Drawn:	YF
Job No.:	23013.011
Checked:	SJS
Date Issued:	9/04/2024

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PROPOSED ELECTRICAL SITE PLAN

BLOWER & ELECTRICAL UPGRADES KWRU

STOCK ISLAND, FLORIDA

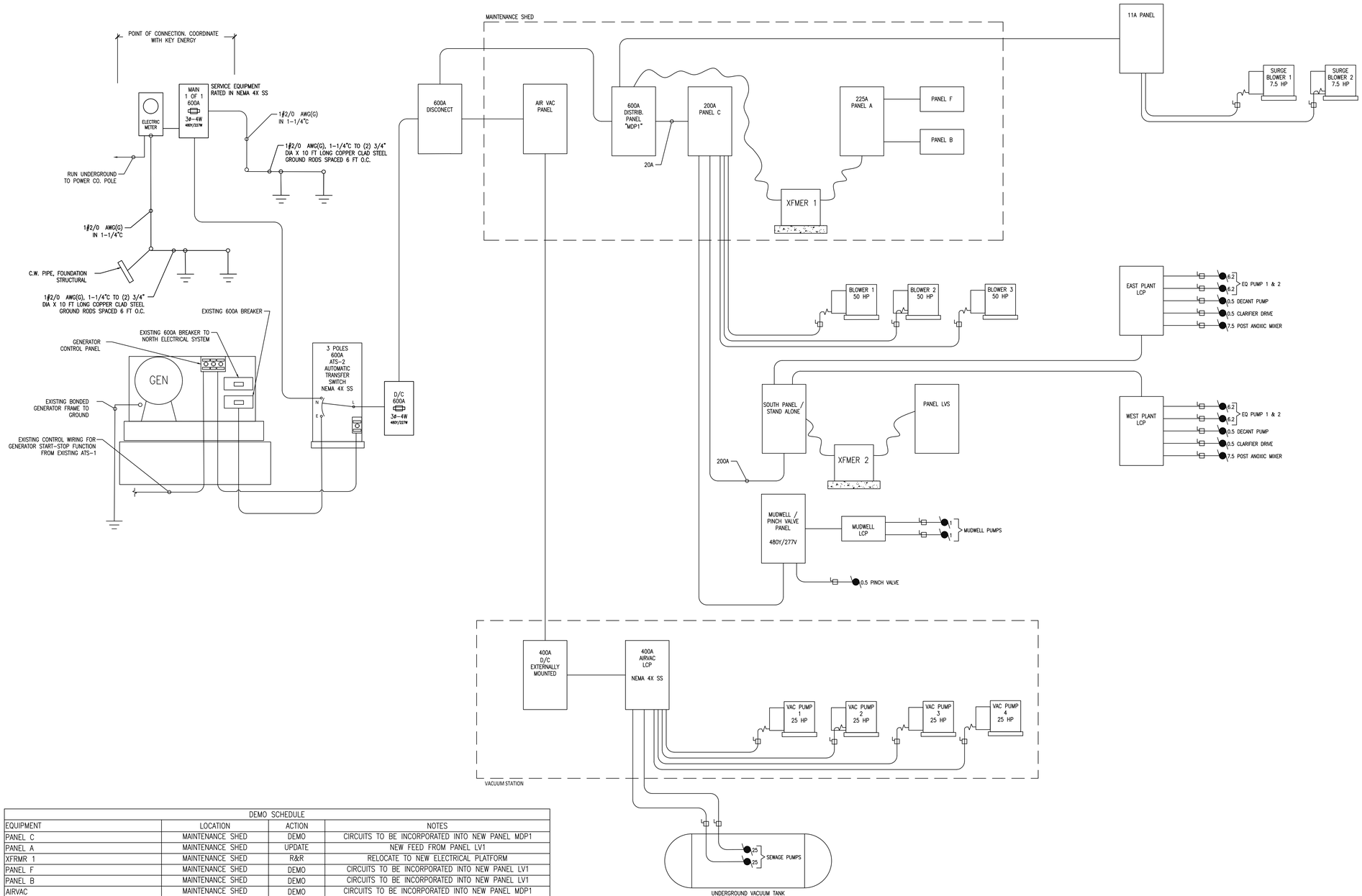
Revisions

	Description
1	...
2	...
3	...
4	...
5	...
6	...

FOR BIDDING PURPOSES

Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. E-1.0



DEMO SCHEDULE			
EQUIPMENT	LOCATION	ACTION	NOTES
PANEL C	MAINTENANCE SHED	DEMO	CIRCUITS TO BE INCORPORATED INTO NEW PANEL MDP1
PANEL A	MAINTENANCE SHED	UPDATE	NEW FEED FROM PANEL LV1
XFRMR 1	MAINTENANCE SHED	R&R	RELOCATE TO NEW ELECTRICAL PLATFORM
PANEL F	MAINTENANCE SHED	DEMO	CIRCUITS TO BE INCORPORATED INTO NEW PANEL LV1
PANEL B	MAINTENANCE SHED	DEMO	CIRCUITS TO BE INCORPORATED INTO NEW PANEL LV1
AIRVAC	MAINTENANCE SHED	DEMO	CIRCUITS TO BE INCORPORATED INTO NEW PANEL MDP1
SOUTH PANEL STAND ALONE		DEMO	CIRCUITS TO BE REMOVED. MDP1 WILL FEED EAST/WEST PLANT LCPs
XFRMR 2		DEMO	CIRCUITS TO BE REMOVED
PANEL LVS		DEMO	CIRCUITS TO BE INCORPORATED INTO LV1
MUDWELL/PINCH VALVE PANEL		DEMO	CIRCUITS TO BE REMOVED. MDP1 WILL FEED MUDWELL LCP AND PINCH VALVE INDIVIDUALLY
600A DISCONNECT	EXT. MAINTENANCE SHED	DEMO	CIRCUITS TO BE REMOVED
NOTE: CONTRACTOR RESPONSIBLE FOR DETERMINING WHAT IS STILL IN USE FOR ALL ELECTRICAL PANELS AND WHAT NEEDS TO BE REROUTED.			

NOTE:
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2. IT IS UNCLEAR WHICH COMPONENTS OF THE EXISTING ELECTRICAL SYSTEM ARE IN USE. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING WHAT IS IN USE FOR ALL ELECTRICAL PANELS AND WHAT NEEDS TO BE REROUTED.

EXISTING EAST/WEST TRAIN ELECTRICAL SYSTEM

SCALE: NTS

Project Information

Approved By:	SJS
Design:	YF
Scale:	AS NOTED
Drawn:	YF
Job No.:	23013.011
Checked:	SJS
Date Issued:	9/04/2024

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EXISTING ELECTRICAL RISER DIAGRAM & DEMO SCHEDULE

BLOWER & ELECTRICAL UPGRADES KWRU

STOCK ISLAND, FLORIDA

Revisions	Description
1	...
2	...
3	...
4	...
5	...
6	...

FOR BIDDING PURPOSES

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Professional Engineer
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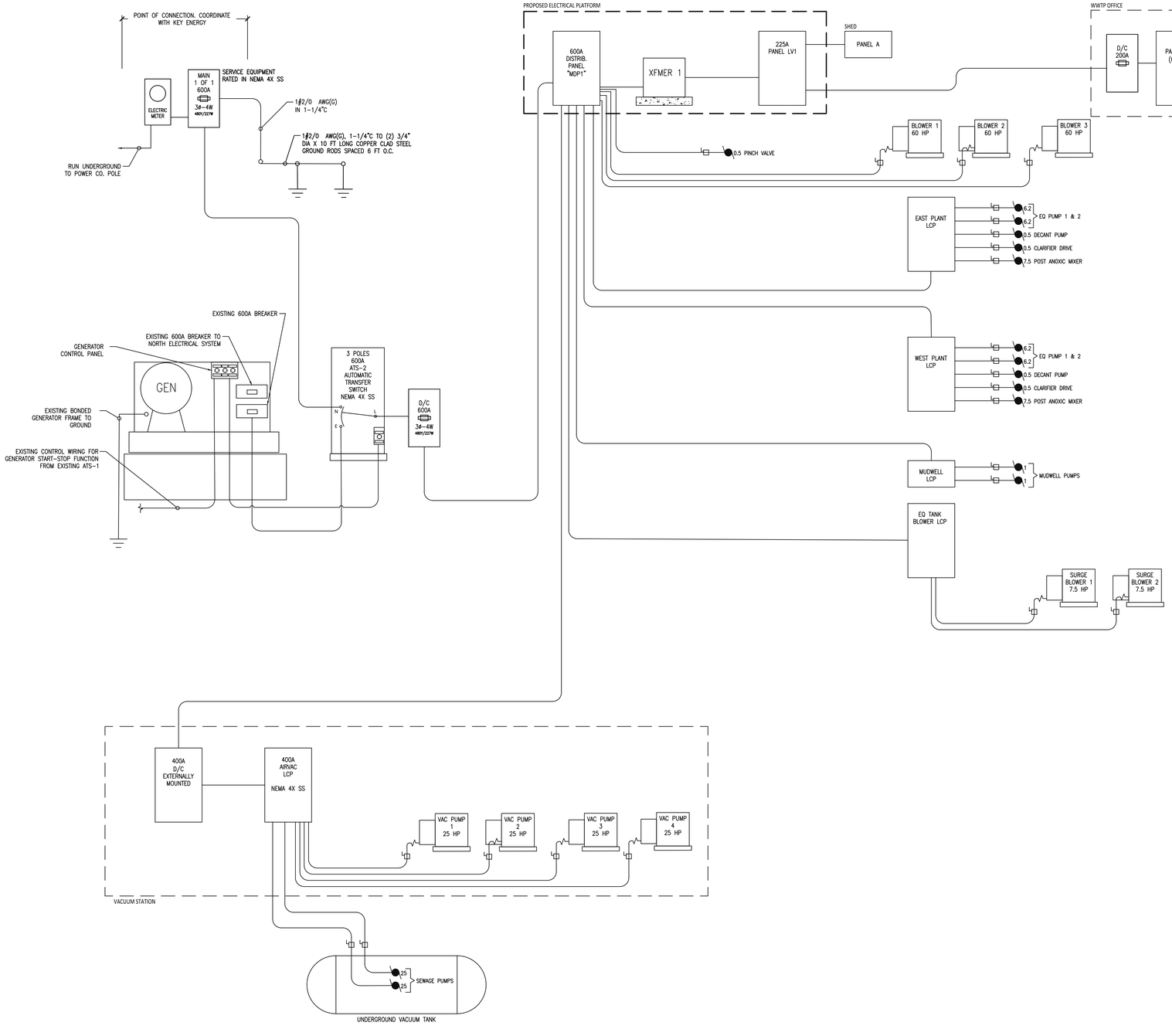
Sheet No. E-1.1



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2. IT IS UNCLEAR WHICH COMPONENTS OF THE EXISTING ELECTRICAL SYSTEM ARE IN USE. THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING WHAT IS STILL IN USE FOR ALL ELECTRICAL PANELS AND WHAT NEEDS TO BE REROUTED.

PANEL SCHEDULE – MDP1					
DISTRIBUTION PANEL	MDP1			MAIN BUS	600A
VOLTAGE 480/227V, 3PH, 4W				MAIN DISCONNECT	
DESCRIPTION		TRIP	POLE	FEEDER	
MUDWELL LCP		20	3P	3#10 , 1#10G , 1"C	
PINCH VALVE		15	3P	3#10 , 1#10G , 1"C	
EAST PLANT LCP		40	3P	3#8 , 1#10G , 1"C	
WEST PLANT LCP		40	3P	3#8 , 1#10G , 1"C	
BLOWER 1		150	3P	4#1/0 , 1#6G , 2"C	
BLOWER 2		150	3P	4#1/0 , 1#6G , 2"C	
BLOWER 3		150	3P	4#1/0 , 1#6G , 2"C	
EQ TANK BLOWER LCP		40	3P	3#8 , 1#10G , 1"C	
AIRVAC		400	3P	4#3/0 , 1#2G , 3" C	
XFRMR 1		150	3P	3#6 , 1#8G , 2" C	

PANEL SCHEDULE – LV1					
LOW VOLTAGE PANEL 1	LV1			MAIN AMP	225A
VOLTAGE DELTA 240V, 3PH				FED FROM	XFRMR T1
DESCRIPTION		TRIP	POLE	WIRE	
MAINTENANCE SHED PANEL A		225	3P	#4/0	
OFFICE DISCONNECT/LV2		150	1P	#2/0	
SPARE		60	2P	#4	
PANEL G TUB PUMPS		50	3P	#6	
LEAN 2 OUTLET		20	1P	#10	
KOHLER GENSET BAT CHRGR		20	1P	#10	
CHLORINE BLDG		20	1P	#10	
TED'S SHED & LEAN 2 OUTLET		20	1P	#10	
		20	1P	#10	

PANEL SCHEDULE – A					
LOW VOLTAGE PANEL A	A			MAIN AMP	225A
VOLTAGE DELTA 240V, 3PH				FED FROM	LV1
DESCRIPTION		TRIP	POLE	WIRE	
SHOP LIGHTS		20	1P	#10	
WELDER OUTLET SHOP		20	2P	#10	
SHOP RECEPT		20	1P	#10	
WELDER OUTLET LEAN 2		40	2P	#8	
CONSTRUCTION TRAILER		60	2P	#4	
OUTLET LEAN 2		20	1P	#10	
PANEL H VAC BLDG		30	3P	#8	
SO CCC RECEPT		20	1P	#10	
OUTLET STAIRS		20	1P	#10	
GATE		20	1P	#10	
GEN JACKET HEATERS		50	2P	#6	

PROPOSED EAST/WEST TRAIN ELECTRICAL SYSTEM

SCALE: NTS

Project Information

Approved By:	SJS
Design:	YF
Scale:	AS NOTED
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PROPOSED ELECTRICAL RISER DIAGRAM & PANEL SCHEDULE

BLOWER & ELECTRICAL UPGRADES KWRU

STOCK ISLAND, FLORIDA

Revisions	Description
1	...
2	...
3	...
4	...
5	...
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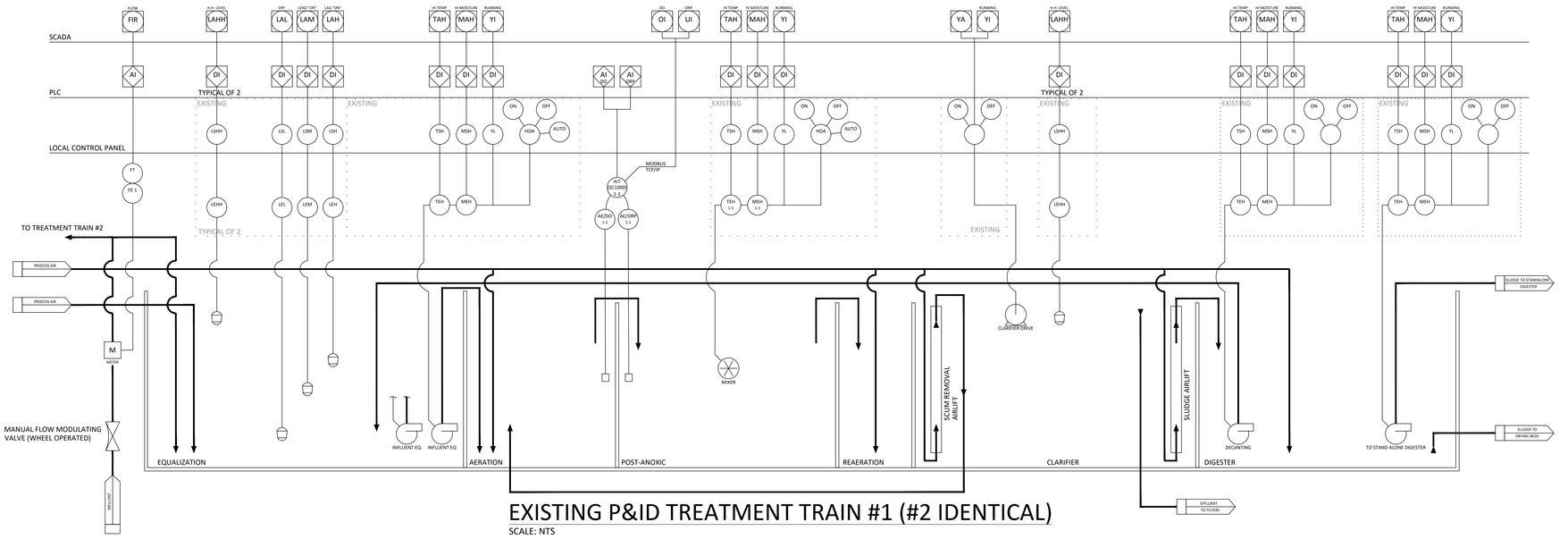
FOR BIDDING PURPOSES

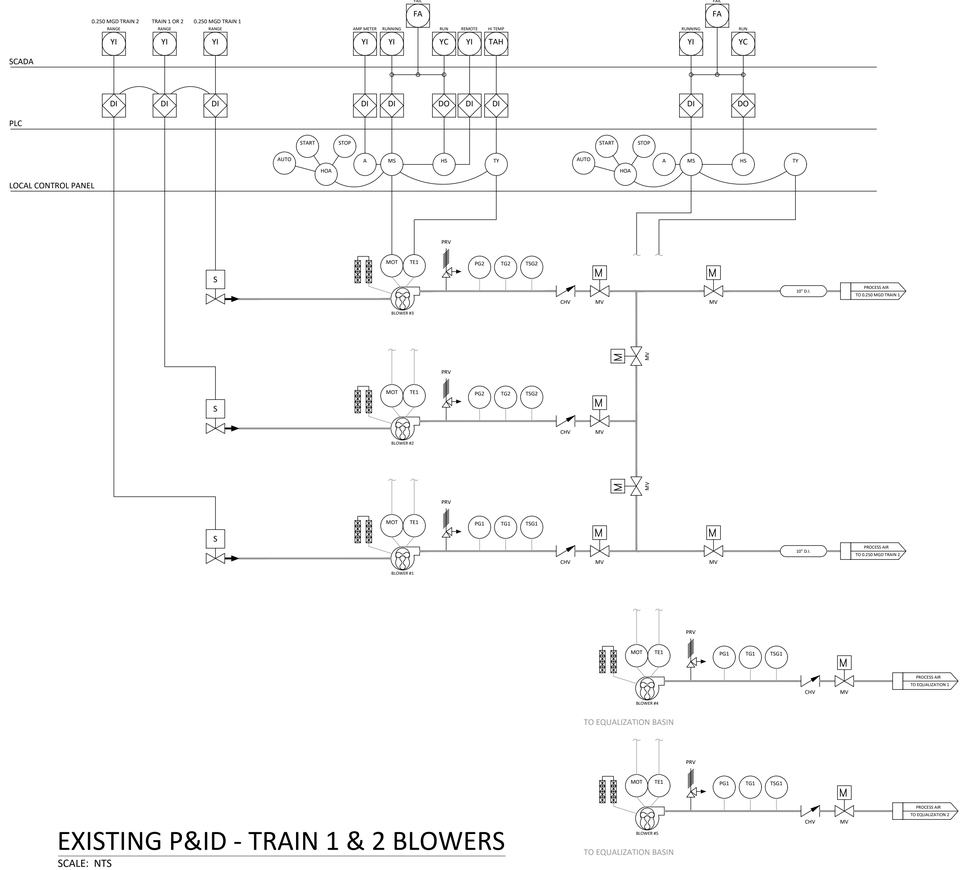
Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. E-1.2



EXISTING P&ID TREATMENT TRAIN #1 (#2 IDENTICAL)

SCALE: NTS



EXISTING P&ID - TRAIN 1 & 2 BLOWERS

SCALE: NTS

NOTE:

1. PLANS ARE DIAGRAMATIC IN NATURE, IT IS THE CONTRACTORS RESPONSIBILITY TO VERIFY ALL MATERIAL LENGTHS, PIPE DIAMETERS, NECESSARY COMPONENTS, ETC. PRIOR TO CONSTRUCTION IN ORDER TO MEET THE DESIGN INTENT OF THIS PROJECT.

Project Information

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Design:	YF
Scale:	AS NOTED
Drawn:	YF
Job No.:	23013.011
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Date Issued:	9/04/2024

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EXISTING P&IDs

BLOWER & ELECTRICAL UPGRADES
KWRU

STOCK ISLAND, FLORIDA

Revisions	Description
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...	4
...	5
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Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. E-1.3

TO BE ISSUED VIA ADDENDUM

PROPOSED P&IDs

BLOWER & ELECTRICAL UPGRADES
KWRU

STOCK ISLAND, FLORIDA

Project Information			
Approved By:	SJS	Design:	YF
Scale:	AS NOTED	Drawn:	YF
Job No.:	23013.011	Checked:	SJS
Date Issued:	9/04/2024		

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	Description	Revisions
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Professional Engineer
State of Florida
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Sheet No. E-1.4

: Center of gravity
Position marginally dependent on design

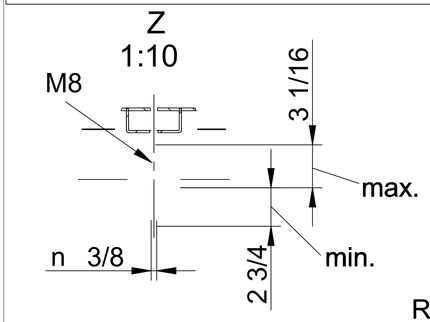
SFC / STC						
Type	Nominal power	A/A***	X*	Y*	Z*	Weight **
EBS 410	60 hp	2 3/4 / 2 3/8	34 5/8 / 35 7/16	40 3/16 / 39 3/8	32 11/16 / 33 1/16	~3188/3172 lb
	75 hp		35 7/16 / 36 1/4	37 3/8 / 36 5/8	33 7/16 / 34 1/4	~3221/3353 lb
	100 hp		36 1/4 / 37	36 5/8 / 36 1/4	33 7/8 / 35 1/16	~3355/3527 lb

* (approximate dimensions)

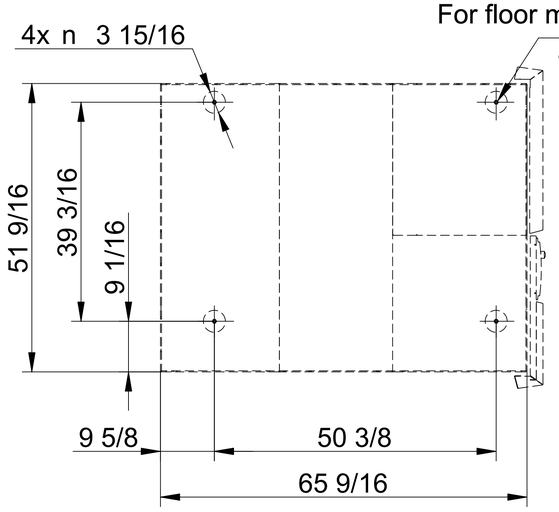
** Nominal value: Actual value depends on design

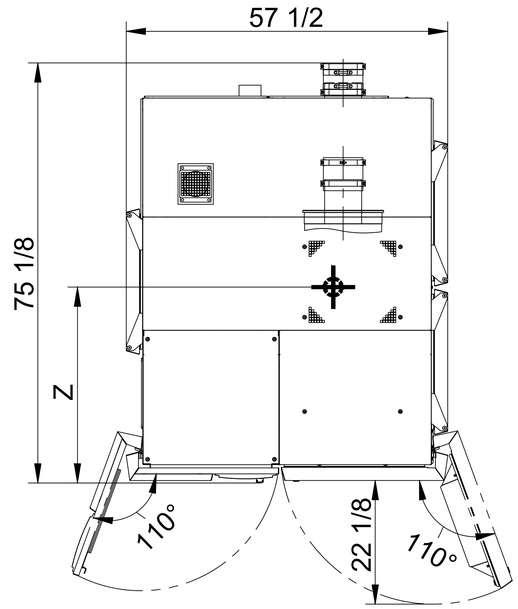
*** Dimensions without check valve

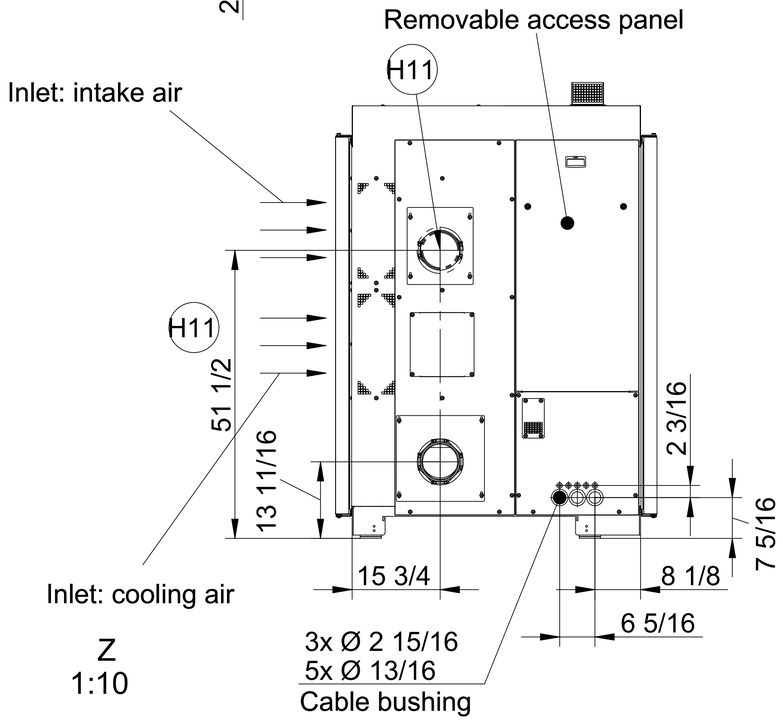
Dimensions shown in inches

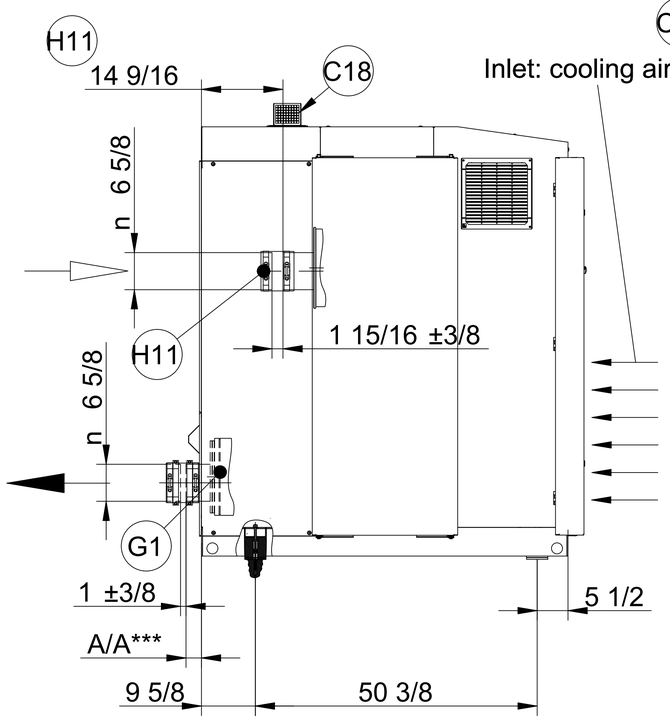


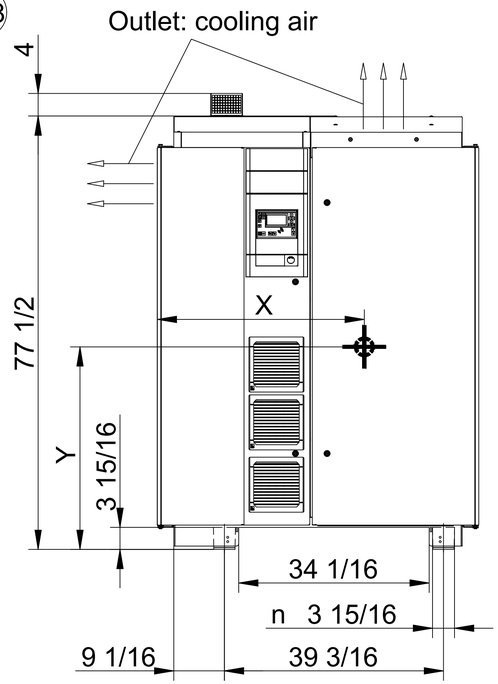
Foundation plan











G1	Check valve
H11	Intake from pipeline
C18	Unloaded press. cont. valve

Change number	Projection	Scale		Date	Name		
		1:25	Drawn	20.04.2020	BOGISCH2		
Document TZM 10477447 USE 00		Original A3	Edited	15.09.2020	BOGISCH2	Language USE	Sheet 1 / 1
			Released	15.09.2020	MLYNEK1		
Document TZD 10477447 D 00		Designation EBS.2 SFC/STC pr					
Status Released		Dimension and connection dim.					

Stand 13.09.2016

Project Information

Approved By:	SJS	Design: YF
Scale:	AS NOTED	Drawn: YF
Job No.:	23013.011	Checked: SJS
Date Issued:	9/04/2024	

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BLOWER DETAILS
BLOWER & ELECTRICAL UPGRADES
KWRU
STOCK ISLAND, FLORIDA

Revisions / Description

1	...	...
2	...	...
3	...	...
4	...	...
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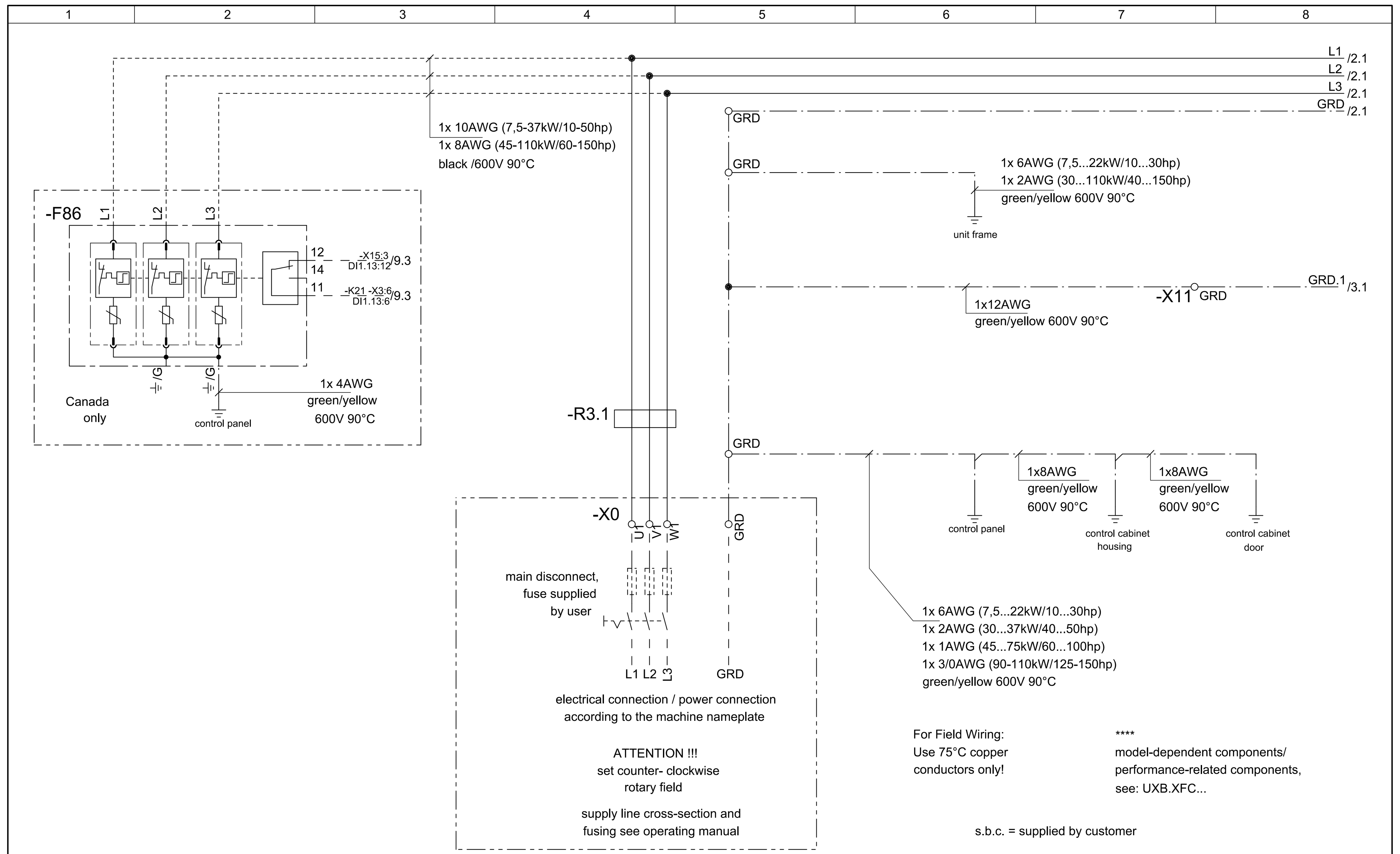
Professional Engineer
State of Florida
Registration No. 85237

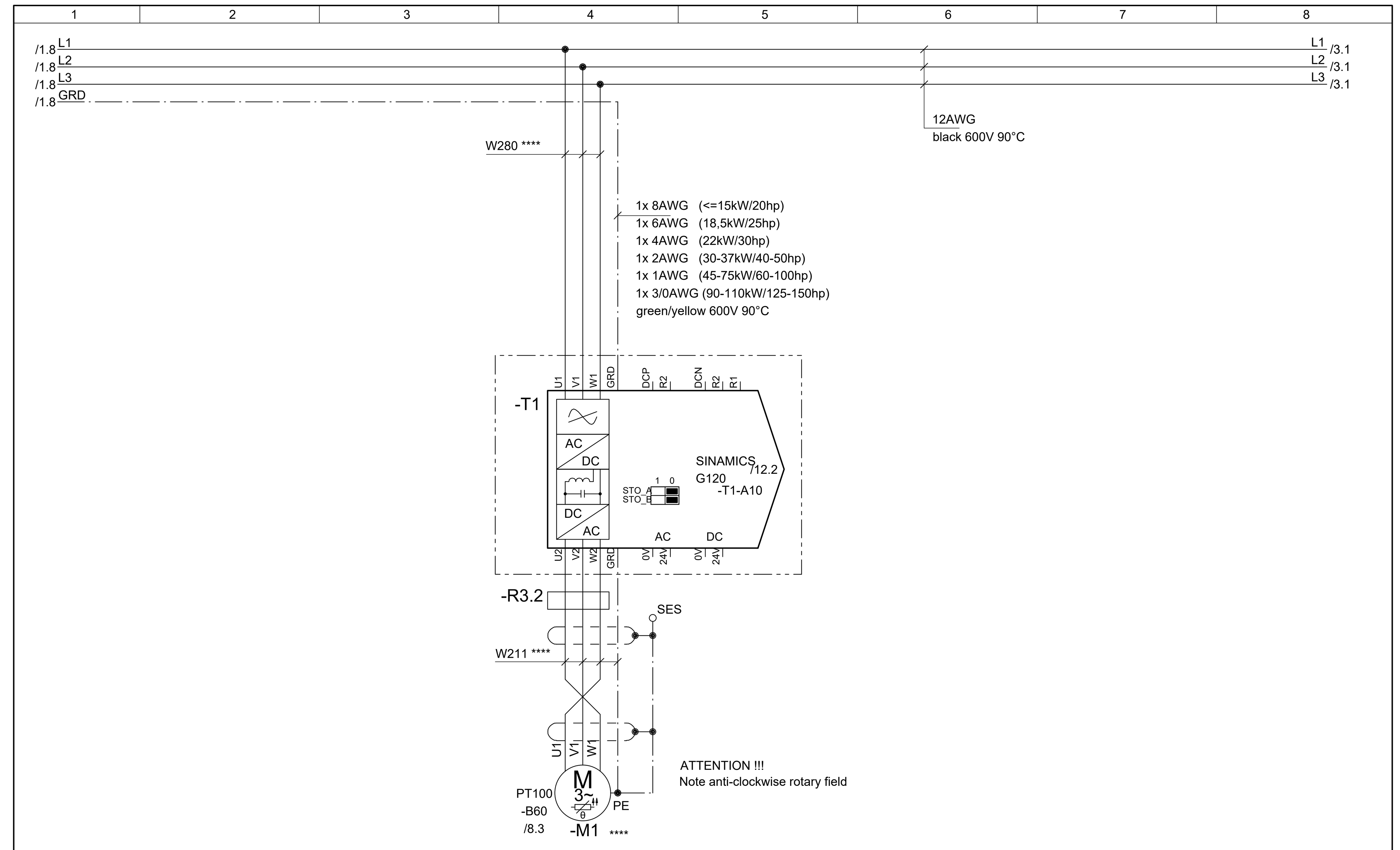
Sheet No. D-1.0



Function: Surge protective device
Group of function: input voltage

c			Date	14.02.2023
b			Drawn	M.Zeeh
a			Released	M.Zeeh
D Change	Date	Name		

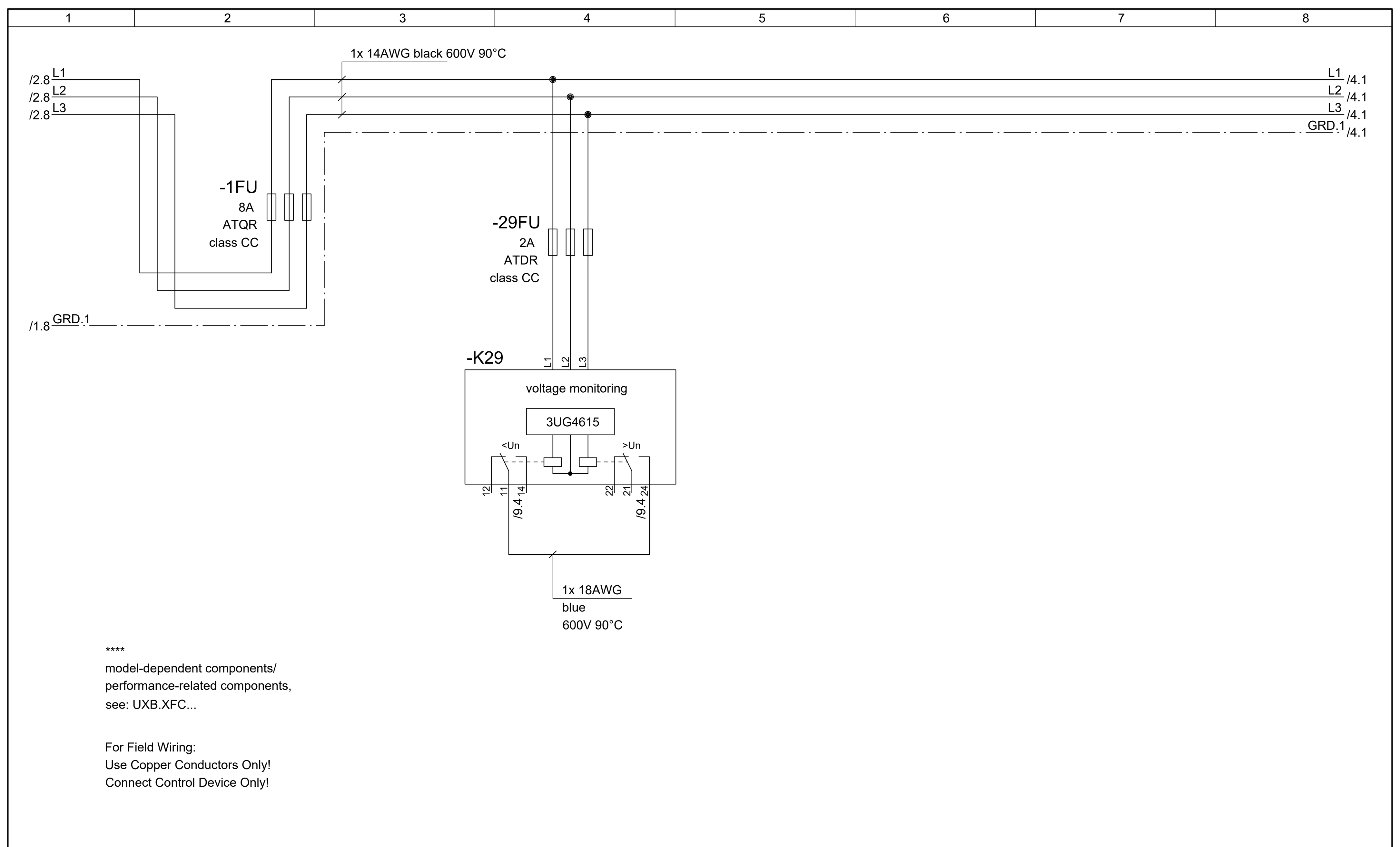
SXB.XFC-U3030.03
wiring diagram
Blower xFC+SC2
input voltage
SXB.XFC-U3032.04
page 1
16 Sht.



Function: frequency converter + compressor motor
Group of function: power unit

c			Date	14.02.2023
b			Drawn	M.Zeeh
a			Released	M.Zeeh
D Change	Date	Name		

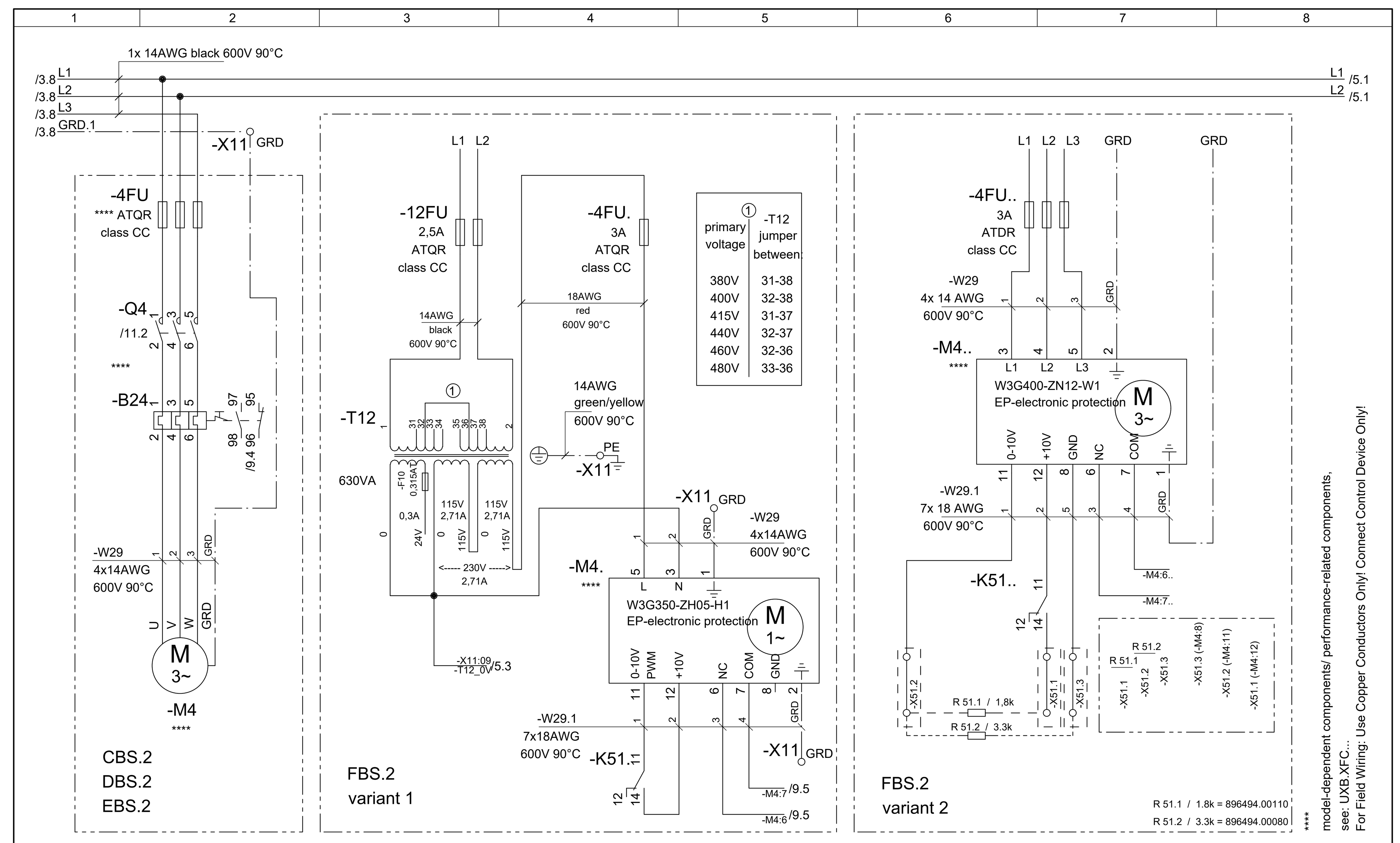
SXB.XFC-U3030.03
wiring diagram
Blower xFC+SC2
power unit
SXB.XFC-U3032.04
page 2
16 Sht.



Function: control voltage tapping phase sequence relay
Group of function: /phase monitoring

c			Date	14.02.2023
b			Drawn	M.Zeeh
a			Released	M.Zeeh
D Change	Date	Name		

SXB.XFC-U3030.03
wiring diagram
Blower xFC+SC2
power unit vent
SXB.XFC-U3032.04
page 3
16 Sht.



Function: vent motor
Group of function: soundproofing casing

c			Date	14.02.2023
b			Drawn	M.Zeeh
a			Released	M.Zeeh
D Change	Date	Name		

wiring diagram
Blower xFC+SC2
power unit vent
SXB.XFC-U3032.04
page 4
16 Sht.

Project Information

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BLOWER ONE-LINE DIAGRAMS

BLOWER & ELECTRICAL UPGRADES KWRU

STOCK ISLAND, FLORIDA

Revisions	Description
1 ...	...
2 ...	...
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Sheet No. D-2.0

No.: 902373 05 USE

Operating manual Rotary screw blower
EBS pr SIGMA CONTROL 2

13 Annex
13.3 Electrical diagrams

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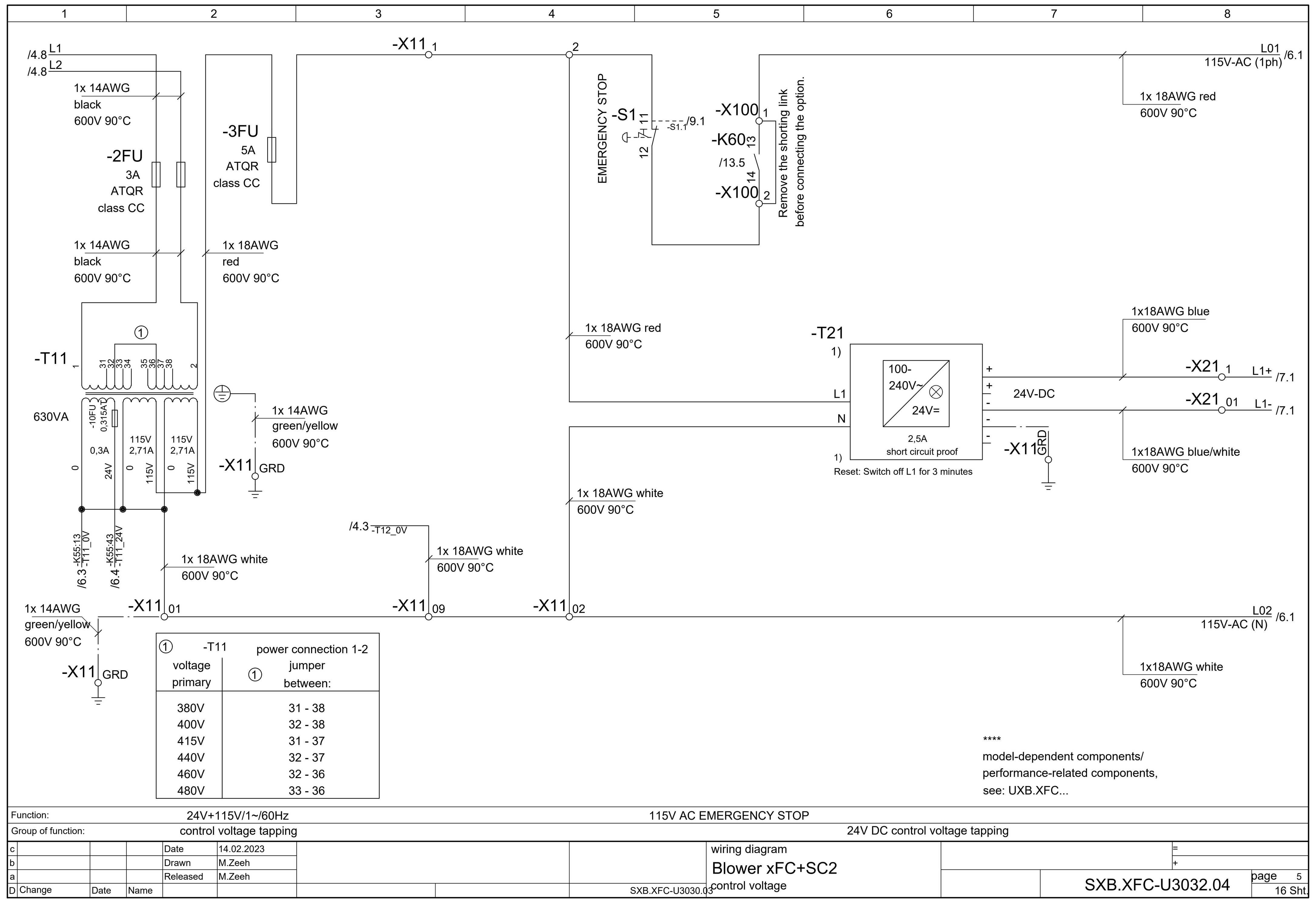

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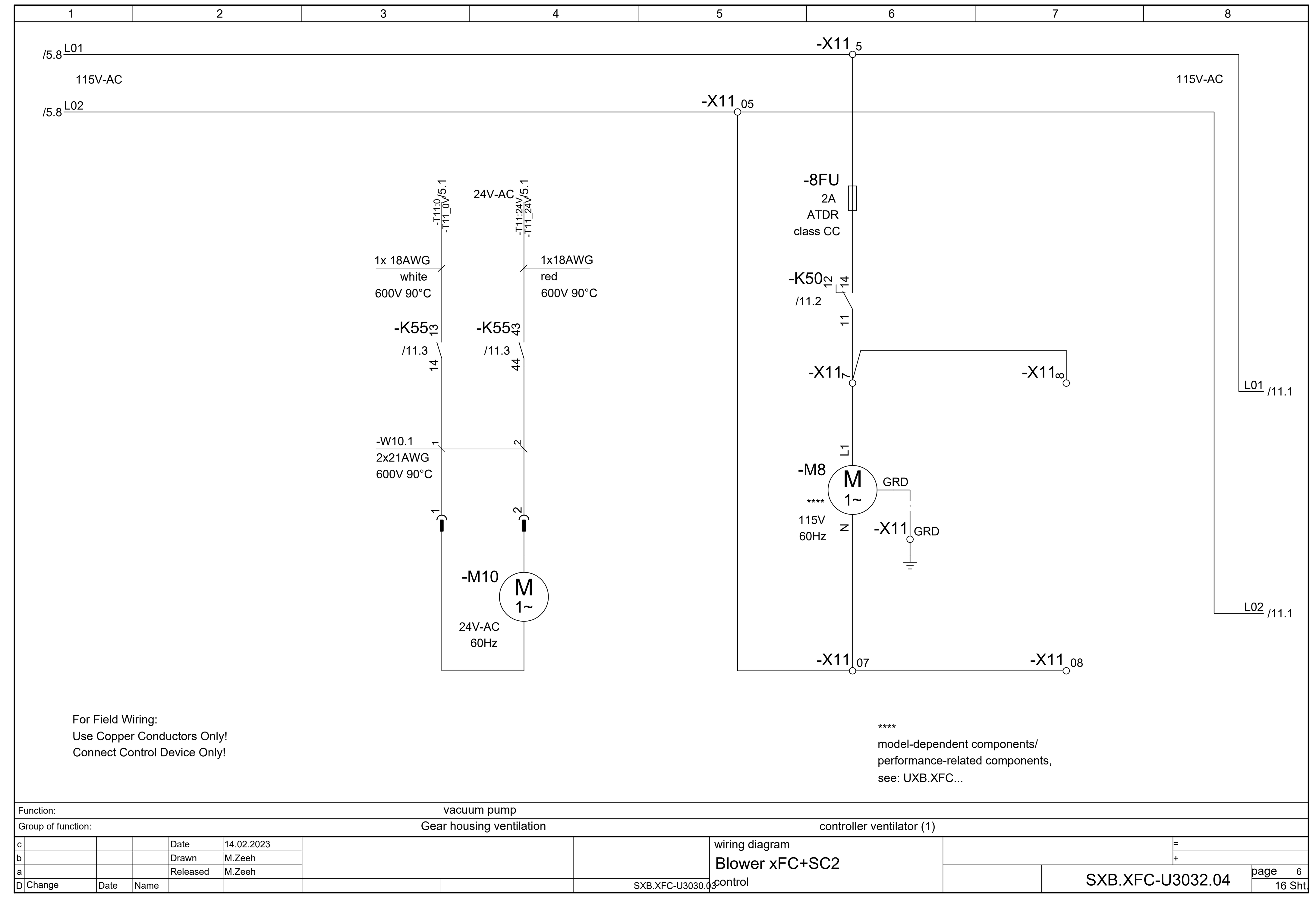

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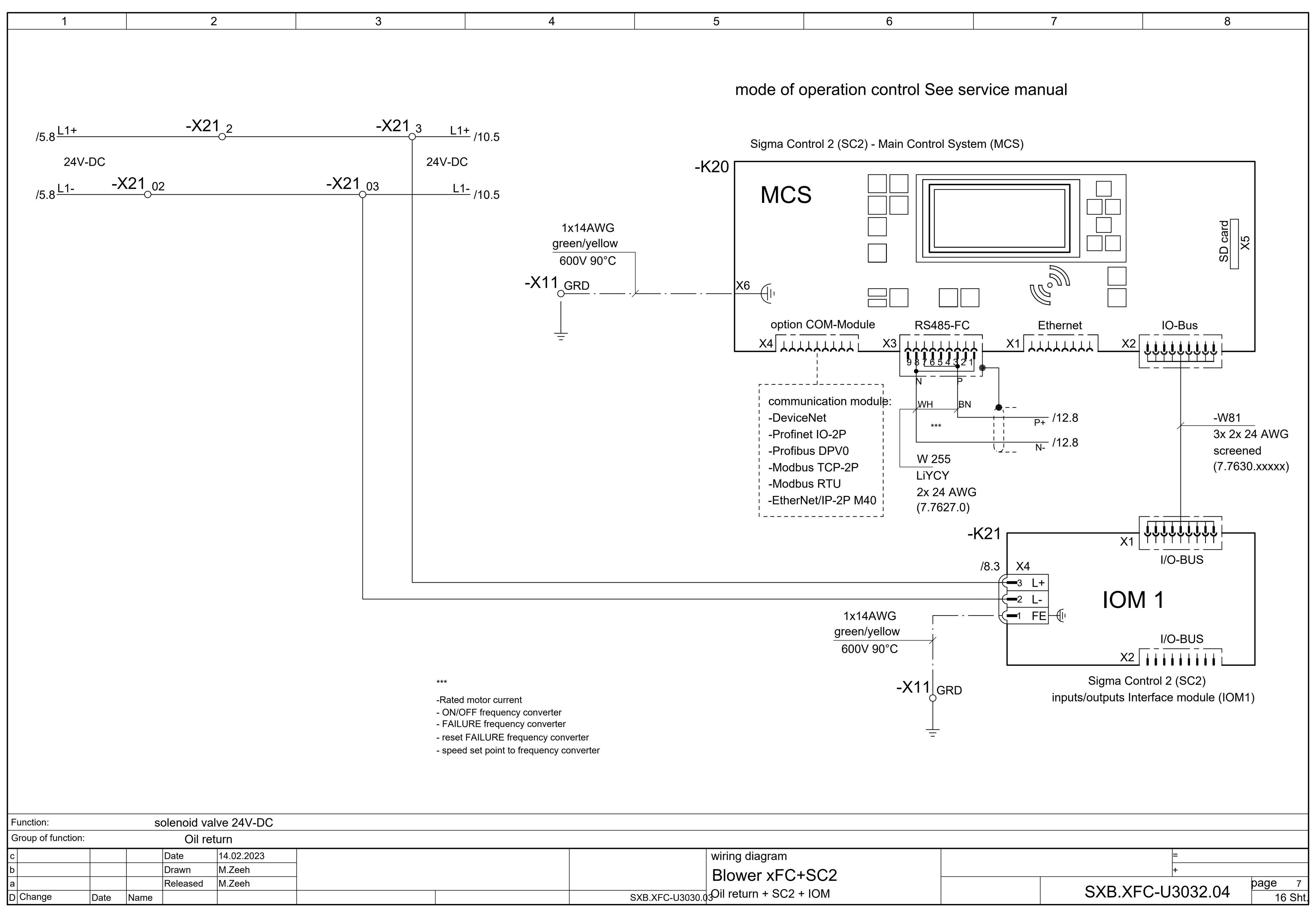

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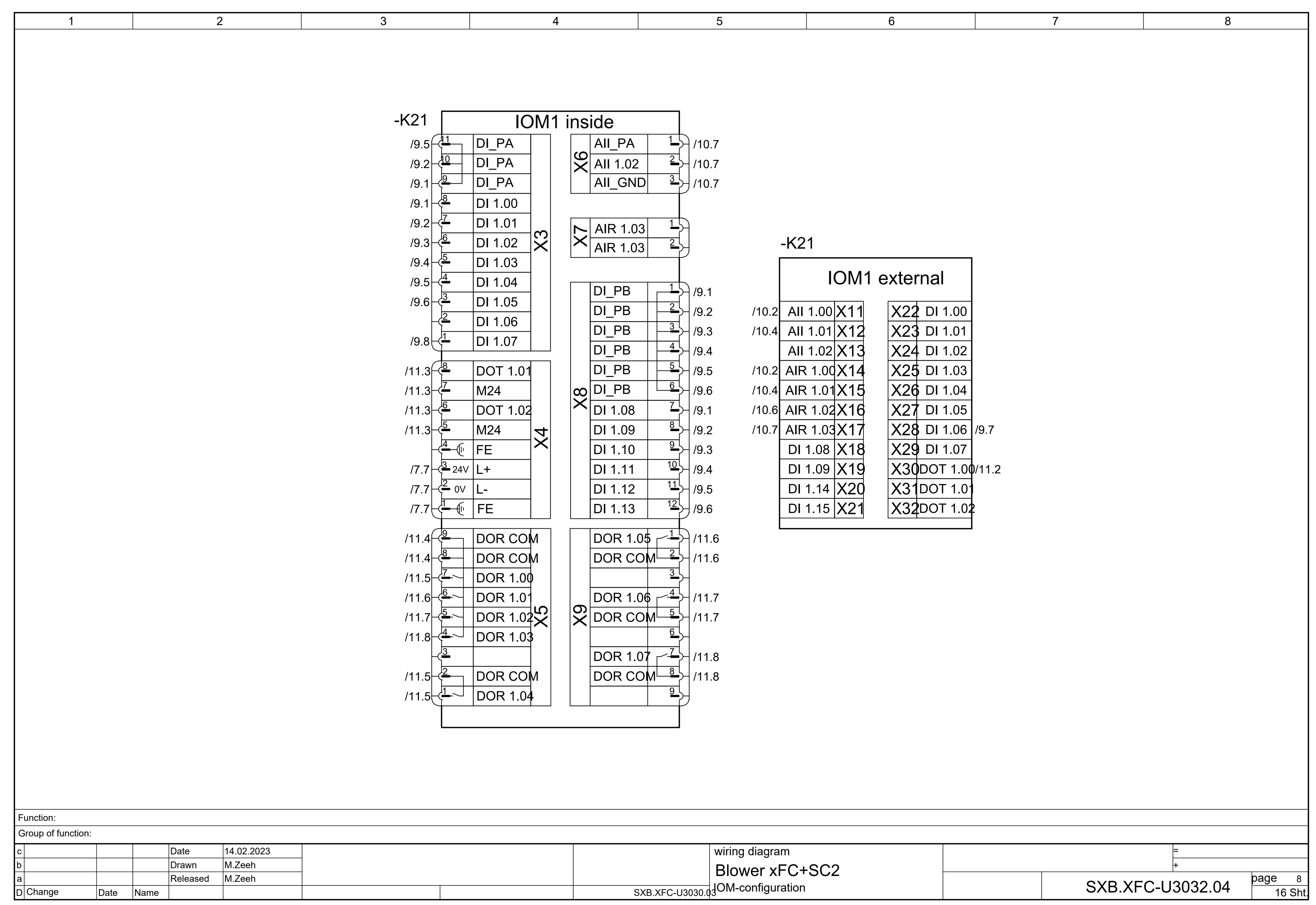

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BLOWER ONE-LINE DIAGRAMS
BLOWER & ELECTRICAL UPGRADES KWRU
STOCK ISLAND, FLORIDA

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4	...	...
5	...	...
6	...	...

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FOR BIDDING PURPOSES

Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. D-2.1

Function:
Group of function:

c				Date	14.02.2023	wiring diagram	
b				Drawn	M.Zeeh	Blower xFC+SC2	
a				Released	M.Zeeh	digital inputs IOM	
D	Change	Date	Name			SXB.XFC-U3030.03	SXB.XFC-U3032.04 page 9 16 Sht.

Function:
Group of function:

c				Date	14.02.2023	wiring diagram	
b				Drawn	M.Zeeh	Blower xFC+SC2	
a				Released	M.Zeeh	analog inputs IOM	
D	Change	Date	Name			SXB.XFC-U3030.03	SXB.XFC-U3032.04 page 10 16 Sht.

Function: vent motor (3ph)
Group of function: soundproofing casing

c				Date	14.02.2023	wiring diagram	
b				Drawn	M.Zeeh	Blower xFC+SC2	
a	DOT1.02 -X15	13.05.15	M.Zeeh	Released	M.Zeeh	Relay-outputs IOM	
D	Change	Date	Name			SXB.XFC-U3030.03	SXB.XFC-U3032.04 page 11 16 Sht.

Function:
Group of function:

c				Date	14.02.2023	wiring diagram	
b				Drawn	M.Zeeh	Blower xFC+SC2	
a				Released	M.Zeeh	frequency converter	
D	Change	Date	Name			SXB.XFC-U3030.03	SXB.XFC-U3032.04 page 12 16 Sht.

Project Information

Approved By:	SJS	Design:	YF
Scale:	AS NOTED	Drawn:	YF
Job No.:	23013.011	Checked:	SJS
Date Issued:	9/04/2024		

WELER ENGINEERING CORPORATION
WEC Excellence in engineering
8805 OVERSEAS HIGHWAY
MARATHON, FLORIDA 33050
(941) 505-1700

BLOWER ONE-LINE DIAGRAMS
BLOWER & ELECTRICAL UPGRADES KWRU
STOCK ISLAND, FLORIDA

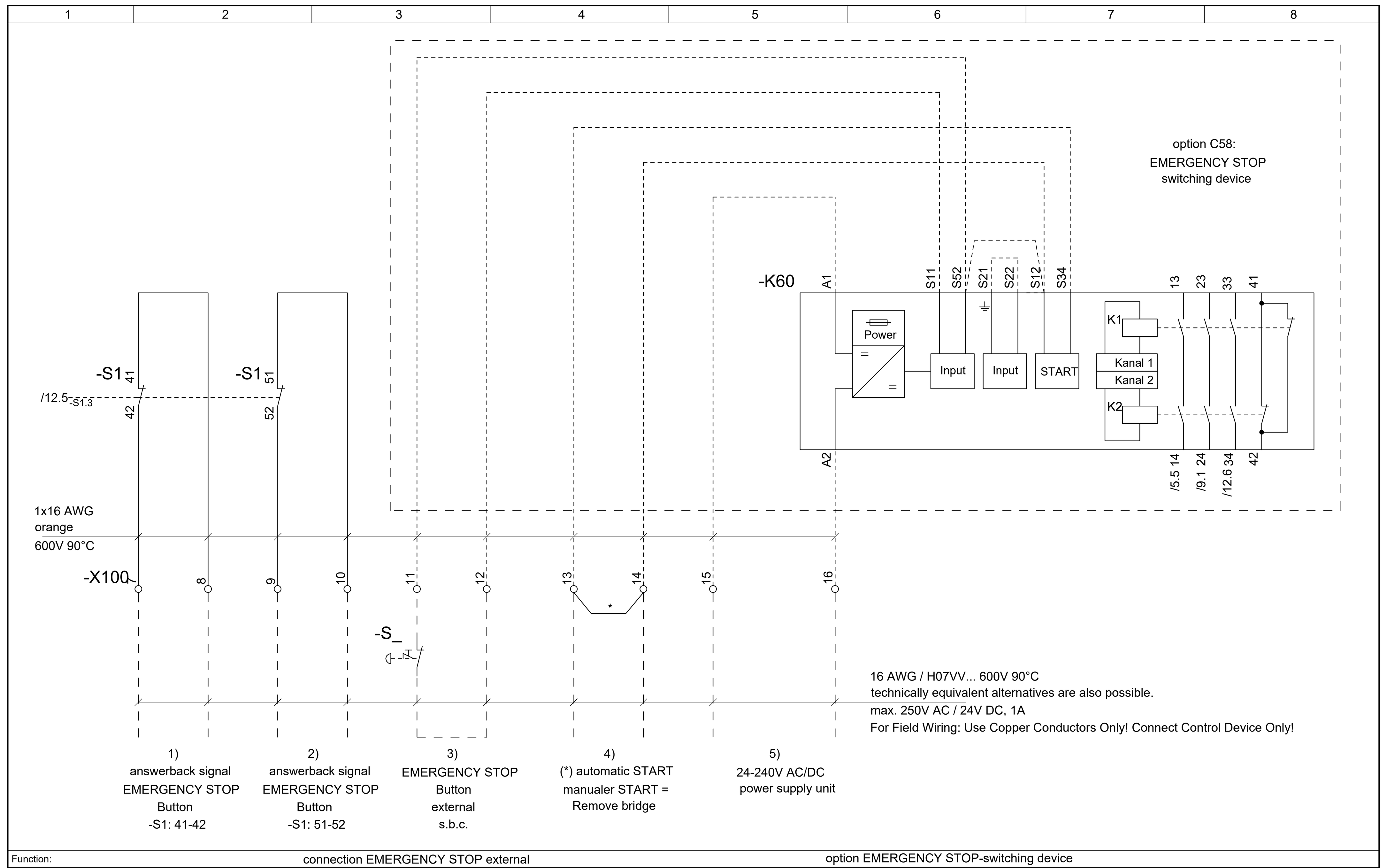
Revisions	Description
...	...
...	...
...	...
...	...
...	...
...	...

1 2 3 4 5 6

FOR BIDDING PURPOSES

Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. D-2.2



Function: connection EMERGENCY STOP external | option EMERGENCY STOP-switching device

wiring diagram
Blower xFC+SC2
User's controller EMERGENCY STOP
Date 14.02.2023 Drawn M.Zeeh Released M.Zeeh
SXB.XFC-U3032.04 page 13 / 16 Sht

terminal strip: -X0 (total 6 terminals)

cable-no. (ext.)	name of device	connection	terminal-no.	location	name of device (inside)	connection	cable-no.
X	-X11	GRD	GRD	/1.5	unit frame		
			GRD	/1.5	-T1	GRD	
X	-supply		U1	/1.4	-T1	U1	
X	-supply		V1	/1.4	-T1	V1	
X	-supply		W1	/1.4	-T1	W1	
X	-supply		GRD	/1.5	control panel		

terminal strip: -X11 (total 20 terminals)

cable-no. (ext.)	name of device	connection	terminal-no.	location	name of device (inside)	connection	cable-no.
X	-X0	GRD	GRD	/1.7			
GRD	-M4	GRD	GRD	/4.2	-K20	X6	X
			GRD	/7.6	-K21-X4	1	
GRD	-M8	GRD	GRD	/6.6			
	-T21	-	GRD	/5.2	-T11	GRD	
			GRD	/5.1			
			1	/5.3	-3FU		
			01	/5.2	-T11	0	
	-S1	11	2	/5.4	-T21	L1	
			02	/5.4	-T21	N	
	-8FU		5	/6.6	-X100	1	
			05	/6.5			
			6	/11.1	-K51	14	
			06	/11.1	-Q4	A2	
1	-M8	L1	7	/6.6	-K50	11	
2	-M8	N	07	/6.6			
			8	/6.7			
			08	/6.7			
			9	/3.7			
			09	/5.3	-T12	0	X

terminal strip: -X12 (total 8 terminals)

terminal-no.	location	name of device	connection
1	/11.5	-K21-X5	2
2	/11.5	-K21-X5	1
3	/11.6	-K21-X9	2
4	/11.6	-K21-X9	1
5	/11.7	-K21-X9	5
6	/11.7	-K21-X9	4
7	/11.8	-K21-X9	8
8	/11.8	-K21-X9	7

terminal strip (cable joint): -X13.1 (total 2 terminals)

cable (ext.)	name of device	connection	terminal-no.	location	name of device	connection	cable-no.
BNBU	-B80	21	1	/9.7	-K21 -X20	1	1
	-B80	22	2	/9.7	-K21 -X20	2	2

terminal strip (cable joint): -X13.2 (total 2 terminals)

cable (ext.)	name of device	connection	terminal-no.	location	name of device	connection	cable-no.
BNBU	-B81	21	1	/9.8	-K21 -X21	1	1
	-B81	22	2	/9.8	-K21 -X21	2	2

terminal strip (cable joint): -X14 (total 3 terminals)

name of device	connection	terminal-no.	location	name of device	connection	cable-no.
-B60	RD	1	/10.3	-K21-X15	1	BNBK shld
-B60	WH	2	/10.4	-K21-X15	3	
-B60	Shield	3	/10.4	-K21-X15	2	

Cables (inside): -W118; -W117; -1x14AWG green/yellow
Cables (external): -W7.1 3x16AWG 600V 90°; -W29 4x 14AWG; -W117; -s.b.c. **; H07V2-K 12 AWGxgreen/yellow

KAESER KOMPRESSOREN terminal connection -X0,-X11,-X12,-X13.1,-X13.2,-X14
Date 14.02.2023 Drawn M.Zeeh Released M.Zeeh
KXB.XFC-U3032.04 page 1 / 3 Sht

terminal strip: -X15 (total 22 terminals)

cable-no. (ext.)	name of device	connection	terminal-no.	location	name of device (inside)	connection	cable-no.
			1	/9.2	-K21 -X3	10	
			2	/9.2			
			3	/9.3	-F86	12	
			4	/9.4	-Q4	13	
			5	/9.5	-K21 -X3	11	
			6	/9.5	-K21 -X3	4	
1	-S9	13	7	/9.6			
2	-S9	14	8	/9.6	-K21 -X3	3	
			9	/9.8			
			10	/9.8	-K21 -X3	1	
			11	/9.2	-K21 -X8	2	
			12	/9.2	-K21 -X8	8	
			13	/9.5	-K21 -X8	5	
	-B24	96	14	/9.4	-K21 -X3	5	
1	-B70	2	19	/9.3	-K21 -X8	3	
			20	/9.5	-K21 -X8	11	
9	-T1	9	21	/12.5	-S1	31	
2	-B70	1	22	/9.3	-K21 -X8	9	
	-K21 -X5	7	23	/12.7	-T1	16	6
	-K21 -X5	6	24	/12.7	-T1	17	7
GRD	-B70	GRD	GRD	/9.3			
GRD	-T1	GRD	GRD	/12.7			

terminal strip: -X16 (total 8 terminals)

	terminal-no.	location	name of device	connection	cable-no.
(+)	1	/12.3	-T1	12	1
(-)	2	/12.3	-T1	13	2
(+)	3	/12.3	-T1	26	3
(-)	4	/12.3	-T1	27	4
(+)	5	/10.5	-T45	1	
(-)	6	/10.5	-T45	2	
	GRD	/12.4	-.		GRD
	GRD	/12.4			

terminal strip: -X21 (total 6 terminals)

name of device	connection	terminal-no.	location	name of device	connection
		1	/5.8	-T21	+
		01	/5.8	-T21	-
		2	/7.2		
		02	/7.2		
-T45	7	3	/7.3	-K21-X4	3
-T45	8	03	/7.3	-K21-X4	2

terminal strip: -X22 (total 6 terminals)

name of device	connection	terminal-no.	location	name of device	connection	cable-no.
-X100	6	1	/12.6	-T1	5	5
		01	/12.5	-T1	69	3
		2	/12.6			
		02	/12.5	-T1	28	2
		3	/11.4	-K21 -X5	9	
-K51	A2	03	/12.4	-T1	34	1

Cables (inside): -W263 12x 21AWG; -W260.1 ÖF150CY 5G0,75mm²
Cables (external): -Ex2 2x 16AWG; -W60 3x 16AWG; -W263 12x 21AWG

KAESER KOMPRESSOREN terminal connection -X15,-X16,-X21,-X22
Date 14.02.2023 Drawn M.Zeeh Released M.Zeeh
KXB.XFC-U3032.04 page 2 / 3 Sht

terminal strip: -X100 (total 16 terminals)

	name of device	connection	terminal-no.	location	name of device	connection	cable-no.
	-K60	13	1	/5.5	-X11	5	
	-K60	14	2	/5.5	-S1	12	
	-K60	23	3	/9.1	-S1	22	
	-K60	24	4	/9.1	-K21 -X3	8	
	-K60	33	5	/12.6	-S1	32	
	-K60	34	6	/12.6	-X22	1	
1)			7	/13.2	-S1	42	X
1)			8	/13.2	-S1	41	X
2)			9	/13.2	-S1	52	X
2)			10	/13.3	-S1	51	X
3)	-S_		11	/13.3	-K60	S52	X
3)			12	/13.3	-K60	S11	X
4)			13	/13.4	-K60	S34	X
4)			14	/13.4	-K60	S12	X
5)			15	/13.5	-K60	A1	X
5)			16	/13.5	-K60	A2	X

Cable (inside): H07V2-K 1,5mm² orange

KAESER KOMPRESSOREN terminal connection -X100
Date 14.02.2023 Drawn M.Zeeh Released M.Zeeh
KXB.XFC-U3032.04 page 3 / 3 Sht

BLOWER ONE-LINE DIAGRAMS

BLOWER & ELECTRICAL UPGRADES KWRU

STOCK ISLAND, FLORIDA

WEILER ENGINEERING CORPORATION
WEC ellence in engineering
6805 OVERSEAS HIGHWAY
MARATHON, FLORIDA 33050
(941) 505-1700

Project Information			
Approved By:	SJS	Design:	YF
Scale:	AS NOTED	Drawn:	YF
Job No.:	23013.011	Checked:	
Date Issued:	9/04/2024		

	Description	Revisions	
1	...	...	...
2	...	...	...
3	...	...	...
4	...	...	...
5	...	...	...
6	...	...	...

FOR BIDDING PURPOSES

Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. D-2.3

The components are performance-related
and not shown to scale.

c				Date	14.02.2023			=	
b				Drawn	M.Zeeh			*	
a	FU adaptation	2017/07	Rössler	Released	M.Zeeh				
i	Change	Date	Name						

KAESER KOMPRESSOREN

lay-out
control cabinet
Switchboard 10-50hp / 7,5-37kW

AXB.XFC-U3032.04

page 1
2 Sht

The components are performance-related
and not shown to scale.

c				Date	14.02.2023			=	
b				Drawn	M.Zeeh			*	
a	FU adaptation	2017/07	Rössler	Released	M.Zeeh				
i	Change	Date	Name						

lay-out
control cabinet
Switchboard 60-150hp / 45-110kW

AXB.XFC-U3032.04

page 2
2 Sht

Project Information

Approved by:	SJS	YF
Design:		
Scale:	AS NOTED	YF
Drawn:		
Job No.:	23013.011	SJS
Checked:		
Date Issued:	9/04/2024	

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MARATHON, FLORIDA 33050
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BLOWER ONE-LINE DIAGRAMS

BLOWER & ELECTRICAL UPGRADES
KWRU

STOCK ISLAND, FLORIDA

	Description	Revisions
1	...	...
2	...	...
3	...	...
4	...	...
5	...	...
6	...	...

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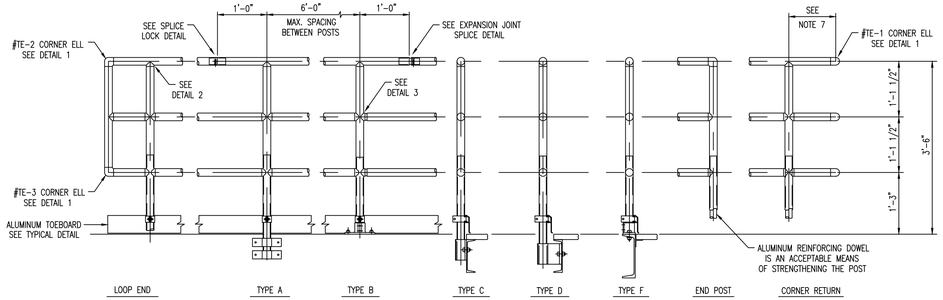
THE SIGNATURE AND ORIGINAL SEAL
OF A FLORIDA LICENSED ENGINEER.

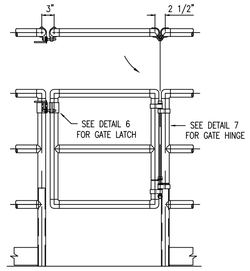
FOR BIDDING PURPOSES

Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. D-2.4



TYPICAL HANDRAIL



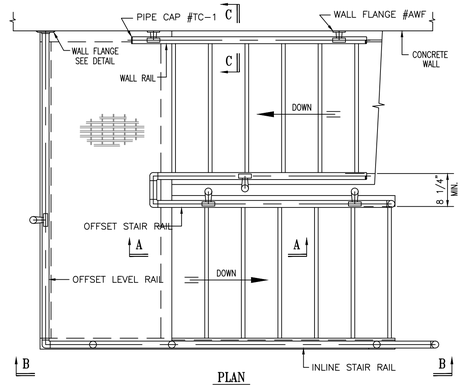
TYPICAL GATE

LEFT HAND GATE SHOWN

UBC-HR3L-98JAN000

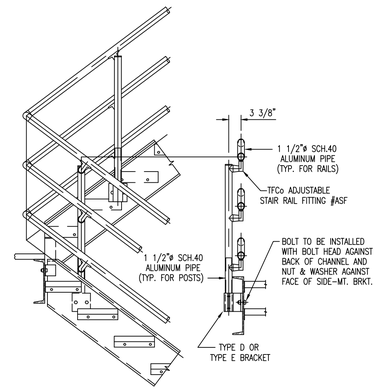
3-LINE COMPONENT HANDRAIL IN COMPLIANCE WITH 1994 UNIFORM BUILDING CODE

TUF RAIL™

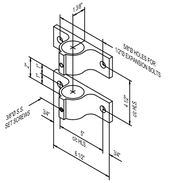


PLAN

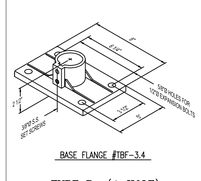
TYPICAL HANDRAIL AT METAL STAIRS; HANDRAIL AT CONCRETE STEPS SIMILAR



SECTION A-A

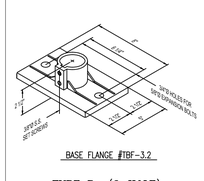


TYPE A



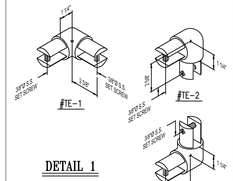
TYPE B (4-HOLE)

LOCATE SET SCREWS IN BASE FLANGE AT 90° FROM CENTERLINE OF HANDRAIL RUN AND ON SIDE AWAY FROM WALKING SURFACE.

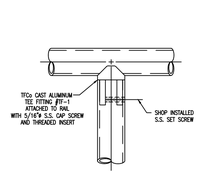


TYPE B (2-HOLE)

LOCATE SET SCREWS IN BASE FLANGE AT 90° FROM CENTERLINE OF HANDRAIL RUN AND ON SIDE AWAY FROM WALKING SURFACE.



DETAIL 1



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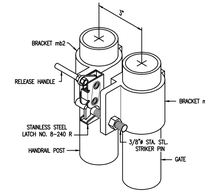

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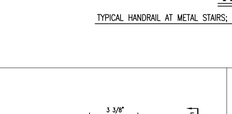
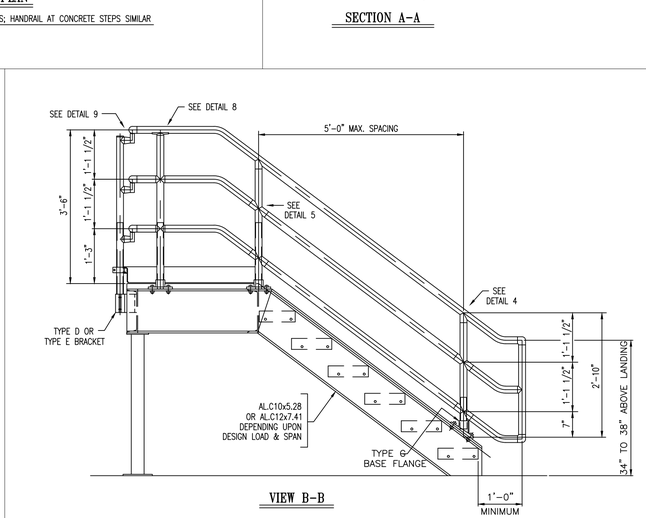
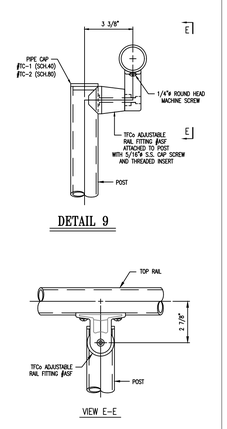


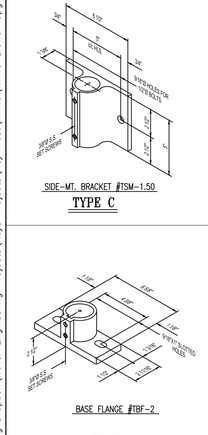
DETAIL 9



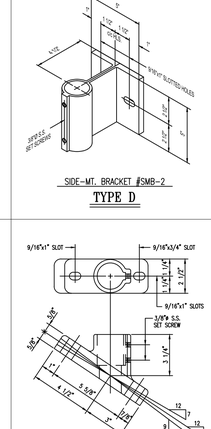
VIEW B-B



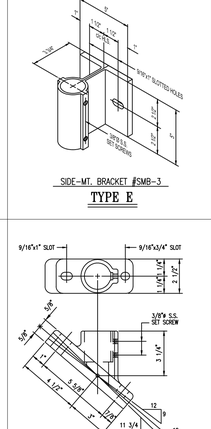
VIEW E-E



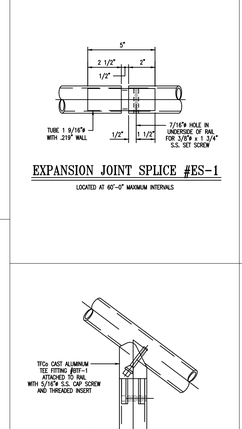
TYPE C



TYPE D

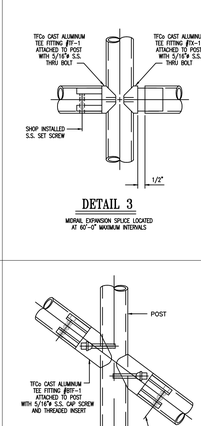


TYPE E



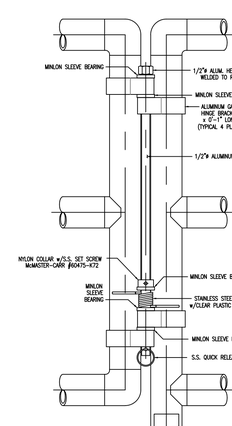
EXPANSION JOINT SPLICE #ES-1

LOCATED AT 60'-0" MAXIMUM INTERVALS



DETAIL 3

MIDRAIL EXPANSION SPLICE LOCATED AT 60'-0" MAXIMUM INTERVALS



DETAIL 7

TYPE F

LOCATE SET SCREWS IN BASE FLANGE AT 90° FROM CENTERLINE OF HANDRAIL RUN AND ON SIDE AWAY FROM WALKING SURFACE.

TYPE G

Ranges from 30° to 37°

TYPE G

Ranges from 37° to 44°

DETAIL 4

DETAIL 5

TOEBOARD DETAILS

SPLICE LOCK #SL-1

WALL RAIL ELEVATION

SECTION C-C

WALL FLANGE DETAIL

DETAIL 8

FOR FIELD ASSEMBLED HANDRAIL

UNIFORM BUILDING CODE DESIGN SPECIFICATIONS

1. Handrail shall be the product of a company normally engaged in the manufacture of pipe railing. Railing shall be shop assembled in lengths not to exceed 24 feet for field erection.
2. Handrails and stair rails shall be designed to withstand a 200# concentrated load applied in any direction at any point on the top rail. Handrails and stair rails shall also be designed to withstand a load of 50#/ft applied horizontally to the top rail. The 200# load will not be applied simultaneously with the 50#/ft load. In addition, the handrails shall be designed to withstand a load of 100#/ft applied vertically downward to the top rail and simultaneously with the 50#/ft horizontal load. The 100#/ft vertical load does not apply to stair rails.
3. The manufacturer shall submit calculations to the Engineer for approval. Testing of base castings or base extrusions by an independent lab or manufacturer's lab (if manufacturer's lab meets the requirements of the Aluminum Association) will be an acceptable substitute for calculations. Calculations will be required for approval of all other design aspects.
4. Post spacing shall be a maximum of 6'-0". Posts and railings shall be a minimum of 1-1/2" Schedule 40 aluminum pipe alloy 6105-T5, ASTM-B-429 or ASTM-B-221. The handrail manufacturer shall show that their posts are of adequate strength to meet the loading requirements. If the manufacturer's posts are not of adequate strength, the manufacturer may reduce the post spacing or add reinforcing dowels or may do both in order to meet the loading requirements.
5. The handrail shall be made of pipes joined together with component fittings. Samples of all components, bases, toe plate and pipe must be submitted for approval. ***Components that are pop-riveted or glued at the joints will not be acceptable.*** All components must be mechanically fastened with stainless steel hardware. Handrail and components shall be TUF Rail, as manufactured by Thompson Fabricating Company (Birmingham, Alabama) or an approved equal.
6. Posts shall not interrupt the continuation of the top rail at any point along the railing, including corners and end terminations (OSHA 1910.23). The top surface of the top railing shall be smooth and shall not be interrupted by projected fittings.
7. The midrail at a corner return shall be able to withstand a 200# load without loosening. The manufacturer is to determine this dimension for their system. Provide physical tests from a laboratory to confirm compliance.
8. Expansion bolts shall be spaced 10d apart and 5d edge distance for no reduction in pullout strength. A safety factor of 4 shall be used on expansion bolt pullout values published by the manufacturer. Expansion bolts shall be stainless steel type 18-8 wedge bolts and shall be furnished by the handrail manufacturer.
9. Toe plate shall conform to OSHA standards. Toe plate shall be a minimum of 4" high and shall be an extrusion that attaches to the posts with clamps which will allow for expansion and contraction between posts. Toe plates shall be set 1/4" above the walking surface. Toe plates shall be provided on handrails as required by OSHA and/or as shown on drawings. Toe plates shall be shipped loose in stock lengths with pre-manufactured corners for field installation.
10. Openings in the railing shall be guarded by a self-closing gate (OSHA 1910.23). Safety chains shall not be used unless specifically shown on the drawings.
11. Finish shall be Aluminum Association M10-C22-A41 (215-R1). The pipe shall be plastic-wrapped. The plastic wrap is to be removed after erection.
12. Aluminum surfaces in contact with concrete, grout or dissimilar metals will be protected with a coat of bituminous paint, mylar isolators or other approved material.

Project Information

Approved By:	SJS
Design:	YF
Scale:	AS NOTED
Drawn:	YF
Job No.:	23013.011
Checked:	SJS
Date Issued:	9/04/2024

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MARATHON, FLORIDA 33050
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HANDRAIL DETAILS

BLOWER & ELECTRICAL UPGRADES
KWRU

STOCK ISLAND, FLORIDA

Revisions

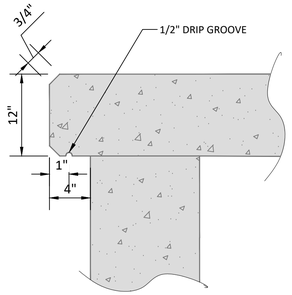
	1	2	3	4	5	6
Description	...	...	...	...	...	...

THIS SHEET IS NOT VALID WITHOUT THE SIGNATURE AND ORIGINAL SEAL OF A FLORIDA LICENSED ENGINEER.

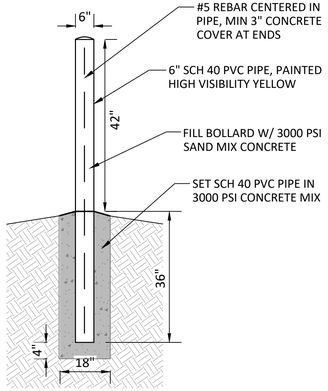
FOR BIDDING PURPOSES

Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

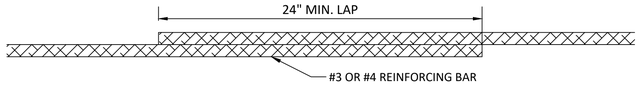
Sheet No. D-3.0



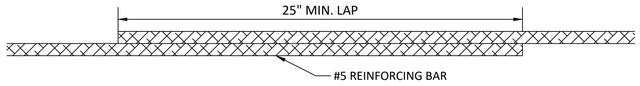
DRIP EDGE/CHAMFER DETAIL
SCALE: NTS



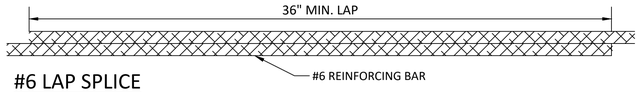
BALLARD DETAIL
SCALE: NTS



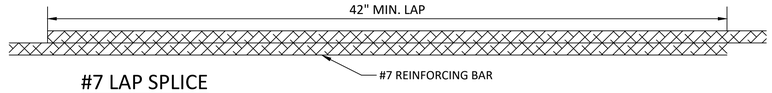
#3 & #4 LAP SPLICE



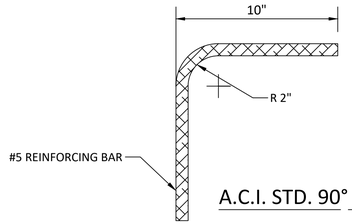
#5 LAP SPLICE



#6 LAP SPLICE

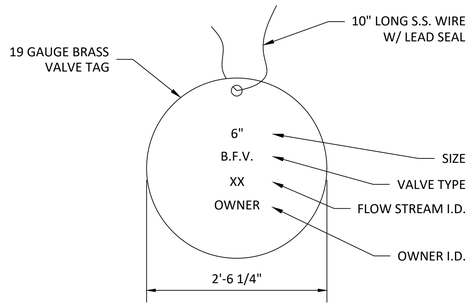


#7 LAP SPLICE



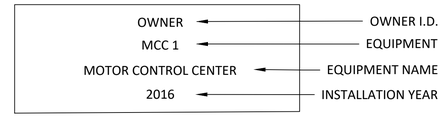
A.C.I. STD. 90° BEND

REBAR LAP & BENDING DETAILS
SCALE: NTS

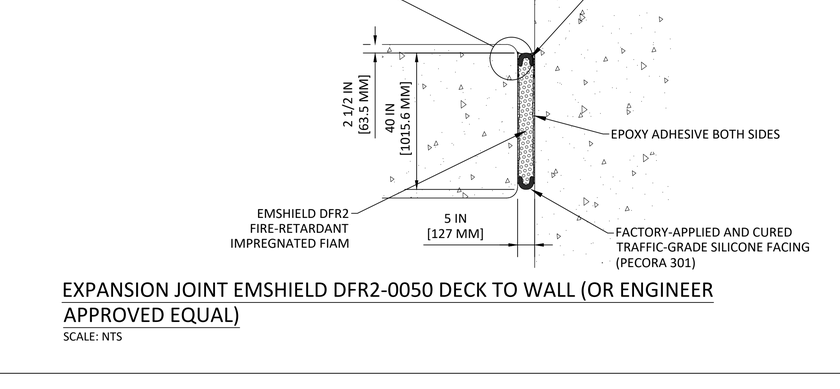


NON-BURIED VALVE MARKER
SCALE: NTS

NOTES:
1. NAMEPLATE SHALL BE ENGRAVED RIGID LAMINATED PLASTIC.
2. NAMEPLATES SHALL BE BLACK WITH WHITE LETTERS.
3. LETTER HEIGHT SHALL BE 3/16".
4. FASTEN TO COMPONENT WITH S.S. SCREWS OR ADHESIVE.
5. CONTRACTOR SHALL CONFIRM TEXT DURING SHOP DRAWING PROCESS.
6. ALL NEW EQUIPMENT SHALL BE LABELED.
7. NAMEPLATE(S) SHALL BE SIZED AS SHOWN.



GENERAL NEW EQUIPMENT LABEL
SCALE: NTS



EXPANSION JOINT EMSHIELD DFR2-0050 DECK TO DECK (OR ENGINEER APPROVED EQUAL)
SCALE: NTS

EXPANSION JOINT EMSHIELD DFR2-0050 DECK TO WALL (OR ENGINEER APPROVED EQUAL)
SCALE: NTS

Project Information

Approved By:	SJS
Design:	YF
Scale:	AS NOTED
Drawn:	YF
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Checked:	SJS
Date Issued:	9/04/2024

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(941) 505-1700

STRUCTURAL DETAILS 1

BLOWER & ELECTRICAL UPGRADES
KWRU

STOCK ISLAND, FLORIDA

Revisions	Description
1	...
2	...
3	...
4	...
5	...
6	...

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FOR BIDDING PURPOSES

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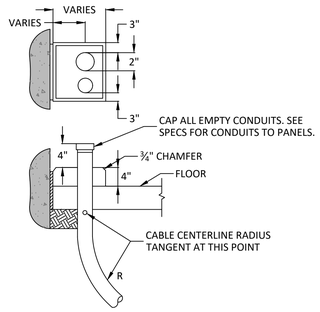
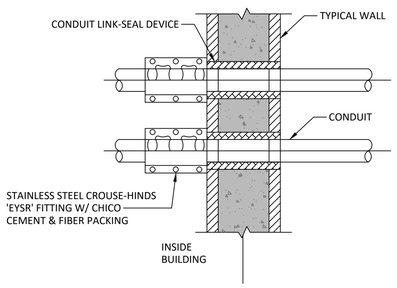
Sheet No. D-4.0



TYPICAL CONDUIT THROUGH SLAB

SCALE: NTS



TYPICAL CONDUIT THROUGH SLAB

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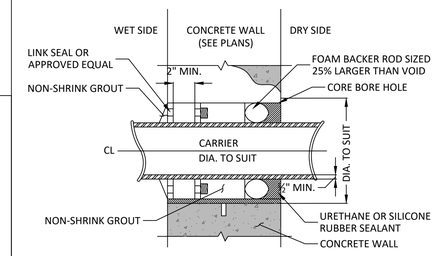
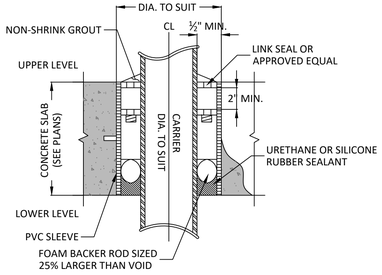


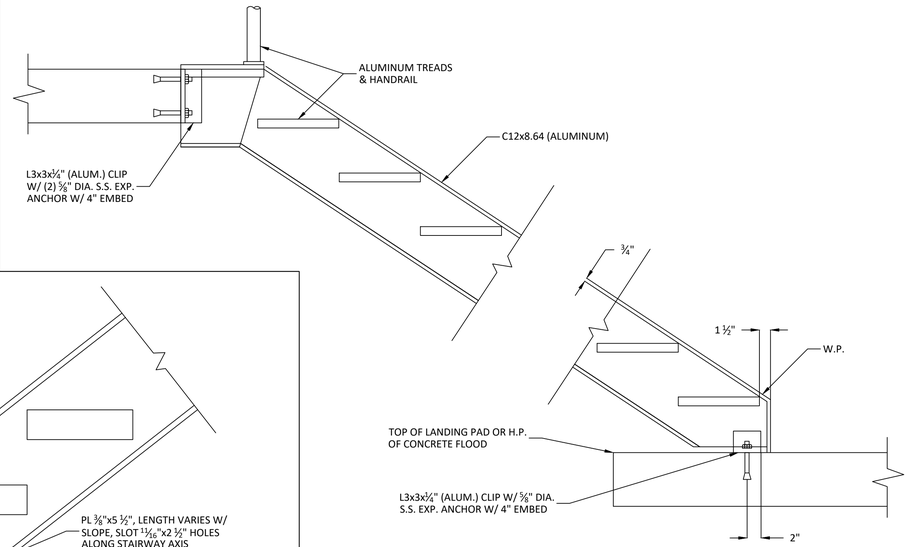
WALL PENETRATION DETAIL

SCALE: NTS



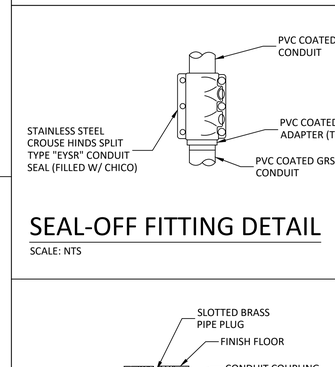
FLOOR PENETRATION DETAIL

SCALE: NTS



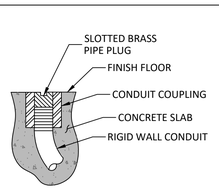
STAIR DETAIL

SCALE: NTS



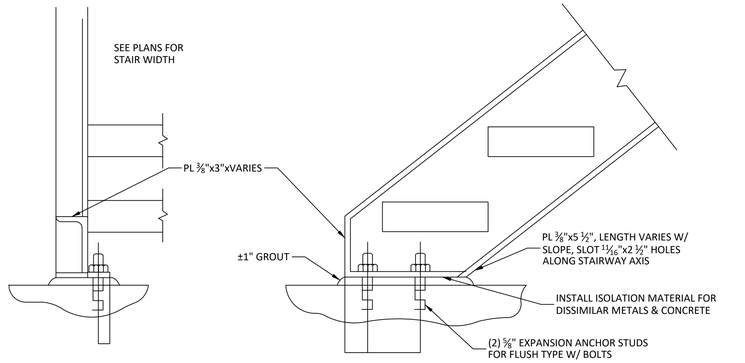
SEAL-OFF FITTING DETAIL

SCALE: NTS



DETAIL OF CONDUIT TERMINATION STUB OUT

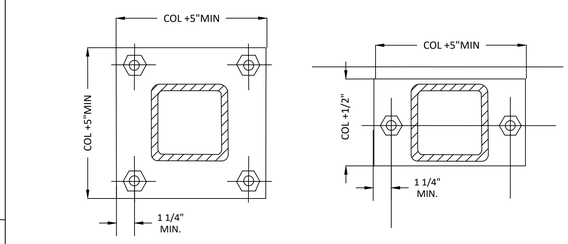
SCALE: NTS



NOTE:
1. USE BASE PLATE OF SAME METAL AS STRINGER.
2. PROVIDE PROTECTION FOR DISSIMILAR METALS AND CONCRETE AS SPECIFIED.
3. STAIR HANDRAIL NOT SHOWN.

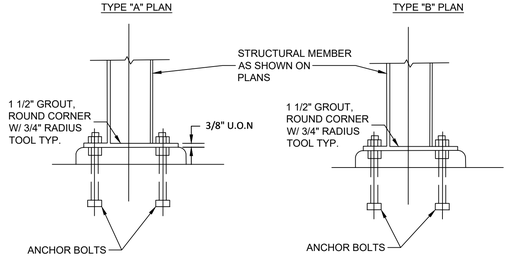
STAIR BOTTOM CONNECTION DETAIL

SCALE: NTS



TYPE "A" PLAN

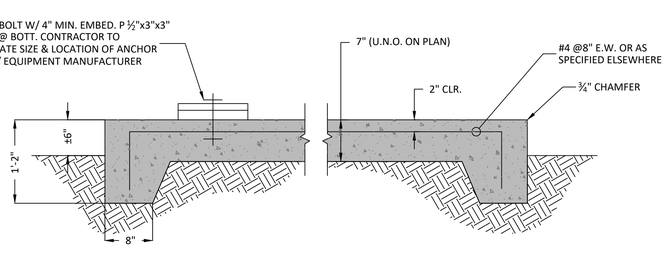
TYPE "B" PLAN



NOTES:
1. ANCHOR BOLTS SHALL BE 3/4" DIA.X1'-0" W/LEVELING NUTS,UNLESS OTHERWISE SHOWN.
2. GROUT SHALL BE NONSHRINK AS PER SPECIFICATIONS, FLOWABLE.

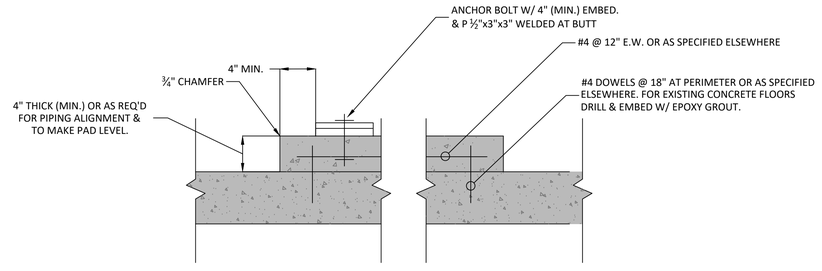
TUBE COLUMN BASE

SCALE: NTS



TYP. EQUIPMENT PAD ON GRADE

SCALE: NTS



NOTE: COORDINATE EXACT SIZE & LOCATION OF EQUIPMENT PADS & ANCHOR PADS W/ EQUIPMENT MANUFACTURER.

TYP. EQUIPMENT PAD ON SLAB

SCALE: NTS

Project Information

Approved By:	SJS
Design:	YF
Scale:	AS NOTED
Drawn:	YF
Job No.:	23013.011
Checked:	SJS
Date Issued:	9/04/2024

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STRUCTURAL DETAILS 2

BLOWER & ELECTRICAL UPGRADES
KWRU

STOCK ISLAND, FLORIDA

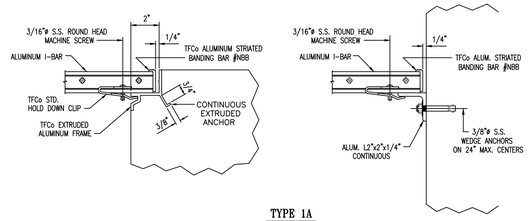
Revisions	Description
1	...
2	...
3	...
4	...
5	...
6	...

FOR BIDDING PURPOSES

Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. D-5.0

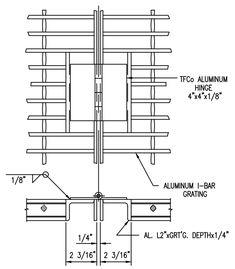
I-BAR GRATING



TYPE 1A

(See plans)

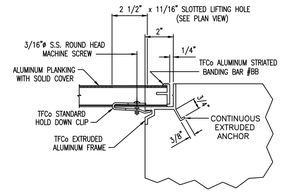
LOAD CHART FOR ALUMINUM I-BAR GRATING	
MAXIMUM SPAN	GRATING DEPTH
3'-8"	1 1/4"
4'-2"	1 1/2"
4'-8"	1 3/4"
5'-2"	2"
5'-8"	2 1/4"
6'-2"	2 1/2"

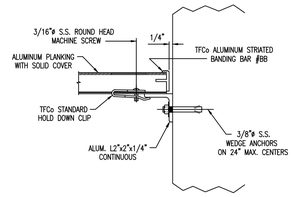


HINGE AT I-BAR GRATING

Where shown on plans

PLANKING

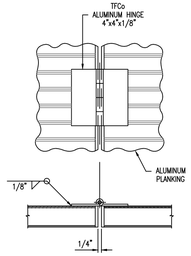




TYPE 2A – SOLID COVER PLANKING (AS SHOWN)

TYPE 3A – PUNCHED COVER PLANKING

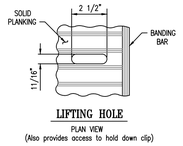
(See plans)



HINGE AT PLANKING

Where shown on plans

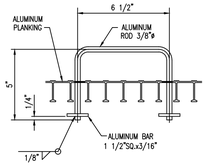
LOAD CHART FOR ALUMINUM PLANK GRATING	
MAXIMUM SPAN	PLANKING DEPTH
4'-0"	1 1/4"
4'-8"	1 1/2"
5'-2"	1 3/4"
5'-8"	2"
6'-2"	2 1/4"
6'-9"	2 1/2"



LIFTING HOLE

PLAN VIEW

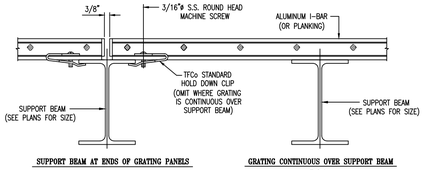
(Also provides access to hold down clip)



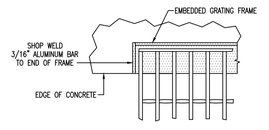
LIFT HANDLE AT PLANKING

Where shown on plans

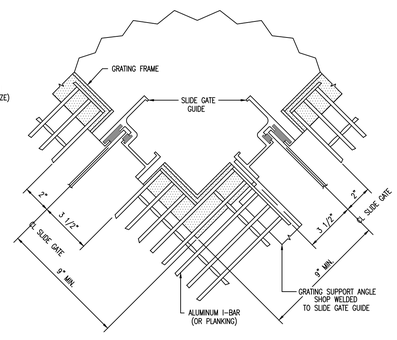
GRATING DETAILS



GRATING AT SUPPORT BEAMS

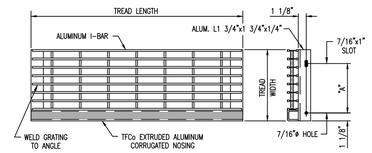


OPEN ENDED GRATING FRAME



GRATING AT SLIDE GATES

STAIR TREAD



STAIR TREAD

ALUMINUM I-BAR TREADS		
TREAD WIDTH	NUMBER OF BEARING BARS	DIM. A
6 5/8"	5	2 1/2"
7 13/16"	6	4 1/2"
9"	7	4 1/2"
10 3/16"	8	7"
11 3/8"	9	7"
12 9/16"	10	7"

ALUMINUM I-BAR TREADS	
BEARING BAR SIZE	MAXIMUM TREAD LENGTH*
1 1/4"	2'-8"
1 1/2"	3'-6"
1 3/4"	4'-7"
2"	5'-8"

* BASED ON 400 LB. CONCENTRATED LOAD APPLIED ON THE CENTERLINE OF THE SPAN AND DISTRIBUTED OVER THE NOSING & 4 BEARING BARS

SAME TABLE FOR PLANKING TREADS WHEN SPECIFIED ON DRAWINGS

GRTG-01MAY000

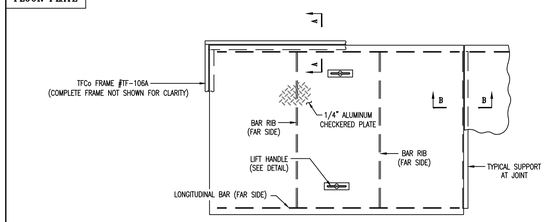
GRATING, PLANKING, TREADS & FLOOR PLATES

TFGRATING

SPECIFICATIONS FOR GRATING, PLANKING, TREADS & FLOOR PLATES

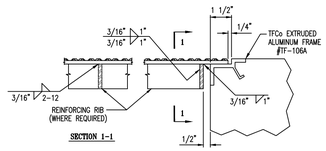
1. Grating shall be fabricated of aluminum I-shaped bars, alloy 6063-T6, with swaged cross bars spaced on 4" centers. Bearing bars shall be spaced on 1-3/16" centers. Top surface of bearing bars shall be striated to provide a nonslip surface.
2. Planking shall be extruded from aluminum alloy 6063-T6. Top surface shall be punched (with upset edges) or unpunched, as specified on the plans, and shall have continuous striations for skid resistance.
3. Grating and planking shall support a uniform load of 200 pounds per square foot with a deflection of not more than 1/4". Maximum fiber stress shall not exceed that allowed by the Aluminum Association. Minimum depth shall be 1-1/4".
4. Standard installation clearances and tolerances shall conform to the requirements of the current Metal Bar Grating Manual published by the National Association of Architectural Metal Manufacturers.
5. Install aluminum clamps or clips to anchor grating and planking to supports A minimum of four fasteners is required per panel unless otherwise noted on the drawings. Clips shall not protrude above the top of the grating.
6. Cutouts for circular obstructions to be at least 2" larger in diameter than the obstruction. Cutouts for all piping 4" and less in diameter to be made in the field. All openings where more than four bearing bars are cut shall be banded with bar the same depth as the bearing bars. The ends of all grating and planking panels shall be banded.
7. Shelf angles shall be anchored to concrete with type 18-8 stainless steel wedge anchors.
8. Aluminum stair treads shall be I-bar grating type treads and shall be furnished with extruded aluminum corrugated nosing. Aluminum carrier angles shall be welded to the ends of stair treads. Minimum depth of grating at treads shall be 1-1/4".
9. Checkered floor plates shall be aluminum with raised diamond pattern on the upper surface. Floor plate shall be 1/4" thick and designed to support a uniform load of 200 pounds per square foot with a deflection of not more than 1/4". Maximum fiber stress shall not exceed that allowed by the Aluminum Association. Reinforcing rib size, depth and spacing is to be determined by the floor plate fabricator. The fabricator of the floor plate shall submit calculations to the Engineer for approval. Calculations shall show reinforcing rib size, spacing and weldment if calculations show that ribs are required.
10. Aluminum surfaces in contact with concrete or dissimilar metals shall be protected with a coat of bituminous paint.

FLOOR PLATE

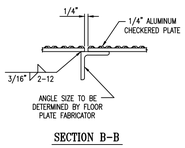


FLOOR PLATE INSTALLATION

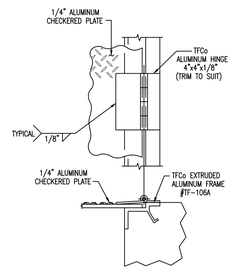
Checkered plate to be sized so that floor plate weight will be a maximum of 100 pounds.



SECTION A-A

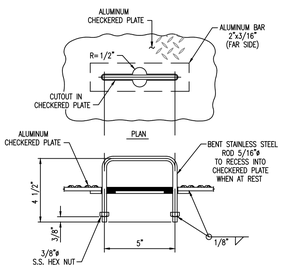


SECTION B-B



HINGE AT FLOOR PLATE

Where shown on plans



LIFT HANDLE AT FLOOR PLATE

Project Information

Approved By:	SJS
Design:	YF
Scale:	AS NOTED
Drawn:	YF
Job No.:	23013.011
Checked:	SJS
Date Issued:	9/04/2024

WELLER ENGINEERING CORPORATION
WE excellence in engineering
6805 OVERSEAS HIGHWAY
MARATHON, FLORIDA 33050
(941) 505-1700

GRATING DETAIL

BLOWER & ELECTRICAL UPGRADES
KWRU

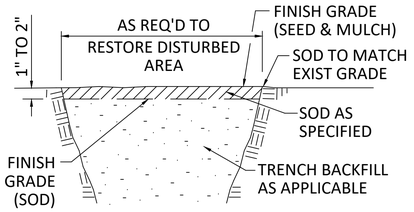
STOCK ISLAND, FLORIDA

Revisions	Description
...	...
1	...
2	...
3	...
4	...
5	...
6	...

FOR BIDDING PURPOSES

Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

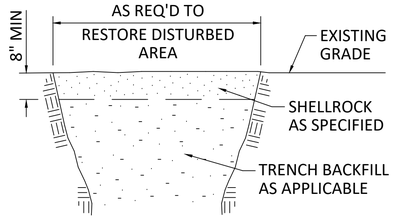
Sheet No. D-6.0



GRASS AREAS

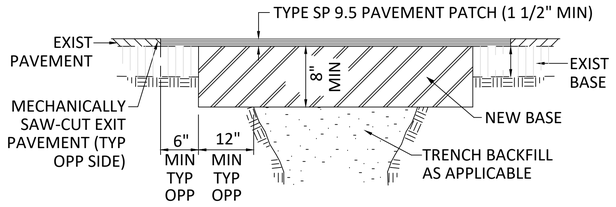
TYPE 1 SOD

TYPE 6 SEED & MULCH



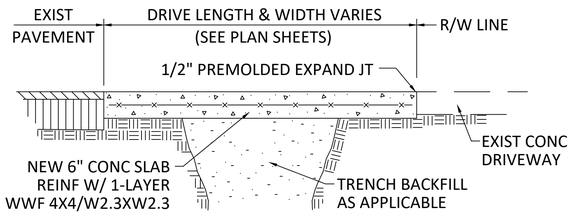
ROCK ROADWAYS AND DRIVEWAYS

TYPE 1



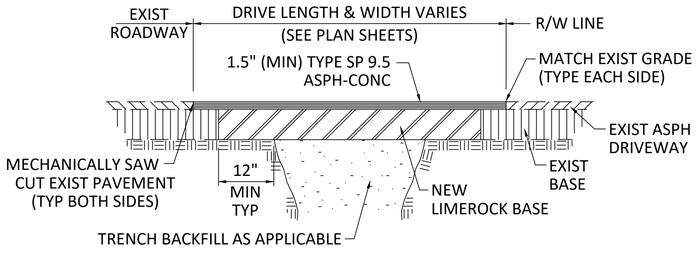
ASPHALT ROADWAYS

TYPE 2



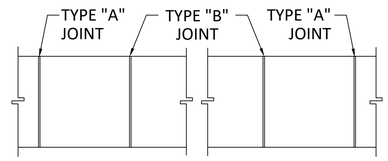
CONCRETE DRIVEWAYS

TYPE 3

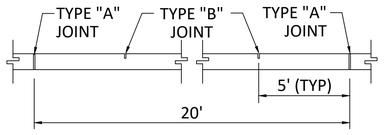


ASPHALT DRIVEWAYS

TYPE 4



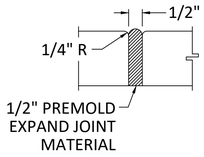
PLAN



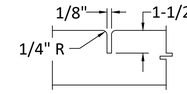
ELEVATION

CONCRETE SIDEWALKS TYPE

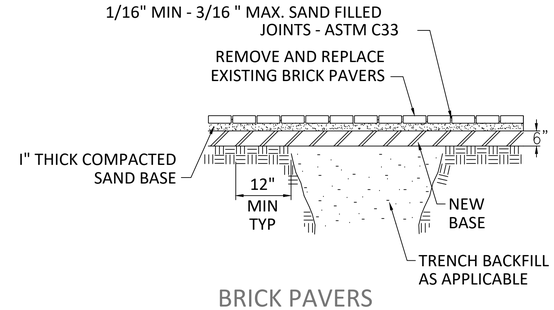
TYPE 5



TYPE "A" JOINT



TYPE "B" JOINT



BRICK PAVERS

TYPE 7

1) ASPHALT ROADWAYS :

A. PAVEMENT MATERIALS SHALL BE AS SPECIFIED.
B. PREPARE BASE SECTION, SAW CUT EXISTING PAVEMENT AS APPLICABLE PRIME COAT, TACK COAT AND PLACE ASPHALT PATCH IMMEDIATELY FOLLOWING PIPE INSTALLATION.
C. BASE MATERIAL SHALL BE TWICE THE THICKNESS OF EXISTING BASE MATERIAL, BUT IN NO CASE BE LESS THAN 8". BASE MATERIAL SHALL BE PLACED IN LIFTS NOT TO EXCEED 8" AND COMPACTED TO 98% OF MAXIMUM DENSITY AS DETERMINED BY AASHTO T-180.
D. PAVEMENT PATCH THICKNESS TO MATCH EXISTING PAVEMENT THICKNESS, BUT IN NOCASE LESS THAN 1 1/2".
E. WHEN OVERLAY IS NOT REQUIRED CONTRACTOR OR ENGINEER SHALL SCHEDULE A FIELD INSPECTION WITH THE MONROE COUNTY RIGHT OF WAY AUTHORITY TO INSPECT CONDITION OF PATCH 90 DAYS AFTER PLACEMENT. IF SAID AUTHORITY FINDS PATCH TO BE UNACCEPTABLE THEN THE PATCH SHALL BE COMPLETELY REMOVED AND REPLACED AT NO ADDITIONAL COST TO THE OWNER.
F. 90 DAYS AFTER PLACEMENT OF ASPHALT PATCH, OVERLAY ROADWAY TO THE EXTENT AS SHOWN ON DRAWINGS AND NOTED HEREIN WITH A MINIMUM OF 1 1/2" TYPE S-I ASPHALTIC CONCRETE APPLIED IN 1 LIFT.
G. APPLY TACK COAT PRIOR TO PLACING ASPHALTIC OVERLAY.
H. EDGES OF OVERLAY SHALL BE KEYED TO EXISTING PAVEMENT.
I. WHERE OVELAY IS REQUIRED, THE PAVEMENT PATCH DOES NOT NEED TO BE COMPLETED.

2) CONCRETE DRIVES :

A. AS APPLICABLE, EXISTING CONCRETE DRIVEWAYS SHALL BE REMOVED AND REPLACED FROM THE R/W LINE TO EDGE OF ROADWAY COMPLETELY. CONCRETE DRIVE DAMAGE OUTSIDE OF THE R/W SHALL ALSO BE RESTORED.
B. NEW SLAB SHALL BE CONSTRUCTED TO THE LINES AND GRADES OF EXISTING DRIVEWAY PRIOR TO CONSTRUCTION.
C. CONCRETE SHALL BE 3000 PSI AS SPECIFIED.
D. 8" OF LIMEROCK OR FLOWABLE FILL SHALL BE USED FOR THE BASE.
E. SUBGRADE SHALL BE PREPARED AS SPECIFIED.

3) ASPHALT DRIVES :

A. REMOVE EXISTING ASPHALT DRIVEWAY SURFACE FROM R/W LINE TO EDGE OF ROADWAY COMPLETELY.
B. PREPARE BASE SECTION AND PRIME COAT AS SPECIFIED DURING TRENCH BACKFILLING.
C. APPLY TACK COAT AS SPECIFIED PRIOR TO PLACING ASPHALT.
D. PAVEMENT MATERIALS SHALL BE AS SPECIFIED.
E. NEW PAVEMENT SHALL BE CONSTRUCTED TO THE LINES AND GRADES OF EXISTING DRIVEWAYS PRIOR TO CONSTRUCTION.

4) CONCRETE SIDEWALKS :

A. SIDEWALK SHALL BE 4" THICK EXCEPT IN DRIVEWAYS WHERE THE THICKNESS SHALL BE 6". CONCRETE SHALL BE 3000 PSI AS SPECIFIED.
B. TYPE "A" JOINTS SHALL BE PLACED AT 20' CENTERS ON SIDEWALKS PC'S AND PT'S OF CURVES, JUNCTIONS OF EXISTING AND NEW SIDEWALKS AND WHERE SIDEWALK ABUTS CONCRETE CURBS, DRIVEWAYS AND SIMILAR STRUCTURES.
C. TYPE "B" JOINTS SHALL BE PLACED AT 5' CENTERS ON SIDEWALKS.
D. 8" OF LIMEROCK OR FLOWABLE FILL SHALL BE USED FOR THE BASE.

5) GRASS AREAS :

A. SOD AND SEED & MULCH SHALL BE AS SPECIFIED
B. DISTURBED AREAS ALONG CANAL R/W SHALL BE REGRADED AT A 20:1 REVERSE SLOPE, UNLESS NOTED OTHERWISE.

6) BRICK PAVERS:

A. REPLACE BRICK PAVERS TO MATCH THE LINE AND GRADES OF EXISTING DRIVEWAY PRIOR TO CONSTRUCTION.
B. 6" OF LIMEROCK SHALL BE USED FOR THE BASE.
C. EDGE RESTRAINT SHALL MATCH EXISTING.

TYPICAL PIPELINE ROUTE SURFACE RESTORATION DETAILS AND NOTES

NOTE: SEE SURFACE RESTORATION NOTES FOR ADDITIONAL DETAILS

Project Information

Design:	YF
Drawn:	YF
Checked:	SJS
Approved By:	SJS
Scale:	AS NOTED
Job No.:	23013.011
Date Issued:	9/04/2024

WEILER ENGINEERING CORPORATION
excellence in engineering
8805 OVERSEAS HIGHWAY
MARATHON, FLORIDA 33050
(941) 505-1700

ROADWAY RESTORATION DETAILS

BLOWER & ELECTRICAL UPGRADES
KWRU

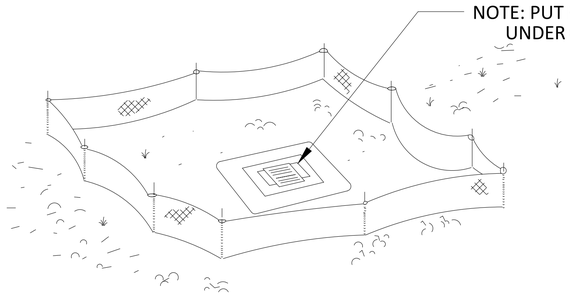
STOCK ISLAND, FLORIDA

Revisions	Description
1	...
2	...
3	...
4	...
5	...
6	...

FOR BIDDING PURPOSES

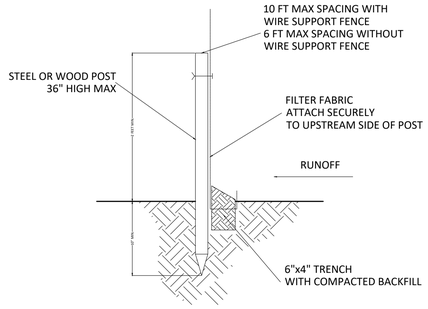
Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. D-7.0



STAKED SILT BARRIER OR SILT FENCE

PROTECTION AROUND DITCH BOTTOM INLETS

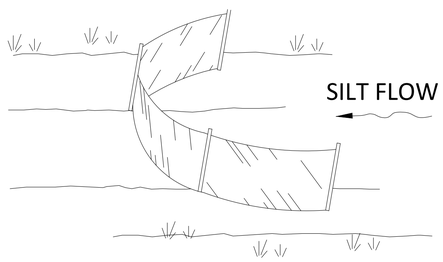


SILT FENCE DETAIL

TRENCH WITH NATIVE BACKFILL

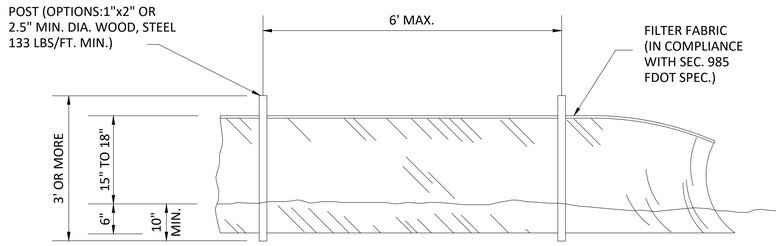
NOT TO SCALE

NOTES:
1 INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY.
2.REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.
3. SILT FENCE SHALL BE INSTALLED AT LEAST 1 FT AWAY FROM VEGETATION DRIP LINE.



TYPE III SILT FENCE

NOT TO SCALE



ELEVATION

TYPICAL SILT FENCE

NOT TO SCALE

NOTE:
CONTRACTOR TO INSPECT SILT FENCE DAILY AND REPAIR IMMEDIATELY IF DAMAGED.

EROSION CONTROL MAINTENANCE SCHEDULE

THE CONTRACTOR SHALL INSTALL SILT FENCE, STAKED HAY BALES, AND AND OTHER EROSION CONTROL DEVICES AS SHOWN ON THE DRAWINGS PRIOR TO BEGINNING CONSTRUCTION. THESE INSTALLATIONS AS SHOWN ON THE DRAWINGS SHALL BE CONSIDERED THE MINIMUM EROSION/SILTATION PROTECTION REQUIRED FOR THE SITE. IN ADDITION THE ENGINEER, OWNER, OR OWNER'S REPRESENTATIVE MAY DEEM IT NECESSARY TO INSTALL PROTECTIVE FACILITIES ELSEWHERE ON THE SITE.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE EROSION PROTECTION FACILITIES THROUGH COMPLETION OF CONSTRUCTION. THE CONTRACTOR SHALL PERFORM DAILY INSPECTIONS OF THE FACILITIES TO ENSURE THAT THE EROSION PROTECTION FACILITIES ARE MAINTAINING THEIR PROTECTION FUNCTIONS AND INTEGRITY.

IN ADDITION TO THE INSTALLATION OF EROSION PROTECTION FACILITIES, THE ENGINEER, OWNER, OR OWNER'S REPRESENTATIVE MAY DEEM IT NECESSARY, UPON INSPECTION OF THE SITE, THAT TURBIDITY MONITORING BE PERFORMED BY THE CONTRACTOR IF GREATER THAN 0 NTU'S ABOVE BACKGROUND LEVELS ARE DETCTED. THE MONITORING SHALL BE PERFORMED DAILY IF BACKGROUND TURBIDITY LEVELS REACH 25-29 NTU'S. FOR BACKGROUND TURBIDITY LEVELS LESS THAN 25 NTU'S, TURBIDITY MONITORING SHALL BE PERFORMED WEEKLY. IF BACKGROUND TURBIDITY LEVELS ARE GREATER THAN 29 NTU'S, ALL CONSTRUCTION ACTIVITIES SHALL STOP AND THE CONTRACTOR SHALL PROVIDE ADDITIONAL EROSION PROTECTION NECESSARY TO RETURN LEVELS TO 29 NTU'S OR LESS. CONSTRUCTION ACTIVITIES SHALL BEGIN AGAIN ONLY UPON APPROVAL BY THE ENGINEER, OWNER, OR OWNER'S REPRESENTATIVE.

ALL EROSION PROTECTION FACILITIES SHALL BE REMOVED AFTER CONSTRUCTION COMPLETION, AND WHEN A VEGETATIVE COVER HAS BEEN WELL ESTABLISHED OVER THE CONSTRUCTED AREAS. PER THE PLANS: THE CONTRACTOR SHALL REMOVE PROTECTION FACILITIES ONLY UPON APPROVAL BY THE ENGINEER, OWNER, OR OWNER'S REPRESENTATIVE.

Project Information

Approved By:	SJS
Design:	YF
Scale:	AS NOTED
Drawn:	YF
Job No.:	23013.011
Checked:	SJS
Date Issued:	9/04/2024

WELLER ENGINEERING CORPORATION
WE excellence in engineering
8805 OVERSEAS HIGHWAY
MARATHON, FLORIDA 33050
(941) 505-1700

BEST MANAGEMENT PRACTICES

BLOWER & ELECTRICAL UPGRADES
KWRU

STOCK ISLAND, FLORIDA

Revisions

	Description
1	...
2	...
3	...
4	...
5	...
6	...

THIS SHEET IS NOT VALID WITHOUT THE SIGNATURE AND ORIGINAL SEAL OF A FLORIDA LICENSED ENGINEER.

FOR BIDDING PURPOSES

Stephen J. Suggs
Professional Engineer
State of Florida
Registration No. 85237

Sheet No. D-8.0

KAESER COMPRESSORS

QUOTATION

Kaeser Compressors, Inc.
PO Box 946
Fredericksburg, VA 22404
Contact: George Graves
Tel: (540) 642-8567

c/o MTS Environmental
Eric Peters
Tel: (904) 273-8600

Bidding Contractor
Omega Bid Job
511 Sigma Drive
Fredericksburg VA 22408

Your reference	Customer no.	Quotation no.	Date
KWRU WWTP (Stock Isl	529482	86987881	06/04/2024

Dear Mr. Peters:

We are pleased to present the following proposal for your review. With Kaeser Compressors, you can be confident your organization will benefit from years of engineering expertise, premium products, and a nationwide service network. Our products reduce life cycle costs with years of reliable service, simple maintenance and high energy efficiency-making them the smart investment.

Kaeser will be providing our standard equipment and instrumentation. Kaeser's scope of supply is as shown on the quote. Items not quoted will not be provided. Kaeser must take blanket exception to any specifications provided with this RFQ.

Thank you for the opportunity to prove Kaeser Compressors offers the best product solutions for your needs, as well as the customer service you deserve.

Sincerely,

Dalton Kujawa
Project Support Engineering Team Leader

I hereby represent that: I am an authorized signatory for this company; agree to the terms of this order; and by signing below I authorize Kaeser to process an order in accordance with this quotation.

Greg Wright
Printed Name

Vice President
Title

Authorized Signature

6/10/24
Date

KAESER COMPRESSORS **QUOTATION**

PRICE SUMMARY

Item	Description	Material	QTY	UM	Unit price USD	Total USD
	*** Blower Packages ***					
30	**Screw Blower EBS410L-SFC-60hp-GS3**	EBS.2C	3.000	PC	82,814.53	248,443.59
	Country of installation	USA				
	Model	EBS 410 L				
	Operating mode	Gauge pressure				
	Screw blower package price includes suite of sensors, VFD, local SC2 controller to provide plug-and-play blower solution with EtherNet/IP communications module					
	Blower package price includes C-Unit adder(s): ~ Outdoor, NOT under roof, and CZ1 modifications ~ Extra Thickness Paint					
	Kaeser has offered a 5-year warranty on the blower package sound enclosure.					
	*** Spare Parts ***					
45	**Filter fleece DN150**	895411.0	3.000	PC	65.52	196.56
55	**Filter mat 216x216x10**	7.4519.00040	9.000	PC	16.98	152.82
65	**Filter mat 283x283x10**	7.4519.00010	3.000	PC	21.99	65.97
75	**Filter element E6KE**	901520.0	3.000	PC	97.93	293.79
85	**Anti-friction bearing grease Unirex N3 4**	6.3234.0	3.000	PC	36.01	108.03
95	**SIGMA FLUID G-680 1 l**	9.0188.20020	12.000	PC	40.77	489.24

KAESER COMPRESSORS **QUOTATION**

PRICE SUMMARY

Item	Description	Material	QTY	UM	Unit price USD	Total USD
	*** Services ***					
115	**Equipment submittal PDF**	USSUBMTLPDF	1.000	PC	425.00	425.00
	Kaeser's standard equipment submittal in a pdf file (via email) to be supplied. Note on PO if approval is required before release to production.					
125	**Equipment specific manual PDF**	USMANUALPDF	1.000	PC	425.00	425.00
	Kaeser's equipment specific O&M manual in a pdf file (via email) to be supplied.					
135	**STARTUP LABOR**	USSTARTUP	2.000	PC	1,500.00	3,000.00
	Blower Start-up Assistance for the blower packages quoted. Please provide a two week notice to schedule.					
145	**On Site Training**	USONSITE	1.000	PC	1,500.00	1,500.00
	Blower Training for the blower packages being quoted. Please provide a two week notice to schedule					
	TOTAL PRICE					**255,100.00**

Pricing does not include applicable sales taxes.

Terms of payment:
Within 30 days
Payment terms are subject to credit approval.

Terms of delivery (Incoterms® 2010)
FCA US Shipping Point
If prepay and add shipping is requested the freight charges will be added to the invoice.

Quotation valid until
08/04/2024

Estimated delivery time:
Estimated 26-28 weeks upon release to production.
Should there be a requested delay in the scheduled ship date, a weekly storage fee equal to 1% of the net value of the order will be charged until the order is shipped.

Contractual basis
Terms and conditions:
Kaeser quotations are offered with Kaeser's standard Terms and Conditions of Sale and Use and Terms and Conditions of Service. All additional or different terms and conditions must be agreed to by written contract with Kaeser corporate office, Fredericksburg, Virginia. Any modifications made by the recipient to the information provided on this Quote will not be honored. Kaeser's Terms and Conditions are available at www.us.kaeser.com/terms and upon written request.

Wells Fargo Commercial Banking
1021 E Cary Street, 4th Floor
Richmond VA 23219

January 30, 2024

To Whom It May Concern:

This letter is provided as notification that KAESER COMPRESSORS, INC. maintains a valid account with Wells Fargo Bank, N.A. Account information is shown below.

Bank Name:	Wells Fargo Bank N.A.
Bank Address:	420 Montgomery San Francisco, CA 94104
Account Name:	
Account Number:	
Routing Transit Number:	
ACH Routing Transit Number:	
Swift/BIC (Code):	WFBIUS6S
Currency:	USD
CHIPS Participant:	0407

Should you have any questions or concerns, please feel free to contact me at 757-667-3560.

Sincerely,

Stephanie B Parsons

Stephanie B Parsons
Assistant Vice President
Wholesale Banking Relationship Associate Team Lead

KAESER COMPRESSORS®
Built for a lifetime.

Account Profile Form

Fax Completed Form to: _____ **Your Kaeser Representative:** _____

Required information

Company Legal Name KW Resort Utilities Corp. Telephone # 305-295-3301

Dba (if applicable) NA Fax # —

Physical Address 6630 Front St Key West FL 33040

Mailing Address 6630 Front St Key West FL 33040

County of physical address: Monroe Physical address located within city limits? ☐ Yes ☒ No

Tax Exempt Status ☒ Taxable ☐ Exempt (Please attach tax exemption certificate)

Are you able to receive electronic invoices? ☒ Yes, Email: greg@kwru.com ☐ No

Is a purchase order number required on all invoices? ☐ Yes ☒ No # of Employees 14

Please Check Applicable Boxes ☒ Corporation ☐ Partnership ☐ Proprietorship ☐ LLC

Federal Tax I.D. Number 13-3250037 **Are you an OEM? ☐ Yes ☒ No**

If reference sheet is attached, proceed to signature fields. If reference sheet is not attached, complete all fields.

Name of President/Partner/Owner Christopher Johnson Telephone # 305-295-3301

Other Officer/Partner Gregory Wright Telephone # 305-295-3301

Current D & B Rating NA Duns No. —

Primary Banking Reference Jay Hall Sr. VP TRUIST Acct # confidential

Address 1010 KENNEDY DR. SUITE 100 Telephone # 305 292 3832

KEY WEST, FL 33040 Fax # Jay.Hall@Truist.com

Major Trade References: **Please provide email address (preferred) or fax #**

Name: Nearshore Electric, Inc. Phone: 305 294 3991 Email: dianaearshore@bellsouth.net

Address: 5680 First Ave, Suite 5 Key West, FL Fax #: —

Name: Waste Management Inc Phone: 305 296 8297 Email: GSulliva@wm.com

Address: 800 Capital St, Suite 3000 Houston, TX Fax #: —

Name: Hawkins Inc. Phone: 800 328 5460 Email: customer.service@hawkinsinc.com

Address: 2381 Rosegate, Roseville MN Fax #: —

Required

I hereby authorize Kaeser Compressors, Inc. to contact the above establishments for the purpose of determining our payment practice. An electronic signature or a fax/email copy of this Account Profile Form will be considered the original.

Terms and Conditions of Sale and Use and Terms and Conditions of Service are readily available and can be found at www.us.kaeser.com/terms. I certify that I have read and accept these terms and conditions of sale and service which will govern all orders placed with Kaeser unless a written letter of authority is received at the below address to the attention of Contract Management prior to any order placement.

CHRISTOPHER JOHNSON, PRESIDENT _____ 6/11/2024

Name & Title of Authorized Agent (Please type or print clearly) Signature/Date

ORDER CONFIRMATION

No. 11457119

Greg Wright
Engineering Technical
KW Resort Utilities Corp
6630 Front St
Key West FL 33040

Information

Order Entry Date:	07/23/2024
Your order No.:	QT 86987881
Your order of:	07/22/2024
Confirmation date:	07/23/2024
Customer no.:	10108336
Contact person:	Tom Saylor
Phone:	(540)898-5500260
Fax:	001/540-8985520
Email:	tom.saylor@kaeser.com

Please deliver to

KW Resort Utilities Corp
6630 Front St
Key West FL 33040

Shipping details / Services

Date of delivery approx.:	02/19/2025
Delivery:	FCA
(Incoterms®2020)	US Shipping Point
Shipping mode:	VA-Z11 Truck

Invoice Recipient

KW Resort Utilities Corp
6630 Front St
Key West FL 33040

Terms of payment

Within 30 days

Additional Information

Ship via: dedicated carrier

Invoicing: KWRU wishes to pay using ACH

Item	Description	Material	QTY	UM	Unit price USD	Total USD
	*** Blower Packages ***					
30	**Screw Blower**					
	EBS410L SFC 60hp GS3	EBS.2C	3.000	PC		
	1 Service manual(s) included with each, English					
	Country of installation	USA				
	Model	EBS 410 L				
	Operating mode	Gauge pressure				

Item	Description	Material	QTY	UM	Unit price USD	Total USD
	Screw blower package price includes suite of sensors, VFD, local SC2 controller to provide plug-and-play blower solution with Modbus RTU communications module					
	Blower package price includes C-Unit adder(s): ~ Extra Thickness Paint ~ Outdoor, NOT under roof, and CZ1 modifications					
	Kaeser has offered a 5-year warranty on the blower package sound enclosure.					
	Date of delivery approx.:	02/19/2025				
	*** Spare Parts ***					
45	**Filter fleece DN150**	895411.0	3.000	PC		
	Date of delivery approx.:	02/19/2025				
55	**Filter mat 216x216x10**	7.4519.00040	9.000	PC		
	Date of delivery approx.:	02/19/2025				
65	**Filter mat 283x283x10**	7.4519.00010	3.000	PC		
	Date of delivery approx.:	02/19/2025				
75	**Filter element E6KE**	901520.0	3.000	PC		
	Date of delivery approx.:	02/19/2025				
85	**Anti-friction bearing grease Unirex N3 4**	6.3234.0	3.000	PC		
	Date of delivery approx.:	02/19/2025				
95	**SIGMA FLUID G-680 1 l**	9.0188.20020	12.000	PC		
	Date of delivery approx.:	02/19/2025				
	*** Services ***					
115	**Equipment submittal PDF**	USSUBMTLPDF	1.000	PC		
	Kaeser's standard equipment submittal in a pdf file (via email) to be supplied. Note on PO if approval is required before release to production.					

Item	Description	Material	QTY	UM	Unit price USD	Total USD
	Date of delivery approx.:	02/19/2025				
125	**Equipment specific manual PDF**	USMANUALPDF	1.000	PC		
	Kaeser's equipment specific O&M manual in a pdf file (via email) to be supplied.					
	Date of delivery approx.:	02/19/2025				
135	**Startup Labor**	USSTARTUP	2.000	PC		
	Blower Start-up Assistance for the blower packages quoted. Please provide a two week notice to schedule.					
	Date of delivery approx.:	02/19/2025				
145	**On Site Training**	USONSITE	1.000	PC		
	Blower Training for the blower packages being quoted. Please provide a two week notice to schedule					
	Date of delivery approx.:	02/19/2025				
	TOTAL VALUE					255,100.00
	TOTAL PRICE USD					**255,100.00**

Commercial Note

KW Resort Utilities Corp
6630 Frint St
Key West FL 33040
305-295-3301

Estimated ship date, units will ship upon arrival from Germany

Terms and conditions

This Order confirmation is effective and expressly conditional on Buyer's assent to all terms and conditions incorporated in this Order confirmation that are additional to or different from those stated in Buyer's purchase order or other documents. However, if an executed, mutually agreed contract or agreement exists, that document shall take precedence. Buyer's assent to this provision will be manifested by ordering, paying for, or receiving any portion of the goods designated herein. Seller's terms and conditions are available on request, and at us.kaeser.com/terms.

Please Note: Sales tax may apply if the delivery location is in one of the following states in which we have a presence:
AL, AR, CA, CO, CT, DC, FL, GA, HI, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, NC, ND, NJ, NM, NV, NY, OH, OK, PA, RI, SC, TN, TX, VA, WA, WI, WV, WY

Thank you for your order. Please view our video regarding receiving shipments: www.kaeser.com/freight-tips.

BID FORM

KWRU Blower & Electrical Upgrades Project

TABLE OF CONTENTS

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

KW Resort Utilities Corp.

6630 Front Street

Key West, Florida 33040

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for **60 days** after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

Addendum No.	Addendum, Date
1	10/8/2024
2	10/15/2024
3	10/18/2024
4	10/24/2024
5	10/31/2024

B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions (if any) at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.

F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.

J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 *Bidder certifies that:*

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the e execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
1.00	**General**				
1.01	Mobilization (no more than 5% of bid price)	LS	1	$79,500.00	$79,500.00
1.02	Bonds & Insurance (no more than 2.5% of bid price)	LS	1	$39,500.00	$39,500.00
1.03	Prepare & Submit Submittals for All Products	LS	1	$23,500.00	$23,500.00
1.04	Erosion Control (BMPS)	LS	1	$2,500.00	$2,500.00
2.00	**Blower**				
2.01	Demo & Removal of Existing Blowers, Piping, and Concrete	LS	1	$30,000.00	$30,000.00
2.02	Install Rotary Screw Blowers	EA	3	$10,000.00	$30,000.00
2.03	Furnish & Install 6" SS 316 SCH.10 Air Piping	LS	1	$255,000.00	$255,000.00
2.04	Furnish & Install Butterfly Valves & Fittings	LS	1	$35,000.00	$35,000.00
2.05	Install Concrete Platform Extension	LS	1	$115,000.00	$115,000.00
2.06	Reroute Existing PVC Pipe	LS	1	$2,500.00	$2,500.00
3.00	**Electrical**				
3.01	Demo Existing Electrical Equipment	LS	1	$30,000.00	$30,000.00
3.02	Furnish & Install New Electrical Equipment	LS	1	$175,000.00	$175,000.00
3.03	Furnish & Install New Electrical Conduits	LS	1	$175,000.00	$175,000.00

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
3.04	Furnish & Install New Electrical Wires & Cables	LS	1	$156,000.00	$156,000.00
3.05	Removal of Existing Conduits, Wires & Cables	LS	1	$25,000.00	$25,000.00
3.06	Furnish & Install Pre-Engineered/Fabricated Aluminum Platform	LS	1	$85,000.00	$85,000.00
3.07	Demo Existing Concrete Foundation	LS	1	$15,000.00	$15,000.00
3.08	Install New Concrete Foundation	LS	1	$45,000.00	$45,000.00
4.00	**SCADA Integration**				
4.01	Provide and install SCADA System	LS	1	$245,000.00	$245,000.00
4.02	Provide and install fiber optic SCADA network	LS	1	$20,000.00	$20,000.00
4.03	Provide and Install cellular backup system for SCADA	LS	1	$12,000.00	$12,000.00
5.00	**Closeout**				
5.01	Record Documents	LS	1	$4,000.00	$4,000.00
	Total of Bid Items				$1,599,500.00

Bidder acknowledges that (1) each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and (2) estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

Total of Unit Price Bids = Total Bid Price $ 1,599,500.00

One million five hundred ninety-nine thousand five hundred dollars and zero cents

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete within **330** calendar days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **360** calendar days after the date when the Contract Times commence to run.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 *The following documents are submitted with and made a condition of this Bid:*

A. List of Proposed Subcontractors;

B. List of Project References;

C. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;

D. Contractor's License No.: CGC1525041;

E. Required Bidder Qualification Statement with supporting data

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

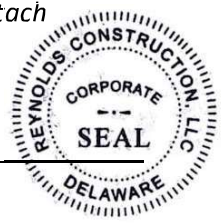
BIDDER: *[Indicate correct name of bidding entity]*

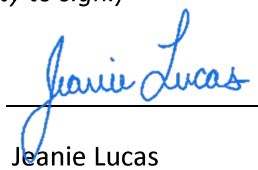
Reynolds Construction, LLC dba Reynolds Construction of Florida, LLC

By:
[Signature] 

[Printed name] Kevin Shemwell, Executive Vice President

(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)



Attest:
[Signature] 

[Printed name] Jeanie Lucas

Title: Assistant Secretary

Submittal Date: ~~10/21/2024~~ 11/4/2024

Address for giving notices:

300 East Broad Street, Fairburn, GA 30213

Telephone Number: (770)969-4040

Fax Number: (770)969-4363

Contact Name and e-mail address: Josh Vondersaar

joshua.vondersaar@reynoldscon.com

Bidder's License No.: CGC1525041

(where applicable)

Key West Resort Utilities Corporation
Mr. Christopher Johnson
6630 Front St
Stock Island, FL 33040

November 4, 2024

RE: KWRU Blower & Electrical Upgrades
Schedule of Work
Immediate Start of Work

Mr. Johnson:

Reynolds Construction is appreciative of the opportunity to submit a bid on the Key West Resort Utilities Blower and Electrical Upgrades project.

In the matter of this project, Reynolds stands ready to start this project within three (3) business days of the issued letter of intent and complete critical submittals on concrete and components upon award as we understand the critical nature of the project.

Reynolds and our electrical contractor will start work on the demolition of the blower equipment on or about the date of the NTP, we expect “boots on the ground” within three (3) business days.

Reynolds and our electrical contractor are both companies who are eager to work with KWRU.

Respectfully Provided:

Reynolds Construction, LLC

Joshua R. Vondersaar

"Excellence in Engineering"

6805 Overseas Highway
Marathon, Florida 33050
(305) 289-4161 ph
(305) 289-4162 fax

ADDENDUM NO. 1

Issue Date: ***October 8, 2024***

Project Name: ***KWRU Blower & Electrical Upgrades***

Notice to All Bidders:

The following information contained within this addendum is part of the contact documents and is binding. Any clarifications, additional information, and changes in scope presented in this addendum shall amend, where noted, previous parts or requirements of the bid documents which are dated prior to the issuance of this addendum.

Prospective Bidders shall acknowledge this addendum by including a signed copy of this page with their bid packages in order to be considered responsive and responsible.

Issued By: **Yanay Ferral, E.I. Weiler Engineering, Project Administrator**
Name

PROOF OF RECEIPT

Recipient Signature: _____
Print Name: Kevin Shemwell, Executive Vice President
Company: Reynolds Construction, LLC dba Reynolds Construction of Florida, LLC
Date: 10/21/2024

"Excellence in Engineering"

6805 Overseas Highway
Marathon, Florida 33050
(305) 289-4161 ph
(305) 289-4162 fax

ADDENDUM NO. 2

Issue Date: ***October 15, 2024***

Project Name: ***KWRU Blower & Electrical Upgrades***

Notice to All Bidders:

The following information contained within this addendum is part of the contact documents and is binding. Any clarifications, additional information, and changes in scope presented in this addendum shall amend, where noted, previous parts or requirements of the bid documents which are dated prior to the issuance of this addendum.

Prospective Bidders shall acknowledge this addendum by including a signed copy of this page with their bid packages in order to be considered responsive and responsible.

Issued By: **Yanay Ferral, E.I. Weiler Engineering, Project Administrator**
Name

PROOF OF RECEIPT

Recipient Signature: K Shemwell
Print Name: Kevin Shemwell, Executive Vice President
Company: Reynolds Construction, LLC dba Reynolds Construction of Florida, LLC
Date: 10/28/2024

"Excellence in Engineering"

6805 Overseas Highway
Marathon, Florida 33050
(305) 289-4161 ph
(305) 289-4162 fax

ADDENDUM NO. 3

Issue Date: ***October 18, 2024***

Project Name: ***KWRU Blower & Electrical Upgrades***

Notice to All Bidders:

The following information contained within this addendum is part of the contact documents and is binding. Any clarifications, additional information, and changes in scope presented in this addendum shall amend, where noted, previous parts or requirements of the bid documents which are dated prior to the issuance of this addendum.

Prospective Bidders shall acknowledge this addendum by including a signed copy of this page with their bid packages in order to be considered responsive and responsible.

Issued By: **Yanay Ferral, E.I. Weiler Engineering, Project Administrator**
Name

PROOF OF RECEIPT

Recipient Signature: KSHell
Print Name: Kevin Shemwell, Executive Vice President
Company: Reynolds Construction, LLC dba Reynolds Construction of Florida, LLC
Date: 10/28/2024

"Excellence in Engineering"

6805 Overseas Highway
Marathon, Florida 33050
(305) 289-4161 ph
(305) 289-4162 fax

ADDENDUM NO. 4

Issue Date: ***October 24, 2024***

Project Name: ***KWRU Blower & Electrical Upgrades***

Notice to All Bidders:

The following information contained within this addendum is part of the contact documents and is binding. Any clarifications, additional information, and changes in scope presented in this addendum shall amend, where noted, previous parts or requirements of the bid documents which are dated prior to the issuance of this addendum.

Prospective Bidders shall acknowledge this addendum by including a signed copy of this page with their bid packages in order to be considered responsive and responsible.

Issued By: **Yanay Ferral, E.I. Weiler Engineering, Project Administrator**
Name

PROOF OF RECEIPT

Recipient Signature: _____
Print Name: Kevin Shemwell, Executive Vice President
Company: Reynolds Construction, LLC dba Reynolds Construction of Florida, LLC
Date: 11/4/2024

"Excellence in Engineering"

6805 Overseas Highway
Marathon, Florida 33050
(305) 289-4161 ph
(305) 289-4162 fax

ADDENDUM NO. 5

Issue Date: ***October 31, 2024***

Project Name: ***KWRU Blower & Electrical Upgrades***

Notice to All Bidders:

The following information contained within this addendum is part of the contact documents and is binding. Any clarifications, additional information, and changes in scope presented in this addendum shall amend, where noted, previous parts or requirements of the bid documents which are dated prior to the issuance of this addendum.

Prospective Bidders shall acknowledge this addendum by including a signed copy of this page with their bid packages in order to be considered responsive and responsible.

Issued By: **Yanay Ferral, E.I. Weiler Engineering, Project Administrator**
Name

PROOF OF RECEIPT

Recipient Signature: KSL
Print Name: Kevin Shemwell, Executive Vice President
Company: Reynolds Construction, LLC dba Reynolds Construction of Florida, LLC
Date: 11/4/2024

Bidder Qualification Statement

QUALIFICATIONS STATEMENT

THE INFORMATION SUPPLIED IN THIS DOCUMENT IS CONFIDENTIAL TO THE EXTENT PERMITTED BY LAWS AND REGULATIONS

1. SUBMITTED BY:

Official Name of Firm: Reynolds Construction, LLC dba Reynolds Construction of Florida, LLC

Address: 300 East Broad Street, Fairburn, GA 30213

2. SUBMITTED TO: Key West Resort Utilities

3. SUBMITTED FOR: Blower and Electrical Upgrades

Owner: Key West Resort Utilities

Project Name: Blower and Electrical Upgrades

TYPE OF WORK: Blower & Electrical Upgrades

4. CONTRACTOR'S CONTACT INFORMATION

Contact Person: Kevin Shemwell

Title: Executive Vice President

Phone: 678-231-5350

Email: Kevin.shemwell@reynoldscon.com

5. AFFILIATED COMPANIES:

Name: ReyCon Partners, LLC & ReyCon Tech, LLC

Address: 6225 N County Road 75 E, Orleans, IN 47452

6. TYPE OF ORGANIZATION:

☐ SOLE PROPRIETORSHIP

Name of Owner: _____

Doing Business As: _____

Date of Organization: _____

☐ PARTNERSHIP

Date of Organization: _____

Type of Partnership: _____

Name of General Partner(s): _____

☐ CORPORATION

State of Organization: _____

Date of Organization: _____

Executive Officers:

- President: _____
- Vice President(s): _____
- Treasurer: _____
- Secretary: _____

☒ LIMITED LIABILITY COMPANY

State of Organization: Delaware

Date of Organization: 03/01/2016

Members: Please see attached list of officers.

☐ JOINT VENTURE

Sate of Organization: _____

Date of Organization: _____

Form of Organization: _____

Joint Venture Managing Partner

- Name: _____

- Address: _____

Joint Venture Managing Partner

- Name: _____

- Address: _____

Joint Venture Managing Partner

- Name: _____

- Address: _____

7. LICENSING

Jurisdiction: State of Florida

Type of License: General Contractor

License Number: CGC1525041

Jurisdiction:

Type of License:

License Number:

8. CERTIFICATIONS

CERTIFIED BY:

Disadvantage Business Enterprise: N/A

Minority Business Enterprise:

Woman Owned Enterprise:

Small Business Enterprise:

Other (_____):

9. BONDING INFORMATION

Bonding Company: Travelers Casualty & Surety Company of America

Address: One Tower Square, Hartford, CT 06183

Bonding Agent: Arthur J. Gallagher Risk Management Services, LLC

Address: 1601 Alliant Avenue, Louisville, KY 40299-6338

Contact Name: Will Kantlehner, III

Phone: 502-415-7034

Aggregate Bonding Capacity: $300,000,000

Available Bonding Capacity as of date of this submittal: $150,000,000

10. FINANCIAL INFORMATION

Financial Institution: CIBC Bank USA

Address: 120 S LaSalle Street

Chicago, IL 60603

Account Manager: Martin Santellano

Phone: 312-564-2943

INCLUDE AS AN ATTACHMENT AN AUDITED BALANCE SHEET FOR EACH OF THE LAST 3 YEARS

11. CONSTRUCTION EXPERIENCE:

Current Experience:

List on **Schedule A** all uncompleted projects currently under contract (If Joint Venture list each participant's projects separately).

Previous Experience:

List on **Schedule B** all projects completed within the last 5 Years (If Joint Venture list each participant's projects separately).

Has firm listed in Section 1 ever failed to complete a construction contract awarded to it?

☐ YES ☒ NO

If YES, attach as an Attachment details including Project Owner's contact information.

Has any Corporate Officer, Partner, Joint Venture participant or Proprietor ever failed to complete a construction contract awarded to them in their name or when acting as a principal of another entity?

☐ YES ☒ NO

If YES, attach as an Attachment details including Project Owner's contact information.

Are there any judgments, claims, disputes or litigation pending or outstanding involving the firm listed in Section 1 or any of its officers (or any of its partners if a partnership or any of the individual entities if a joint venture)? Please see attached.

☒ YES ☐ NO

If YES, attach as an Attachment details including Project Owner's contact information.

12. SAFETY PROGRAM:

Name of Contractor's Safety Officer: Armando Exposito

Include the following as attachments:

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) OSHA No. 500- Log & Summary of Occupational Injuries & Illnesses for the past 5 years.

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) list of all OSHA Citations & Notifications of Penalty (monetary or other) received within the last 5 years (indicate disposition as applicable) - IF NONE SO STATE.

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) list of all safety citations or violations under any state all received within the last 5 years (indicate disposition as applicable) - IF NONE SO STATE.

Provide the following for the firm listed in Section V (and for each proposed Subcontractor furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) the following (attach additional sheets as necessary):

Workers' compensation Experience Modification Rate (EMR) for the last 5 years:

YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____
YEAR	_____	EMR	_____

Please see attached EMR information.

Total Recordable Frequency Rate (TRFR) for the last 5 years:

YEAR	2019	TRFR	2.95
YEAR	2020	TRFR	1.67
YEAR	2021	TRFR	0.95
YEAR	2022	TRFR	0.67
YEAR	2023	TRFR	1.25

Total number of man-hours worked for the last 5 Years:

YEAR	2019	TOTAL NUMBER OF MAN-HOURS	949,566.75
YEAR	2020	TOTAL NUMBER OF MAN-HOURS	839,278.75
YEAR	2021	TOTAL NUMBER OF MAN-HOURS	632,863
YEAR	2022	TOTAL NUMBER OF MAN-HOURS	595,293
YEAR	2023	TOTAL NUMBER OF MAN-HOURS	799,985.25

Provide Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) Days Away From Work, Days of Restricted Work Activity or Job Transfer (DART) incidence rate for the particular industry or type of Work to be performed by Contractor and each of Contractor's proposed Subcontractors and Suppliers) for the last 5 years:

YEAR	2019	DART	2.11
YEAR	2020	DART	1.19
YEAR	2021	DART	0.58
YEAR	2022	DART	0.34
YEAR	2023	DART	0.50

13. EQUIPMENT:

MAJOR EQUIPMENT:

List on **Schedule C** all pieces of major equipment available for use on Owner's Project.

Please see attached Equipment list.

I HEREBY CERTIFY THAT THE INFORMATION SUBMITTED HEREWITH, INCLUDING ANY ATTACHMENTS, IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

NAME OF ORGANIZATION: Reynolds Construction, LLC dba Reynolds Construction of Florida, LLC

BY: _____

TITLE: Kevin Shemwell, Executive Vice President

DATED: 11/4/2024

NOTARY ATTEST:

SUBSCRIBED AND SWORN TO BEFORE ME

THIS 4 DAY OF November, 2024

NOTARY PUBLIC - STATE OF Florida

MY COMMISSION EXPIRES: 8/14/2026

JEANIE M LUCAS
Notary Public - State of Florida
Commission # HH 298093
My Comm. Expires Aug 14, 2026
Bonded through National Notary Assn.

REQUIRED ATTACHMENTS

1. Schedule A (Current Experience).
2. Schedule B (Previous Experience).
3. Schedule C (Major Equipment).
4. Audited balance sheet for each of the last 3 years for firm named in Section 1.
5. Evidence of authority for individuals listed in Section 7 to bind organization to an agreement.
6. Resumes of officers and key individuals (including Safety Officer) of firm named in Section 1.
7. Required safety program submittals listed in Section 13.
8. Additional items as pertinent.

SCHEDULE A

CURRENT EXPERIENCE

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

SCHEDULE B

PREVIOUS EXPERIENCE (Include ALL Projects Completed within last 5 years)

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

SCHEDULE B

PREVIOUS EXPERIENCE (Include ALL Projects Completed within last 5 years)

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				
	Name: Address: Telephone:	Name: Company: Telephone:				

SCHEDULE C - LIST OF MAJOR EQUIPMENT AVAILABLE

ITEM	PURCHASE DATE	CONDITION	ACQUIRED VALUE

REYNOLDS CONSTRUCTION COMPANY OFFICERS							
First Name MI Last	Title	Joined company*	Years Exp.	Business Address	City	ST	Zip
Jeff J. Reynolds	Director	1982	40	6225 N County Road 75 E	Orleans	IN	47452
Les F. Archer, PE DBIA	President	2000	36	6225 N County Road 75 E	Orleans	IN	47452
Kevin D. Shemwell	Executive Vice President	2008	22	300 East Broad St.	Fairburn	GA	30213
M. Paul Burton, DBIA	Executive Vice President	1984	38	6225 N County Road 75 E	Orleans	IN	47452
Elizabeth L. Smith	Executive Vice President	1993	29	6225 N County Road 75 E	Orleans	IN	47452
William R. Ryon	Vice President	1986	35	1825 Lebanon Pike	Nashville	TN	37210
John R. Chase	Vice President	2017	18	12421 San Jose Blvd., Suite 200B	Jacksonville	FL	32223
Adam K. Ralph, DBIA	Vice President	2002	18	6225 N County Road 75 E	Orleans	IN	47452
Randolph E. Tummers	Vice President	1991	30	6225 N County Road 75 E	Orleans	IN	47452
Jeffrey P. Berning	Vice President	1999	34	6225 N County Road 75 E	Orleans	IN	47452
Joshua R. Vondersaar	Vice President	2013	24	300 East Broad St.	Fairburn	GA	30213
Eduardo Medina	Vice President	2010	23	12535 Orange Drive, Suite 603	Davie	FL	33330
Scott Huber, PE	Vice President	2019	27	12220 N. Meridian, Suite 175	Carmel	IN	46032
Greg Slone	Vice President	2021	32	6225 N County Road 75 E	Orleans	IN	47452

*The dates indicated are based on when the employee first joined Reynolds Construction, LLC and/or one of the former company's in the Reynolds history (Reynolds, Inc. or Layne Heavy Civil, Inc.).

Ron DeSantis, Governor

Melanie S. Griffin, Secretary

STATE OF FLORIDA
DEPARTMENT OF BUSINESS AND PROFESSIONAL REGULATION

CONSTRUCTION INDUSTRY LICENSING BOARD

THE GENERAL CONTRACTOR HEREIN IS CERTIFIED UNDER THE
PROVISIONS OF CHAPTER 489, FLORIDA STATUTES

SHEMWELL, KEVIN DUANE

REYNOLDS CONSTRUCTION OF FLORIDA, LLC
6225 NORTH COUNTY ROAD 75 EAST
ORLEANS IN 47452

LICENSE NUMBER: CGC1525041

EXPIRATION DATE: AUGUST 31, 2026

Always verify licenses online at MyFloridaLicense.com

ISSUED: 06/04/2024

Do not alter this document in any form.

This is your license. It is unlawful for anyone other than the licensee to use this document.

KWRU Blower & Electrical Upgrades

Subcontractors List

Subcontractor	Trade	Address
Nearshore Electric Inc.	Electrician	5680 1st Avenue Suite 5 Key West, FL 33040
Skyline Steel Inc.	Metals Fabricator	4987 NW 23rd Avenue Fort Lauderdale, Fl 33309
C.C. Control Corporation	Controls Contractor	5760 Corporate Way West Palm Beach, Florida 33407

MITTAUER
& ASSOCIATES, INC.
CONSULTING ENGINEERS &
PROJECT FUNDING SPECIALISTS

580-1 WELLS ROAD
ORANGE PARK, FL 32073
PHONE: (904) 278-0030
FAX: (904) 278-0840
WWW.MITTAUER.COM

February 21, 2020

Mr. Kevin Shemwell
Executive Vice President - Southeast Division
Reynolds Construction, LLC
300 E. Broad Street
Fairburn, GA 30213

RE: WRF Improvements, Phase 2 (UV Replacement)
City of Key Colony Beach, Florida
Mittauer & Associates, Inc. Project No. 0604-12-1

Dear Mr. Shemwell:

I would like to express my appreciation for your team's fine work on the subject Key Colony Beach, Florida project designed by our office. The Reynolds team, lead by Project Manager Josh Vondersaar, were instrumental in the successful completion of this project.

Over the course of construction, we found Reynolds' staff to be very knowledgeable and responsive regarding the completion of the work. They consistently performed in a professional manner, communicated in a clear and timely fashion, and addressed unforeseen issues in the field effectively. The result was a high-quality work product, delivered on time, that the Owner appreciated.

Again, thanks to the Reynolds operations team for their dedicated efforts on our project. We look forward to working with Reynolds Construction on future projects.

Sincerely yours,
Mittauer & Associates, Inc.

Jason R. Shepler, P.E.
Vice President of Environmental Services

JRS/pj

CITY OF MARATHON, FLORIDA
9805 Overseas Highway, Marathon, FL 33050
Phone (305) 743-0033 | www.ci.marathon.fl.us

March 19, 2019

Mr. Kevin Shemwell, Vice President
Reynolds Construction, LLC
300 East Broad Street
Fairburn, GA 30213

RE: City of Marathon Utilities Projects

Dear Mr. Shemwell,

Regarding the projects listed below, The City of Marathon Utilities Team would like to acknowledge the focus, knowledge, professionalism, dedication, quality of work, and "can do" attitude provided by the Reynolds Operations Team.

The Reynolds Team of Josh Vondersaar, Kevin Conkey, and Jeremy Girod have been dedicated to the job, extremely responsive to change requests and have stayed on schedule and work extremely well with City staff and our engineers. Kevin and Jeremy stay in constant contact with the City's operations staff to make sure all of the work is coordinated with required plant operations. Nighttime work has been used as have other very creative ideas presented successfully by the Reynolds team. Jeremy and Kevin are a wonder of constant planning and execution. The work seems to flow seamlessly toward completion regardless of the issues of the day.

Reynolds Construction has successfully performed and continues to perform admirably on a number of contracts for the City of Marathon. The following projects have been successfully completed, on time and with-in budget:

- Service Area 6 Force Main Extension (2016-2017)
- Service Area 3 & 4 WWTP Upgrades (2017-2018)
- Service Area 3 Force Main Extension (2017)
- Service Area 5 Membrane Upgrade Project (2018)

Currently we are in progress of a project with the Reynolds Team in Service Area 5 which was awarded on March 13th, 2018 and includes steel tank and glass lined tank repairs, headworks replacement, piping, valves, pumps, control systems, and lots of other miscellaneous work. This project has been a big challenge because it is an upgrade to an existing wastewater treatment plant that is running at 100% capacity during the entire construction project. Currently it is on-time and on budget and we have maintained full compliance with advanced wastewater treatment standards throughout the project.

This operations team has been a pleasure to work with these last several years. Kevin and Jeremy would offer ideas and suggestions about anything that would be beneficial to the project. This gave us an opportunity to draw on their expertise and experience and we took advantage of it regularly. We hope to continue working with them on future projects and appreciate their professionalism and dedication to our projects.

Sincerely,

Daniel Saus

Utilities Director

U.S. Water Services Corporation

Water and Wastewater Utility Operations, Maintenance, Engineering, Management, Construction

Mr. Kevin Shemwell, Vice President
Reynolds Construction, LLC
300 East Broad Street
Fairburn, GA 30213

RE: City of Key Colony Beach

Dear Mr. Shemwell,

Regarding the city of Key Colony Beach UV replacement project completed February 2020 I would like to acknowledge the focus, knowledge, professionalism, dedication, quality of work, and "can do" attitude provided by the Reynolds Operations Team.

The Reynolds Team of Josh Vondersaar and Jeremy Girod have been dedicated to the job and extremely responsive to change requests and have stayed on schedule and work extremely well with City staff and our engineers.

Josh and Jeremy stay in constant contact with the City's operations staff to make sure all of the work is coordinated with required plant operations.

The Reynolds team attention to detail and planning is obvious in the performance of the installation of our equipment the UV reactors were able to be removed and replaced without any interruption to the facility operation. I was particularly impressed by their attention to safety.

I look forward to working with them again on future projects.

David L Evans
US Water Service Corporation
Senior Project Manager

98310 Overseas Highway * Key Largo * Florida 33037
Telephone: 305-853-5122 * Toll Free: 866-756-8292 * Fax: 305-853-5124

4939 Cross Bayou Boulevard * New Port Richey, Florida 34652
Telephone: 727-848-8292 * Toll Free: 866-756-8292 * Fax: 727-848-7701

FLORIDA KEYS AQUEDUCT AUTHORTY
KERMIT H. LEWIN RO GENERATOR FACILITY
KEY WEST, FLORIDA

Reynolds Construction

Project Description

Construction of an emergency standby electrical power generation facility consisting of two Tier 2 rated, high-speed emergency engine generators. Each generator will be furnished with an exhaust silencer, protected-type day tanks to be located in separate sprinkled rooms with remote pumps to supply fuel to the engine-generators. The generators will be protected against a 500-year flood event by locating the generators inside a raised building, at an elevation outside the Special Flood Hazard Area (SFHA). The project also includes a 480V motor control center (MCC),network rack, local control panels for both engine generators and fuel tanks, and lighting panel for low voltage lighting and miscellaneous loads. Switchgear and PLC monitoring and controlling the generators will be located in the electrical room in the New Kermit H. Lewin Reverse Osmosis Facility project and provided under a separate contract.

At a Glance

Contract Amount:
$8,142,448

Notice to Proceed:
May 2, 2022

Est. Completion Date:
December 20, 2024

Owner Contact Info:
FKAA
David Hackworth, Director
(305) 296-2454
dhackworth@fkaa.com

Engineer Contact Info:
Black & Veatch
Rafael Frias, PE
(913) 458-2000
FriasRE@bv.com

CITY OF MARATHON
MARATHON AREA 7
MARATHON, FLORIDA

Project Description

The construction of this project consists of upgrades to the filters and static screen at the Area 7 WWTP. The upgrades include the installation of two-disc filters and a metal platform. Modification to the existing headworks platform as well as the purchase and installation of a new static screen will occur.

At a Glance

Contract Amount:
$1,236,413.33

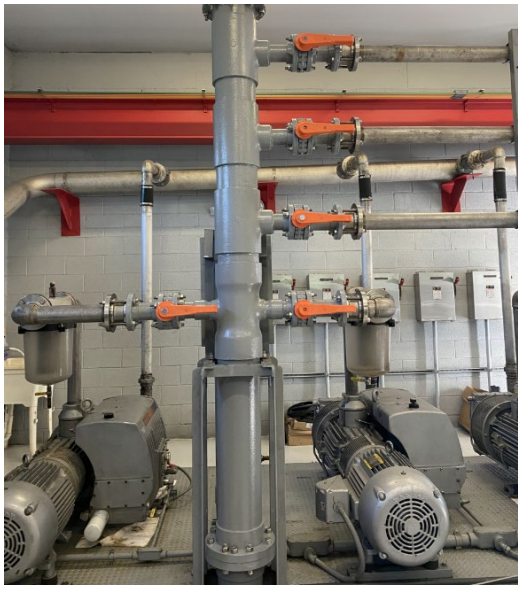
Notice to Proceed:
July 1, 2023

Est. Completion Date:
November 10, 2024

Owner Contact Info:
Dan Saus
O: (305) 743-0033; C: (305) 289-5009
Sausd@ci.marathon.fl.us

Engineer Contact Info:
Steve Suggs
O: (305) 289-4161; C: (941) 323-1787
ssuggs@weilerengineering.com

KEY LARGO WASTEWATER DISTRICT
VACUUM STATIONS MODIFICATIONS
KEY LARGO, FLORIDA



Project Description

The Key Largo Wastewater Treatment District is performing capital upgrades of its vacuum pump stations to allow emergency operation using a trailer-mounted vacuum pump skid and control panel. Upgrades will take place at all 7 pump station locations.

At a Glance

Contract Amount:
$2,641,567

Notice to Proceed:
May 19, 2023

Est. Completion Date:
November 9, 2024

Owner Contact Info:
Peter Rosasco, General Manager
(305) 451-4019
Peter.rosasco@klwtd.com

Engineer Contact Info:
Stephen Suggs, P.E.
O: (305)289-4161 C:(941)323-1787
ssuggs@weilerengineering.org

KEY LARGO WASTEWATER DISTRICT
KEY LARGO FILTRATION
KEY LARGO, FLORIDA

Project Description

The Key Largo Wastewater Treatment District intends to install a third disc filtration unit to treat its effluent prior to disinfection and disposal. The facility currently has two disc filter units. The third unit will be added to increase throughput and to provide additional reliability. The work includes installation of the new disc filter, including foundation, platform and filtration unit. All associated work needed to provide a fully functional system, including installation of 18" and 20" ductile iron pipe, replacement of booster pump, elevated concrete platform, and electrical work.

At a Glance

Contract Amount:
$2,196,846

Notice to Proceed:
May 1, 2023

Est. Completion Date:
November 9, 2024

MGD: avg 4.7, peak 9.4

Owner Contact Info:
Peter Rosasco
(305) 451-4019
peter.rosasco@klwtd.com

Engineer Contact Info:
Jessica Huff
O: (305) 289-4161; C: (814) 577-3418
jhuff@weilerengineering.org

CITY OF MARATHON
MARATHON WWTP CHEMICAL SYSTEM UPGRADES
MARATHON, FLORIDA

Reynolds Construction

Project Description

The City of Marathon's Utilities Department is performing capital upgrades on chemical feed systems for the 5 wastewater treatment facilities located in the City. These chemical feed systems include pumps and controls for feed of sodium hydroxide, alum, sodium hypochlorite. Underground chemical feed lines will be installed to the locations of various injection points throughout the WWTP and must keep the facility operational at all times during construction. Reynolds' summary of work was to provide elevated deck for chemical feed skids and install chemical feed skid. Each skid shall include multiple pumps for each chemical, including sodium hydroxide, glycerin, alum and sodium hypochlorite liquid solutions. Provide and install chemical storage tanks and all piping, fittings, meters and devices for the chemical feed system to deliver chemicals to the specified locations at the site. Install all necessary electrical components. And provide programming of the chemical feed systems controls, including system startup and testing, and placing the system into operation.

At a Glance

Contract Amount:
$2,814,132

Notice to Proceed:
January 24, 2022

Completion Date:
September 27, 2024

Owner Contact Info:
City of Marathon
Daniel Saus, Utilities Director
(305) 289-5009
sausd@ci.marathon.fl.us

Engineer Contact Info:
Weiler Engineering Corporation
Steve Suggs, PE
(305) 289-4161
ssuggs@weilerengineering.org

FLORIDA KEYS AQUADUCT AUTHORITY
SIGSBEE MASTER LIFT STATION
DREDGER'S KEY, KEY WEST, FLORIDA

Project Description

Reynolds worked in conjunction with the Florida Keys Aqueduct Authority (FKAA) to redesign the Engineer's design of a cast-in-place (CIP) wet well to a pre-cast solution. Reynolds worked on a design to allow the existing wet well / pump station to stay in service while operating the new wet well to assure pumping compacity and operations. Additionally, Reynolds' work with the FKAA to redesign a control panel stand and sunshade structure into a combined system for an elevated suspended deck generator pad saving the Owner slab space and assisting with the functionality for maintenance. Underground influent and effluent pipes (4" to 12" PVC – 305 LF Force main, 8" PVC 100 LF) were relocated, replaced and tied in during shutdown sequencing. Reynolds self-performed the sheeting and dewatering operations to place the pre-cast concrete wet well. All work was performed within 120' of the ocean.

At a Glance

Contract Amount:
$2,719,594

Notice to Proceed:
October 20, 2021

Completion Date:
July 23, 2023

MGD: 1.3

Owner Contact Info:
Florida Keys Aqueduct Authority
David Hackworth
(305) 295-2152
Dhackworth@fkaa.com

Engineer Contact Info:
Carollo Engineers, Inc.
Christopher T. Reinbold, PE
(561) 868-6400
creinbold@carollo.com

CITY OF MARATHON
MARATHON AREA 3, 4, & 5 WWTP UPGRADES
MARATHON, FLORIDA

Project Description

This project upgraded the city's wastewater treatment capacity.

For Marathon Area 3, Reynolds replaced an existing membrane disc filter with a new membrane disc filter, modified existing screenings equipment, installed a new 125,000 gallon field welded steel equalization basin, and replaced existing blowers with new blowers.

For Marathon Area 4, Reynolds installed a new membrane disc filter and rehabilitated the existing sand filters.

For Marathon Area 5, Reynolds upgraded the MBR system, installed a new screening system with free standing elevated steel platform, along with multiple pumping and piping upgrades. The pumps were dry pit installation.

At a Glance

Contract Amount:
$9,000,617

Notice to Proceed:
January 3, 2017

Completion Date:
January 21, 2022

MGD: 0.9

Owner Contact Info:
City of Marathon
Dan Saus, Utilities Director
(305) 289-5009
sausd@ci.marathon.fl.us

Engineer Contact Info:
Weiler Engineering Corporation
Steve Suggs, Project Manager
(941) 505-1700
ssuggs@weilerengineering.org

CITY OF KEY COLONY BEACH
KEY COLONY BEACH
KEY COLONY BEACH, FLORIDA

Project Description

The Project consisted of demolition of the existing pre-engineered metal building, furnishing and installing a UV replacement system to be sequentially installed to maintain the water reclamation facility operations; existing electrical, demolition, removal, and replacement; sequenced demolition and temporary services to maintain UV disinfection system during construction of improvements and construction of maintenance I-Beam trolley in existing ISAM Control Room.

At a Glance

Contract Amount:
$348,967

Completion Date:
August 27, 2021

Owner Contact Info:
City of Key Colony beach
Pat Hyland
(305) 289-1212

Engineer Contact Info:
Weiler Engineering
Steve Suggs
(941) 323-1787
ssuggs@weilerengineering.org

FLORIDA KEYS AQUEDUCT AUTHORITY
BIG COPPITT WWTP
TERTIARY FILTRATION IMPROVEMENTS
KEY WEST, FL

Project Description

Reynolds installed 2 additional disc filters at the Big Coppitt Wastewater Treatment Plant that are being furnished by FKAA. Two (2) membrane disk filters were installed which involved a coordinated shutdown that included the installation of 10" PVC pipe, flowmeters and chemical injection relocation. All electrical and Instrumentation and controls upgrades were performed under the supervision of Reynolds.

At a Glance

Contract Amount:
$784,764

Notice to Proceed:
September 15, 2020

Completion Date:
June 11, 2021

Owner Contact Info:
Florida Keys Aqueduct Authority
David Hackworth
(305) 295-2152
dhackworth@fkaa.com

Engineer Contact Info:
CPH Engineers
Kyle Bechtelheimer
(305) 274-4805
kbechtelheimer@cphcorp.com

Schedule A:
Current Experience

We have summarized this listing.
Please contact us for any additional
specific information you would like to see.

PROJECT NAME & LOCATION	BUSINESS ASSOCIATION	OWNER CONTACT	ENGINEER CONTACT	CONTRACT DATE	TYPE OF WORK	STATUS	COST OF WORK
Huntingburg Wastewater Utility Improvements – Division "A" WWTP Huntingburg, IN	Prime Contractor	City of Huntingburg Thomas Dippel, Clerk-Treasurer 812-683-2211 tdippel@huntingburg-in.gov	Commonwealth Engineers, Inc Eric Parsley, P.E., Project Manager 812-453-6064	2/23/2026	Wastewater Treatment Plant	1%	$34,070,000.00
Peachtree City Design-Build WWFT Improvements Peachtree City, GA	Prime Contractor	Peachtree City Water & Sewage Authority Larry McNeil, Deputy General Manager 770-487-7993 LMcNeil@pcwasa.org	Civil Engineering Consultants, Inc. David Gauker O: 770-977-5747 C: 404-536-7699 david@cecincga.com	2/1/2026	Wastewater Treatment Plant	7%	$ 5,992,200.00
Mayport PS Rehabilitation Jacksonville, FL	Prime Contractor	American Water Military Michael Digilio, PM 845-667-1177 Michael.Digilio@amwater.com	Ramboll Gaines Barry, Sr. PM 615-277-7503 gbarry@ramboll.com	12/31/2025	Pump Station	5%	$ 8,403,704.00
Mayport Sewer System Rehab Jacksonville, FL	Prime Contractor	American Water Military Jeff Hollis, Capital Project Manager 573-586-4275 Jeffery.hollis@amwater.com	N/A	12/31/2025	Sewer Pipeline	30%	$ 5,623,120.00
Cicero WWTP Cicero, IN	Prime Contractor	Town of Cicero Chris Lutz, Town Council President 317-984-4900 clutz@townofcicero.in.gov	United Consulting Engineers Dann Barrett, PE, Project Manager 317-895-2585	12/1/2025	Wastewater Treatment Plant	8%	$ 19,200,000.00
South Cobb Filtration Rehab Austell, GA	Prime Contractor	Cobb County Water System Wilson Collins O: 770-419-6200 C: 770-419-6466 Wilson.Collins@cobbcounty.org	Jacobs Joel Smith O: 615-354-6002 C: 770-419-6334 Joel.Smith@cobbcounty.org	10/31/2025	Filter Rehab	3%	$ 3,760,000.00
Spider Creek SSS Storage Project Bedford, IN	Prime Contractor	City of Bedford Misty Adams, Management Coordinator 812-278-4371 madams@bedford.in.gov	Lochmueller Group Todd Trinkle, Project Manager/Regulatory Specialist 812-725-7900 TTRinkle@lochgroup.com	7/25/2025	Pump Station and Water Storage	28%	$ 15,015,556.00
Glick Wellfield Improvements Project Lafayette, IN	Prime Contractor	City of Lafayette Water Works Steve Moore, Superintendent O: 765-807-1712 C: 765-491-9378 smoore@lafayette.in.gov	Wessler Engineering Andrew Gordon, PE O: 317-788-4551 C: 317-402-2051 AndrewG@wesslerengineering.com	7/1/2025	Wellfield Improvements	27%	$ 4,238,564.00
NJAW Oak Street Lakewood, NJ	Prime Contractor	New Jersey American Water Madelyn Spinner, P.E., Engineering Project Manager 856-325-9408 Madelyn.Spinner@amwater.com	Gannett Fleming Chris Olson, Design Project Manager 856-745-9234 colson@gfnet.com	7/1/2025	PFAS Removal	8%	$ 4,498,553.00
Monticello Biosolids Monticello, IN	Prime Contractor	City of Monticello Cathy Gross, Mayor 574-583-9889 mayor@monticelloin.gov	Wessler Engineering Gary Ruston, PE O: 317-788-4551 C: 317-696-1687 GaryR@wesslerengineering.com	5/26/2025	Biosolids Facility System	21%	$ 1,397,000.00
Chandler Water Transmission Line Chandler, IN	Prime Contractor	Town of Chandler Tyler Kinder, Director of Public Services 812-483-7896 TKinder@townofchandler.org	Beam, Longest & Neff, LLC Pete Wamsley, PE O: 317-806-6021 C: 937-242-5036 pwamsley@b-l-n.com	5/25/2025	Water Line	80%	$ 14,951,885.00
Chalfont Well No. 11 PFAS Treatment Improvements Chalfont, PA	Prime Contractor	Aqua Pennsylvania Brennan T. Kelley, PE, Sr. Engineer O: 610-645-4297 C: 610-306-7899 btkelly@aquaamerica.com	Mott MacDonald Carolynn A. Zebrowski, PE, DBIA 732-333-3267 carolynn.zebrowski@mottmac.com	4/11/2025	PFAS Removal	18%	$ 5,263,185.00
Richard A Heyman Environmental Protection Facility: RAS & WAS Pump System Replacement Key West, FL	Prime Contractor	City of Key West Albert Childress, City Manager 305-809-3786 planning-dept@cityofkeywest-fl.gov	Black & Veatch Ian McDowell, Manager 305-809-3753 CIMcDowell@cityofkeywest-fl.gov	3/19/2025	Wastewater Treatment Plant	32%	$ 3,600,000.00

Schedule A:
Current Experience

We have summarized this listing.
Please contact us for any additional
specific information you would like to see.

PROJECT NAME & LOCATION	BUSINESS ASSOCIATION	OWNER CONTACT	ENGINEER CONTACT	CONTRACT DATE	TYPE OF WORK	STATUS	COST OF WORK
Cedar Rapids HCW7- Caisson & Laterals Cedar Rapids, IA	Prime Contractor	City of Cedar Rapids Paul Bestick, Utilities Engineer 319-286-5753 p.bestick@cedar-rapids.org	Black & Veatch Barry Schmidt, Civil Engineer 913-458-3660 schmidtbt@bv.com	3/14/2025	Collector Well	58%	$ 4,032,200.00
Shenango Valley WTP Pretreatment Process Improvements - Phase 1 Sharon, PA	Prime Contractor	Aqua American Pennsylvania Josh Schoff, Sr. Project Engineer O: 412-208-6568 C: 814-341-6533 jpschoff@aquawater.com	Mott-Macdonald Kevin Pugliesi, PE O: 304-212-3032 C: 570-872-4914 kevin.pugliesi@mottmac.com	3/1/2025	Water Treatment Plant	4%	$ 18,857,000.00
Collector Well Rehabilitation Olathe, KS	Prime Contractor	City of Olathe Paul Kokoruda 913-971-9311 pjkokoruda@olatheks.org	N/A	3/1/2025	Collector Well	35%	$ 1,543,730.00
US 31 Corridor Infrastructure Investment Project Phase 2A & 2B Water and Sewer Hamilton County, IN	Prime Contractor	Hamilton County Steve Wood, Superintendent 317-776-8493 steve.wood@hamiltoncounty.in.gov	Wessler Engineering Robert Holden, PE O: 317-788-4551 C: 317-490-5342 bobh@wellserengineering.com	2/28/2025	Wastewater Treatment Plant	43%	$ 16,880,000.00
Galleria Area Outfall Sewer Replacement Atlanta, GA	Prime Contractor	Cobb County Water System Jake Murray, PE 770-419-6345 Jake.murray@cobbcounty.org	Jacobs Joel Smith, PE 770-419-6334 Joel.smith@cobbcounty.org	2/13/2025	Tunneling	62%	$ 9,085,328.00
Whitwell ClearWell Whitwell, TN	Prime Contractor	Tennessee American Water Kevin Kruchinski 859-361-1770 Kevin.Kruchinski@amwater.com	HDR Caroline Archer 423-508-3182 770-871-9379 Caroline.archer@hdrinc.com	2/12/2025	Clearwell	19%	$ 2,089,000.00
First Creek Interceptor Aurora, CO	Prime Contractor	City of Aurora Andrea Long, Principal Engineer O: 720-859-4346 C: 812-760-8717 along@auroragov.org	HDR, Inc Steven Pool O: 303-764-1540 C: 303-250-7938 Steven.pool@hdrinc.com	1/1/2025	Sewer Pipeline	87%	$ 38,207,894.00
Biosolids Progressive- Design- Build Facility Nashville, TN	Prime Contractor	Metro Government of Nashville and Davidson County Taft McNeal, PE 615-294-7509 taft.mcneal@nashville.gov	SSR (Smith, Seickman and Reid) Richard Chappell P.E., BCEE 615-383-1113 rchappell@ssr-inc.com	12/23/2024	Biosolids Facility System	86%	$ 30,371,742.00
Hamilton County US 31 Cooridor Infrastructure Hamilton County, IN	Prime Contractor	Hamilton County Mark Heirbrandt, Commissioner 317-776-9719 Mark.heirbrandt@hamiltoncounty.in.gov	Wessler Engineering Marty Wessler, PE 317-788-4551 Mwessler@wesslerengineering.com	12/20/2024	Wastewater Treatment Plant	68%	$ 36,924,000.00
Confidential	Prime Contractor	Confidential	Confidential	12/16/2024	Biogas Facility	78%	Confidential
GP Cedar Springs Outfall Cedar Springs, GA	Prime Contractor	Georgia Pacific Will Turner, Digital Strategy 229-309-4270 will.turner@gapac.com	Parsons Jack Bunton, Director 251-610-5745 jack.bunton@parsons.com	12/15/2024	Marine Service	54%	$ 8,751,058.00
White River WTP Chlorine Conversion Project Noblesville, IN	Prime Contractor	American Water Indiana Jemesia Jefferson, Engineer 317-525-7215 Jemesia.Jefferson@amwater.com	Gannett Fleming Jamie R Shambaugh, PE 717-503-0692 jshambaugh@gfnet.com	11/22/2024	Water Treatment Plant	75%	$ 2,802,279.00
SRNG Liberty RNG Confidential, NC	Prime Contractor	Confidential	Confidential	11/15/2024	Biogas Facility	88%	$ 15,377,141.00
Key Largo Filtration Key Largo, FL	Prime Contractor	Key Largo Wastewater District Peter Rosasco, General Manager 305-451-4019 peter.rosasco@klwtd.com	Weiler Engineering Corporation Jessica Huff, Design Engineer O: 305-289-4161 C: 814-577-3418 jhuff@weilerengineering.org	11/9/2024	Wastewater Treatment Plant	43%	$ 2,196,846.00

Schedule A:
Current Experience

We have summarized this listing.
Please contact us for any additional
specific information you would like to see.

PROJECT NAME & LOCATION	BUSINESS ASSOCIATION	OWNER CONTACT	ENGINEER CONTACT	CONTRACT DATE	TYPE OF WORK	STATUS	COST OF WORK
Key Largo Wastewater Treatment District Vacuum Stations Modifications Key Largo, FL	Prime Contractor	Key Largo Wastewater District Peter Rosasco, General Manager 305-451-4019 peter.rosasco@klwtd.com	Weiler Engineering Corporation Steve Suggs, PE O: 305-289-4161 C: 941-323-1787 ssuggs@weilerengineering.org	11/9/2024	Vac Stations	44%	$ 2,641,567.00
Town of Cloverdale & Leiber SRA Sanitary Improvements Cloverdale, IN	Prime Contractor	Town of Cloverdale Jason Hartman, Manager 765-795-6033 manager@cloverdalein.com Leiber Park SRA 877-463-6367	HWC Engineering Brain Neilson, PE, LEED AP O: 317-981-1267 C: 317-656-1311 bneilson@hwcengineering.com	11/1/2024	Wastewater Treatment Plant	54%	$ 7,500,600.00
Terry Ranch Pipeline Greeley, CO	Prime Contractor	City of Greeley Jim Paulson, P.E. C: 970-590-5338 O: 970-350-9814 jim.paulson@greeleygov.com	Providence Infrastructure Consultants Daniel Rice, P.E. 303-997-5035 drice@providenceic.com	11/1/2024	Water Pipeline	82%	$ 35,974,221.00
James E Quarles WTP Valve & Actuator Replacement Marietta, GA	Prime Contractor	Cobb County- Marietta Water Rita Neely, PE O: 770-514-5293 C: 678-920-3801 rneely@ccmwa.org	Hazen and Sawyer Bevis Piott, Sr. Associate O: 404-459-6363 C: 678-244-6719 bpigott@hazenandsawyer.com	11/1/2024	Water Treatment Plant	64%	$ 3,821,803.00
AWIN Sheridan WTF Sheridan, IN	Prime Contractor	American Water Indiana Roy Francis, PE 317-885-2417 Roy.francis@amwater.com	Gannett Fleming Jamie R Shambaugh, PE 717-503-0692 jshambaugh@gfnet.com	10/31/2024	Wastewater Treatment Plant	74%	$ 24,985,785.00
Eastern Utility Extension Zone 4 Waterline Aurora, CO	Prime Contractor	City of Aurora Dean Bedford, PE 720-859-4342 dbedford@auroragov.org	HDR Keith Bushdiecker, PM 303-764-1547 Keith.Bushdiecker@hdrinc.com	10/31/2024	Water Pipeline	82%	$ 33,652,780.00
CEG Harbour WTP Sodium Hypochlorite Building & Corrosion Inhibitor Noblesville, IN	Prime Contractor	Citizens Energy Group Sarah Wittig, PE, Project Manager O: 317-927-4609 C: 413-329-7868 swittig@citizensenergygroup.com	Black & Veatch Matthew Pierce O: 317-570-8331 C: 260-420-2411 piercemj@bv.com	10/31/2024	Water Treatment Plant	33%	$ 2,517,600.00
CEG Geist WTP Sodium Hypochlorite Building and Corrosion Inhibitor Indianapolis, IN	Prime Contractor	Citizens Energy Group Sarah Wittig, PE, Project Manager O: 317-927-4609 C: 413-329-7868 swittig@citizensenergygroup.com	Black & Veatch Matthew Pierce O: 317-570-8331 C: 260-420-2411 piercemj@bv.com	10/31/2024	Water Treatment Plant	44%	$ 3,017,000.00
Kermit H Lewin RO Generator Facility Key West, FL	Prime Contractor	Florida Keys Aquaduct Authority David Hackworth, Director of Engineering 305-296-2454 dhackworth@fkaa.com	Black & Veatch Rafael Frias, PE 913-458-2000 FriasRE@bv.com	10/31/2024	Wastewater Treatment Plant	95%	$ 8,142,448.00

Schedule B:
Reynolds Construction Projects Last 5 Years

Project Name & Location	Owner Address	Engineer Address	Final Completion Date	Description	Pipe Length & Width	Status	Final Contract Amount
Iron Filtration System at Seaman's Neck Road Levittown, NY	Liberty Utilites 15 Buttrick RD Londonderry, NH 03053 Jason Tse 516-273-0419 Jason.Tse@libertyutilities.com	D&B Engineers 330 Crossways Park Drive, Woodbury, NY Phil Sachs 516-364-9890 ext 3401 psachs@bd-eng.com	8/12/2024	Furnishing of plant equipment, replacement of actuators, rebuilding and adjustment of 4 hydraulic flow control valves including removal, disposal, and replacement of iron filter and support media. Modifications and repair to interior filter vessels underdrain piping and spot repair of exterior vessels coating system. Removal, disposal, and replacement of miscellaneous mechanical equipment and replacement of mechanical fastening support. Installation of a post-filtration sodium hydroxide storage and water treatment system with a new chemical safety control system.		100%	$1,616,448
Duck River New Intake Phase 1 Lewisburg, TN	Marshall County Board of Public Utilities 3562 Verona Caney Rd Lewisburg TN 37091 Chad Dennis, Superintedent O: 931-359-6905 C: 931-224-3147 chadd@mcbpu.com	James C. Hailey & Co 360 Cool Springs Blvd #100 Franklin, TN 37067 Matthew Tucker, PE O: 615-883-4933 C: 731-697-3290 mtucker@jchengr.com	7/12/2024	This project consists of a drill and blast a 27’ OD, 50’ deep shaft for a new intake for Marshall County Board of Public Utilities. Once the shaft is complete, we will be microtunneling into Duck River via UBM-1200, installing 90’ of 60” steel casing with 30” FRP carrier pipe. Other duties include a 3” line, shotcreting the shaft, and installation of gates, valves, and intake screen. This project includes a raw water intake	60"- 90LF	100%	$5,450,931
AWKY UV Disinfection System Additions Lexington, KY	American Water Kentucky 2300 Richmond Rd Lexington, KY 40502 Austin Thore O: (859) 268-6730 C: (859) 559-9514 Austin.Thore@amwater.com	Stantec 3052 Beaumont Centre Circle Lexington, KY 40513 Bret Lavey 859-552-4909 bret.lavey@stantec.com	6/30/2024	New UV disinfection systems will be integrated and installed into existing infrastructures.	16" DIP- 19,882LF 12" DIP- 440LF 1" Poly- 200LF 8" HDPE- 21,149LF 18" PVC- 85LF 10" PVC- 188LF	100%	Confidential
Sugar Creek WTP Chlorine Conversion Design-Build Franklin, IN	American Water Indiana 1 Water Street Camden, NJ 08102 Conor Bourque, Lead Design Engineer 732-597-0449 Conor.bourque@amwater.com	Gannett Fleming 207 Senate Avenue Camp Hill, PA 17011 Jamie R Shambaugh, PE 717-503-0692 jshambaugh@gfnet.com	6/28/2024	This project is converting an existing chlorine gas system into a bulk sodium hypochlorite system.		100%	$2,926,677
Long Term Control Plan Phase III Division B WWTP Improvements Project Paoli, IN	Town of Paoli 110 N. Gospel Street Paoli, IN 47454 Danny Hickman 812-788-0342 dhickman@paoli.in.gov	Commonwealth Engineers, Inc. 420 NW 5th Street, Suite 201 Evansville, IN 47708 Eric Parsley O 812-474-1177 M 812-453-6064 eparsley@contactcei.com	3/24/2024	This facility includes an influent lift station, screening, UV disinfection, cascade aeration, a sludge holding tank, a bag dewatering system, chemical phosphorus removal system, and a new effluent sewer and outfall. Reynolds’ crew placed and finished an estimated 1,451 cubic yards of concrete in a continuous pour for the new WWTP project.	8” DIP - 80LF 24” DIP - 120LF 18” DIP - 500LF 24” DIP - 50LF 24” DIP - 50LF 30” DIP - 80LF 4” DIP - 200LF 6” DIP - 400LF	100%	$10,499,666
Metro Water Recovery: PAR1316-Interceptor Rehab Ph3 Robert W Hite Treatment Facility Work Denver, CO	Inliner Solutions, LLC 7915 Cherrywood Loop Kiowa, CO 80117 Baldemar Corral O: 303-646-1200 C: 719-318-5778 Baldemar.corral@puriscorp.com	Metro Water Recovery 6450 York St Denver, CO 80216 Mark Hofmeister O: 303-646-1200 C: 303-638-1049 Mhofmeister@MetroWaterRecovery.com	2/28/2024	Reynolds' scope consisted of the excavation, removal, and replacement of the tops/lids to concrete structures as well as “slip line” install 110” HOBAS (FRP) pipe. The lids on the concrete structures needed to be sawcut and removed for Granite Inliner to gain access to line the existing structures and pipe.	110"-30LF	100%	$1,795,251
Smith Raw Water EKPC Winchester, KY	East Kentucky Power P.O. Box 707 Winchester, KY 40392 Patrick Bischoff, Principal Engineer 857-229-4684 Patrick.Bischoff@EKPC.coop	GRW Engineering 801 Corporate Drive Lexington, KY 40503 Adalyn Hangy, PM 859-223-3999 AHangy@GRWinc.com	1/31/2024	This project included 12,300’ of 10” PVC raw Water line. Replacing a leaking existing raw water main.	10"- 12,300LF	100%	$3,807,880
Kankakee WTP UV Disinfection Facility Kankakee, IL	Aqua America Illinois 1000 S. Schuyler Ave Kankakee, IL 60901 Tracy Fullen, Engineering Manager O 217-442-3063 M 217-260-6070 tmfullen@aquaamerica.com	Donohue & Associates, Inc. 230 W. Monroe Street, Suite 2925 Chicago, IL 60606 Richard Claus, PE, Sr. PM O 312-583-7241 M 513-453-2347 rclaus@donohue-associates.com	12/15/2023	This project included construction of a UV disinfection facility including intake structures, chemical feeds, coagulation, clarification, filtration, disinfection and delivery to the system via clearwell storage and distribution pumping.	20" DIP - 285 LF 42" DIP - 201 LF	100%	$10,663,422

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Schedule B:
Reynolds Construction Projects Last 5 Years

Project Name & Location	Owner Address	Engineer Address	Final Completion Date	Description	Pipe Length & Width	Status	Final Contract Amount
White River Residual Imps Ph 2 Indianapolis, IN	Citizens Energy Group 2150 Dr. Martin Luther King Jr Street Indianaoplis, IN 46202 Dan Kramer O: 317-327-1033 C: 317-796-3541 dan.kramer@citizensenergygroup.com	Donohue & Associates, Inc. 101 W Ohio Street, Suite 1650 Indianapolis, IN 46204 Richard Claus O: 317-267-4235 C: 317-453-2347 rclaus@donohue-associates.com	11/30/2023	The WTP is equipped with two membrane filter presses and ancillary equipment. These membrane presses were no longer in service. This project included the removal and disposal of the existing presses and construction of a new Belt Filter Press operation along with other miscellaneous improvements to the residuals handling process.		100%	$3,653,731
Hopewell LSPS Structural, HVAC, and Foundation Repairs Hopewell, VA	American Water Virginia 900 Industrial Street Hopewell, VA 23860 Jim Reilly, DBIA O 856-955-4001 Main 856-955-4222 M 732-904-1344 Jim.Reilly@amwater.com	Gannett Fleming 207 Senate Ave Camp Hill, PA 17011 Jeff Raffensperger O: 717866-5738 jraffensperger@GFNET.com	11/2/2023	Virginia American Water requested Structural, HVAC, and Foundation Repairs to the current Hopewell Low Service Pump Station facility. Reynolds provided Foundational waterproofing, HVAC, and Electrical upgrades to this facility by way of subcontractors. These services helped to update the critical function sof this facility.	6"-200LF	100%	$563,159
Design-Build High Zone Water Tank Douglas County, CO	Dominion Water & Sanitation District 9250 E. Costilla Ave, Suite 210 Greenwood Village, CO 80112 Andrea Cole 720-531-4210 Andrea.cole@dominionwsd.com	Black & Veatch 4600 South Syracuse Street, Suite 800 Denver, CO 80237 Dan Kugler, P.E. Project Manager, Water 720-834-4200 KuglerDR@BV.com	10/16/2023	Design-build of one 2 million gallon, buried, prestressed concrete water storage tank with cast-in-place concrete slab supported on a compacted granular fill. Installation of adjoining pipe to connect with the Eastern Regional Pipeline consisting of 24” Ductile Iron Pipe (outlet), 30” steel pipe (inlet), and a 24” Ductile Iron Bypass and valving.	30” WSP- 413 LF 24” DIP -459 LF 24” DIP -345LF 30” DIP - 134 LF 12” DIP - 134 LF 4” PVC - 134 LF	100%	$5,572,130
Tank 18 Blue Zone Transmission Pipeline Castle Rock, CO	Town of Castle Rock 175 Kellogg Court Castle Rock, CO 80109 Matthew B. Hayes 303-210-1678 Mhayes@crgov.com	Town of Castle Rock Engineering Divison 175 Kellogg Court Castle Rock, CO 80109 Matthew B. Hayes 303-210-1678 Mhayes@crgov.com	9/29/2023	A new 16" water main was installed between the existing 16" main in Castle Oaaks Drive and Tank 18. There was 8,250 LF of 16" pipe and installation of all appearances and site restoration.	16"- 8,250LF	100%	$4,229,515
Windler 36" Waterline Relocation Aurora, CO	Windler Public Improvement Authority 304 Inverness Way South Suite 490 Englewood, CO 80112 Chris Fellows (WPIA President) 303-795-9900 chris@fellowscos.com Barney Fix 303-353-3670	Olsson 1525 Raleigh St, Suite 400 Denver, CO 80204 Clatyon Chabannes O:303-237-2072 C:720-668-6237 cchabannes@olsson.com	8/1/2023	Relocation of a portion, approximately STA 149+00 – 202+50, of the 36” Gun Club Road (42003) that we completed in 2021. This part is going through a future subdivision and needs to be relocated to accommodate those needs.	36" Steel-4,800LF	100%	$2,306,944
Sigsbee Wastewater Lift Station Replacement Dredger's Key, Key West, FL	Florida Keys Aqueduct Authority 1100 Kennedy Drive Key West, FL 33040 David Hackworth, PE-Director of Capital Projects 305-295-2151 dhackworth@fkaa.com	Carollo Engineers 2056 Vista Parkway, Suite 400 West Palm Beach, FL 33411 Chris Reinbold 561-868-6400 creinbold@carollo.com	7/23/2023	Reynolds worked on a design to allow the existing wet well / pump station to stay in service while operating the new wet well to assure pumping compacity and operations. Underground influent and effluent pipes ranging in size of 4” to 12” were relocated, replaced and tied in during shutdown sequencing.	4"-45LF 6"-135LF 18"-100LF 12"- 125LF	100%	$2,719,594
Newbridge Road Well 4A Enclosure Merrick, NY	Liberty Utilities 60 Brooklyn Ave Merrick, NY 11566 Greg Sachs 516-924-7702 Gregory.Sachs@LibertyUtilities.com	D&B Engineers 330 Crossways Park Drive Woodbury, NY 11797 Phil Sachs 516-264-9890 psachs@db-eng.com	6/1/2023	Demolition of Well 4 enclosure, fence, and building and fence foundation. Excavation, controlled backfilling and clearing and grubbing of the area around the enclosure. Construction of reinforced concrete pump and building foundations and building entrance pads, as required for the new building. Furnishing and installation of a new cast-in-place floor slab and precast concrete enclosure and accessories.	12"- 85LF 8"- 50LF	100%	$1,504,563

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Schedule B:
Reynolds Construction Projects Last 5 Years

Project Name & Location	Owner Address	Engineer Address	Final Completion Date	Description	Pipe Length & Width	Status	Final Contract Amount
24Inch Water Main Crossing TN River Loudon, TN	Loudon Utilities 2360 TN-72 Loudon, TN 37774 Larry Joe Dockery, PM 865-458-7587 larryjoe.dockery@loudonutilities.org	CTI Engineers, Inc 112 Durwood Rd, Suite A Knoxville, TN 37922 David L Jones, PE O: 865-246-2750 C: 865-242-1107 F: 865-246-2755	5/31/2023	Installation of 24" water main crossing the TN River, drill & blast, 1063' of 24" ductile iron ball & socket pipe.	24"-1,063LF	100%	$2,570,289
Dykeer Station GAC Somers, NY	Liberty Utilities 60 Brooklyn Ave Merrick, LI, NY Frank Proscia 516-317-3558 Frank.proscia@libertyutilities.com	Hazen and Sawyer 100 Great Meadow Road, Suite 702 Wethersfield, CT 06109 Matt Hross 860-936-3907 mhross@hazenandsawyer.com	5/31/2023	Project's goal was to add GAC treatment to an existing treatment plant. We constructed a new building to house the new treatment equipment. The treatment equipment was owner supplied but we installed it and tied it in to the existing plant.	6" - 220LF 8" - 60Lf	100%	$1,232,797
Jefferson St Well Merrick, NY	Liberty Utilities 60 Brooklyn Ave Merrick, NY 11566 Matthew Baccus 516-287-5490 matthew.baccus@libertyutilities.com	D&B Engineers 330 Crossways Park Drive Woodbury, NY 11797 Frank Merkliun 516-264-9890 fmerklin@db-eng.com	5/31/2023	This project included the construction of a new concrete pump, building foundations and entrance, furnishing a new cast-in-place floor slab, mechanical piping and supporting equipment, and installing a new well pump and motor for Well 12A	6"-175LF 15"-175LF 12"-25LF	100%	$1,087,764
Level Creek Interceptor Upgrades Gwinnett County, GA	Gwinnett County 75 Langley Drive Lawrenceville, GA 30046 Jimmy Powell 770-822-8720 C: 678-327-8657 Jimmy.powell@gwinnettcounty.com	Precision Planning, Inc 400 Pike Blvd Lawrenceville, GA 30046 Bill Crowder, PE 770-267-8800	5/5/2023	Construction of approximately 5,115 LF of 24-inch and 48 LF of 8-inch DIP gravity sewer main, 22 concrete manholes, 40 LF of 48-inch – steel casing open cut installation, restoration of all disturbed areas to pre-construction conditions, and all other appurtenances.	24" DIP - 5,115 LF 8" DIP - 48 LF 48" DIP - 40 LF	100%	$3,291,295
Walnut Creek Lift Station Hampton, GA	Clayton County Water Authority 1600 Battle Creek Road Morrow, GA 30260 Jeff Winston 404-670-8918 jeff.winston@ccwa.us	Hazen and Sawyer 5775 Peachtreet Dunwoody Road #D520 Atlanta, GA 30342 Brian Jones 470-427-7188 bjones@hazenandsawyer.com	3/15/2023	Installation of new lift station, including wetwell, screening structure, valve vault, electrical building, generator, piping, and mechanical equipment. Installation of concrete driveway, crush stoned areas, and demolition of existing station once new station was on-line.	18” SDR 26 -700LF 12” SDR 26 -42LF 10” DIP -100LF 8” DIP -40LF 6” DIP -40LF	100%	$2,738,419
NAS Key West Boca Chica Field - West Fire Pumping Station Key West, FL	Florida Keys Aqueduct Authority 1100 Kennedy Drive Key West, FL 33040 David Hackworth 305-295-2152 dhackworth@fkaa.com	CPH, Inc. 1992 SW 1st Street Miami, FL 33135 Kyle M. Bechtelheimer, PE 305- 274-4805 kbechtelheimer@cphcorp.com	2/24/2023	The project primarily consisted of replacing three fire pumps and motors (2 diesel, 1 electrical), process piping, associated carbon steel piping for upgrades to the fuel systems, water piping and underground (UG) storage tank piping / valves at the West fire pumping stations.	8"- 80LF 10"- 30LF 12" -60LF	100%	$1,159,876
AWIN Riley WWTP Improvements Terre Haute, IN	American Water Indiana 5200 S Frye St Terre Haute, IN Mike Seals 317-885-2444 Mike.Seals@amwater.com	N/A	1/6/2023	The general work sequence installed temporary piping and pump connections to divert flow to Plant 2, which is currently not in operation. Once the Plant 2 treatment process was stablized and functioning adequetley, Plant 1 was taken off-line for Contractor cleaning and replacement and reapir of the aeration diffuser grids and associated components. Upon completion of the WWTP inprovments, Plant 1 was reactivate.		100%	$572,365
Parks and Recreation Pro Fortville, IN	Town of Fortville 714 E Broadway Fortville, IN 46040 Joe Renner, Town Manager 317-485-4044 jrenner@fortvilleindiana.org	RQAW 8770 N St, Ste 110 Fishers, IN 46038 Eric Weflen 317-588-1798 eweflen@rqaw.com	1/3/2023	Reynolds was selected on this project as the Town’s BOT partner. The project included facilities within the Fortville Parks & Recreation department and the Town Hall. Reynolds replaced the nonfunctional sport lighting, installed security cameras and access control throughout the park facilities, installed solar panels to increase energy efficiency, and renovation of the existing town hall.		100%	$2,856,903
Gun Club Road 60" Pipeline-Phase II Aurora, CO	City of Aurora 15151 E Alameda Parkway Suite 5700 Aurora CO 80012 Steven R. Fiori, P.E. 720-859-4327 sfiori@auroragov.org	Dewberry 990 South Broadway, Suite 400 Denver, CO 80209-4275 Mike Kainer, PE 303-951-0617 mkainer@drewberry.com	12/30/2022	Installation of 4,395’ of water line along Gun Club Road and Colfax Ave with an additional 458’ bore and installed the same under I-70. We connected to the 60” Phase I on the south end and the existing 30” line on the north end.	60" WSP - 4,395 LF	100%	$7,516,743

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Schedule B:
Reynolds Construction Projects Last 5 Years

Project Name & Location	Owner Address	Engineer Address	Final Completion Date	Description	Pipe Length & Width	Status	Final Contract Amount
Mooresville WTP UV Disinfection Facility Mooresville, IN	American Water Indiana 153 North Emerson Avenue Greenwood, IN 46143 Jared Burnett Phone 317-885-2428 Fax 317-885-2431 jared.burnett@amwater.com	Gannett Fleming 207 Senate Avenue Camp Hill, PA 17011 Timothy Glessner 717-886-5378 tglessner@GFNET.com	10/31/22	Construction of new WTF including aeration, an aerated water detention tank, chemical application, pressure filtration, finished water storage, and high service pumping. Construction of two (2) spent backwash water equalization tanks, equipped with a floating decanter, clarified water recycle pumps, residuals pumps, chemical, electrical, instrumentation and control (I&C) and other supporting operational, pumping equipment, and electrical facilities.	4"DIP-700'LF 6"DIP-500' LF 14" DIP-80'LF 16"DIP-50'LF 18*"DIP-400'LF 20"DIP-600'LF 24"DIP-220'LF 3/4"PVC-4300'LF 2"PVC-400'LF 2.5"PVC-200'LF 4"PVC-1300'LF 6" PVC-40'LF 1/2"CU-1200'LF 3/4" CU-100'LF 3/4" HDPE-1100'LF	100%	$18,774,595
State Road 61 Water Main Extension Project Boonville, IN	City of Boonville 135 South 2nd St Boonville, IN 47601 Mayor Charles R Wyatt 812-897-1230 boonvillemayor@gmail.com	Midwestern Engineers, Inc. 802 West Broadway Street, Loogootee, IN 47553 Clint Roos 812-295-2800 812-296-0102 croos@midwesterneng.com	9/30/2022	Reynolds was selected to complete a water main extension project along state road 61. This project included the installation of approximately 16,000 lineal feet of 12” PVC SDR-21 Class 200 water main commencing from near the intersection of Division Street and Yankeetown Road and continuing south and ultimately west to the intersection with Huffman/Jenner Road. The city of Boonville has a new residential development being developed and needed a water utility to be in place.	12" PVC SDR 21 - 15,445' LF	100%	$1,607,876
Cherry Creek Interceptor Parker, CO	Parker Water & Sanitation District 18100 E. Woodman Dr, Parker CO 80134 Rebecca Tejada 720-842-4261 rtejada@pwsd.org	Jacobs 9191 South Jamaica Street, Englewood, CO 80112-5946 Ethan Ford, P.E 720-286-5862 ethan.ford@jacobs.com	9/25/2022	Installation of 2.5 miles of 12-inch, 21-inch, 24-inch, 30-inch, 36-inch and 48-inch PVC and GRP sanitary sewer interceptors; trenchless crossing’s, one existing storm sewer box outlet structure; and connections to the South Water Reclamation Facility including a flow splitter structure.	12”- 12 LF 21”- 2368 LF 24”- 500 LF 30”- 300 LF 36”- 6309 LF 48”- 2314 LF	100%	$14,646,613
Cleaning and Redevelopment of Radial Collector Well Perth Amboy, NJ	City of Perth Amboy and Middlesex Water Company PO Box 167 Islein, NJ 08830 Richie Niziolek 732-221-1762 rniziolek@middlesexwater.com	N/A	9/19/2022	Cleaning and rehabilitation of horizontal laterals in radial collector well. Post maintenance inspection and testing of the collector indicated the cleaning and rehabiliation techniques employed were successful in restoring lost efficiency and production. Scope of services also included pre- and post-maintenance performance testing of the well complete with lateral flow analysis and underwater diver inspection.		100%	$627,400
PWSD MH Replacement Parker, CO	Parker Water & Sanitation District 18100 E Woodman Dr Parker, CO 80134 Jarod Baylie 303-841-4627 Jbaylie@pwsd.org	Providence Infrastructure Consultants 303 Plaza Dr, Suite 320 Highlands Ranch, CO 80129 Mickey Kavanaugh 303-997-503 mkavanaugh@providenceic.com	9/2/2022	Replacement of failing 60" Outside Drop Manhole. Involved installing 2 additional MHs on each side of failing MH, setting up bypass pumping operations, removal of the failing (it was fallin =g apart) MH and ~70' of existing 27" RCP, installng a new drop MH and 27" PVC.	27"- 100LF	100%	$554,848
Spurlock U1 & U2 Air Heater Maysville, KY	East Kentucky Power Cooperative 4775 Lexington Road Winchester, KY 40392 David Begley 606-305-1894 david.begley@ekpc.coop	Stanley Consultants, Inc. 225 Iowa Ave. Muscatine, Iowa 52761 Doug Einck 563-264-6 EinckDouglas@Stanleygroup.com	9/1/2022	The purpose of the project was to eliminate the need for maintenance staff to install temporary pipe throughout the plant to perform the air heater wash cycles. This solution will also ease the traffic flow throughout the plant during these air heater wash cycles.	6" HDPE- 1400 LF 12" SDR 11 HDPE- 350 LF	100%	$1,769,171
Louisville Southern Water Pipeline Supply Expansion Project Louisville, CO	City of Louisville Public Works 749 Main Street Louisville, CO 80027 Cory Peterson 303-335-4610	Murraysmith 1157 W Century Drive, Suite 220 Louisville, CO 80027 Joel Price 970-567-8020	8/12/2022	Project consisted of building an additional raw water line from Louisville Reservoir to Hecla Reservoir (roughly 2.5 Miles). Installation of both 16” ductile iron pipe and 18” high-density polyethylene (HDPE) pipe. Appurtenances included roadway crossings (horizontal directional drilling), and water meter vault connection.	16" DIP- 10,110 LF 18"HDPE- 800 LF 36" DIP- 150LF	100%	$2,916,687

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Schedule B:
Reynolds Construction Projects Last 5 Years

Project Name & Location	Owner Address	Engineer Address	Final Completion Date	Description	Pipe Length & Width	Status	Final Contract Amount
Iowa Dairy Biogas Doon, IA	GEVO, Inc. 345 Inverness Drive South, Building C, Suite 310 Englewood, CO 80112 Chris Ryan 303-858-8358 CRyan@gevo.com	Merrick 5970 Greenwood Plaza Blvd., Greenwood, CO 80111 Bridget King, PE, PMP, Project Manager 303-353-3537 812-363-5468	7/31/2022	The project included the construction of anaerobic digesters and supporting process facilities located at Rock River Jerseys, Meadowvale, and Winding Meadows Dairies, and one gas upgrading (RNG) facility.		100%	$32,446,150
Belmont Ash Slurry Indianapolis, IN	Citizens Energy Group 2020 N Meridian St. Indianapolis IN 46202 Ben Reed 317-927-4609 breed@citizensenergygroup.com	Donohue & Associates, Inc. 101 West Ohio Street, Suite 820 Indianapolis, IN 46204 Greg Garnes 317-267-8200 ggarnes@donohue-associates.com	7/19/2022	Removal and replacement of 2 parallel 8-inch glass lined FRP ash slurry pipelines- approximately 4,400 linear feet. Pipeline replacement included all bends, fittings, control valves for discharge on each line as well as 2 additional discharges from each pipeline. Rehabilitation and painting of all pipe supports & construction of 7 new pipe supports to replace selected supports.	8" glass lined FRP - 4,400 LF	100%	$1,780,632
Sheridan WW System Sheridan, IN	American Water Indiana 801 East 2nd Street Sheridan, IN 46069 Mike Seals 317-885-2444 Mike.Seals@amwater.com	Wessler Engineering 6219 South East Street Indianapolis, IN 46227 Robert Holden, PhD, P.E. , BCEE 317-788-4551 Fax: 317-788-4553	6/30/2022	Demolition of existing concrete digester, installation of new Headworks consisting of new 60” Interceptor manhole, New Raw Sewage Lift Station, Headworks screening area, New Concrete Splitter Box, new Biolac Lagoon, Refurbishment of existing Biolac Lagoon, new 65’ Secondary Clarifier, New Chlorine Contact Tank, new RAS/WAS Wet Well/Lift Station, interconnecting U/G Piping, new Disinfection System utilizing Chlorine Gas and Bisulfate feed systems , added blower with new Aeration System (Lagoons & Existing Digester,) Ferric System Upgrades, and a total I&C SCADA system.	20” DIP- 180 LF 18” DIP- 100 LF 14” DIP- 400LF 12” DIP- 40, LF 8” DIP- 540 LF 4" DIP- 700 LF 1.5-6" DIP- 2,100 LF 16" DIP- 80 LF	100%	$6,825,324
Park 48 Water Main Replacement Bloomington, IN	Cook Medical 750 N. Daniels Way Bloomington, IN 47404 Eric Bomba 800-457-4500 eric.bomba@cookmedical.com	Cook Group 600 N. Profile Parkway Bloomington, IN 47404 Brent Conner 812-339-2235 Brent.Conner@CookGroup.com	6/28/2022	There was a leak in the fire loop, so we replaced it with a new system consisting of 5,559 LF of 4"-12" HDPE, some open cut installation, some was horizontal directional drilled.	4" HDPE- 125 LF 6" HDPE- 200 LF 10" HDPE- 865 LF 12" HDP-4,400 LF	100%	$1,367,269
Thornton Water Project – Segment A Phase I Pipeline Early Works – E 128th Avenue to Quince Thornton, CO	City of Thronton 9500 Civic Center Drive Thorton, CO 80229 Eduardo Moreno 720-977-6272 Eduardo.Moreno@thortonco.gov	AECOM 7595 Thecnology Way, Suite 200 Denver, CO 80241 Martin Garcia, PE 303-694-2770 martin.garcia@aecom.com	5/30/2022	Installation of 2,221’ of 42” raw water line under Quebec St plus bore and installation of 194’ of the same under E 128th Ave on the north end of the project. Additionally there were (3)-2” fiber optic lines and (5) fiber optic manholes along the alignment.	42" WSP - 2,221 LF	100%	$1,886,747
Omohundro Intake No 4 Metro Water Services Nashville, TN	Metro Government of Nashville and Davidson County 730 Second Ave. South Suite 112 Nashville , Tn. 37210 Richard Woodroof 615-862-4639 615-566-3598 Richard.Woodroof@nashville.gov	Greshem Smith 222 Second Avenue S., Suite 1400 Nashville, TN 37201 Ben Luke 615-770-8100	5/26/2022	Reynolds' scope of work was to install 12”ductile iron pipe 372’ from station 2+88 to the new Passive Intake screen. Reynolds removed the old screen, cleaned around and inside the existing intake #4. 300’ of the pipe was installed in the river bottom with the use of divers. Pipe and screen work in the river was installed off of a Barge platform with use of a long stick excavator and an 80 ton crawler crane	12' DIP- 433 LF	100%	$2,447,123
Slide Gates Indianapolis, IN	Shea-Kiewit JV 1736 S. West Street Indianapolis, Indiana 46225 Percy Townsend 317-887-5273 percy.townsend@jfshea.com	N/A	5/25/2022	Installation of (3)- separate Slide Gates w/ actuators, SS Trash Racks, and concrete fillets. All the sites involved permitted confined spaces.		100%	$1,674,592
Raw Water Intake Line Replacement Counce, TN	First Utility District of Hardin County 7075 Highway 57 Counce, TN 38326 Larry Vandiver 731-689-4454	Barge Design Solutions INC. 615 3rd Ave South, Suite 700 Nashville, TN 37210 Partrick Stephens 615-254-1500	5/17/2022	This project moved location and replaced the existing 24” Raw water intake. The project consisted of constructing 755-feet of 30-inch raw water intake influent line in Pickwick Lake. The new line was partially supported on H-Pile support frame in the deepest part of the lake. The new intake line, raw water intake screen with isolation valving, H-Pile structure, hydroburst system, and necessary electrical gear to support the hydroburst system.	30" DIP- 755 LF	100%	$2,378,892

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Schedule B:
Reynolds Construction Projects Last 5 Years

Project Name & Location	Owner Address	Engineer Address	Final Completion Date	Description	Pipe Length & Width	Status	Final Contract Amount
Savannah River Dissolved Oxygen Injection System Port Wentworth, GA	Southern Nuclear Operating Company 3535 Colonnade Parkway, BIN N-218-EC Birmingham, AL 35243 *no contact name, due to Reynolds being a subcontractor	Wood Environment & Infrastructure 1075 Big Shanty Road, NW, Suite 100 Kennesaw, GA 30144 David Price 770-421-7022 david.d.price@woodplc.com	5/1/2022	This project installed oxygen generation equipment that supplies super-oxygenated water into the Savannah River. Project required the installation of approximately 35,000 SF of Tensar TX7 geogrid to stabilize the ground for the pre-engineered canopy pad. Oxygen generation equipment includes air compressors, after coolers, dryers, filters, receiver tanks and O2 generators. Piping consists of type L copper with ProPress fittings. Nine HDPE pipe downcomers were installed into the Savannah River.	.5"-4" Copper-1,500LF	100%	$5,958,035
44th Avenue Townhomes Retaining Wall Nashville, TN	Red Seal Construction 425 Huehl Road Blg 18 Northbrook, IL Michael Larson 847-417-5602 mlarson@redsealhomes.com	NOLCOR 2000 Glen Echo Rd, Suite 212 Nashville, TN 37215 J David Gibbs, PE 615-924-6820 dgibbs@nolcor.net	2/28/2022	The project constructed a 450-feet retaining wall. The project involved pre-drilling 60 each, 36-inch drilled shaft thru both soil and rock, installing HP14x117 beams (piles) and concreting the rock embedded portal of the shaft. 10-inch-thick reinforced precast concrete panels was installed between the piles. Strip drains were installed in granular material between each panel to prevent any water from accumulating behind the wall.		100%	$743,434
Marathon Area 3, 4, &5 WWTP Upgrades Marathon, FL	City of Marathon 9805 Overseas Hwy Marathon, FL 33050 Dan Saus – Utilities Director 305-289-5009 F 305-289-4123 sausd@ci.marathon.fl.us	Weiler Engineering Corporation 201 W. Marion Ave, Suite 1306 Punta Gorda, FL 33950 Steve Suggs, PM 941-505-1700 ssuggs@weilerengineering.org	1/21/2022	Area 3: Replacement of an existing disc filter with a new disc filter, modification to existing screenings equipment,installation of a new equalization basin and replacement of existing blowers with new ones. Area 4: Installation of a new disc filter and rehabilitation of existing sand filters Area 5: Upgrade to the MBR system, installation of a new screening system with free standing elevated steel platform, along with multiple pump and piping upgrades. The pumps were dry pit installation..	8” PVC pipe- 100 LF underground 2” to 14” PVC pipe- 400 LF exposed	100%	$9,000,618
Progressive Design-Build (Target Cost) Hopewell WTP Industrial PS Electrical Bldg, Chemical, and UV Facilities DB Project Hopewell, VA	American Water Virginia 900 Industrial Street Hopewell, VA 23860 Jim Reilly, DBIA O 856-955-4001 Main 856-955-4222 M 732-904-1344 Jim.Reilly@amwater.com Leslie M.B. Steves, PE Leslie.Steves@amwater.com	Gannett Fleming P.O. Box 67100 Harrisburg, PA 17106 Jeffrey Raffensperger 717-763-7211 jraffensperger@gfnet.com	12/31/2021	Construction of a new Chemical Feed/UV Building: UV system – 8.6 MDG avg flow per train x 2 trains. New Industrial Pump Station with (2) 6,000 gpm and (2) 8,000 gpm VT pumps. New Post Chem Feed building, Modifications to existing chem feed buildings, New Chemical systems, day tanks, bulk tanks, etc. New Electrical switchgear, mcc’s, Underground DIP, Above ground DIP, valves, etc. New chemical and electrical ductbanks. Misc. Demo, relocates, tie-ins and taps. Demoed and removed old foundation and abandoned pipe to construct the IPS building, Demoed/abondoned misc old underground infrastructure to install new, Demoed an old containment basin and ammonia tank (above ground), Demoed/abandoned multiple underground electrical ductbanks.	14” DIP - 60 LF 18” DIP - 80 LF 24” DIP - 260 LF 30” DIP - 100 LF 36” DIP - 600 LF 42” DIP - 300 LF 24” DIP - 100 LF 12” RCP - 130 LF 18” RCP - 80 LF 24” RCP - 90 LF ¾” - 6” PVC - 5000 LF	100%	$23,526,916
Eastern Pipeline Project Douglas County, CO	Dominion Water & Sanitation District 8390 E Crescent Parkway Suite 500 Greenwood Village, Colorado 80111 Jon Diebel (retired) 303-888-3486 Jdiebel17@gmail.com Jon Bambei (retired) 303-350-9343 John.bambei@gmail.com Bob Neal (now with Metro Wastewater) 303-548-9794 bneal@metrowaterrecovery.com Evan Bahn 303-523-0380 Evan.bahn@dominionwsd.com	Providence Infrastructure Consultants 4901 East Dry Creek Road, Suite 210 Centennial, CO 80122 Daniel Rice 303-997-5035 drice@providenceic.com	12/31/2021	This project was to construct the Eastern Regional Pipeline for DWSD extending from the Town of Castle Rock to DWSD’s mid zone storage tank in Sterling Ranch. The ERPP involved the installation of approximately 12-miles of potable waterline including 27,000 LF of 24” DIP, 37,000 of 30” welded steel pipe, associated BFVs, CARVs, and low-point blowoffs.	24" DIP - 27,000 LF 30" Steel - 37,000 LF	100%	$27,281,913

Schedule B:
Reynolds Construction Projects Last 5 Years

Project Name & Location	Owner Address	Engineer Address	Final Completion Date	Description	Pipe Length & Width	Status	Final Contract Amount
Confidential	Confidential	Confidential	12/10/2021	Improvements to the existing facility on base including installation of 2 Trojan UV3000 Plus Systems, 2 Slide Gates for UV Equipment Isolation, modifications to existing chlorine contact basin that includes granular fill and reinforced concrete, modifications to the existing Electrical MCC.		100%	Confidential
Canyons Filing 1, 6th Amendment – Storm, Roadways, Water, and Sanitary Castle Pines, CO	The Canyons Metropolitan District No. 7 2154 E. Commons Ave., Suite 2000 Centennial, CO 80122 Kristen D. Bear, Esq. kbear@wbapc.com 303-858-1800	Atwell, LLC 143 Union Boulevard, Suite 700 Lakewood, CO 80228 Chris Sveum 303-928-6733 csveum@atwell-group.com	12/10/2021	Construction of the public infrastructure relating to streets and utilities, including: paving, sidewalks, curb & gutter, striping, signage, storm, water, sanitary. Installation of 5525' of 8" sanitary sewer along with 83 service stub-outs, 4805' of 8" water line with 83 services including curb stops & meter pits, 415' of storm sewer conduits of various sizes, 5 storm inlets, 2 storm manholes, construction of detention pond, 415' of trickle channel, along with 2 forebays and an outlet structure, and 545' of maintenance road.	8" PVC - 5,525 LF 8" PVC - 4,805 LF	100%	$1,967,178
Pre-Treatment and Pumping Facility (East Plant) Improvements Brownsburg, IN	Town of Brownsburg 61 N. Green Street Brownsburg, IN 46112 Kathy Dillon 317-852-1114	GRW Engineers 801 Corporate Drive Lexington, KY 40503 Darren Wells 317-347-3650	11/14/21	Reynolds furnished all labor, equipment, materials, and services to construct, install, test, start-up, and place into operation the East Plant Improvements Reynolds also completed all related civil/site work, process mechanical, rchitectural, structural, HVAC, plumbing, electrical, and instrumentation & control work		100%	$1,050,017
Batesville Waterworks Batesville, IN	City of Batesville 7 N. Eastern Avenue P.O. Box 97 Batesville IN 47006 Eric Laker, Water Utility Manager 812-934-3811 elaker@batevillein.us	Curry & Associates, Inc. 110 Commerce Drive Danville, IN 46122 Lori A. Young, P.E. 317-745-6995	11/1/2021	Construction of a new WTP consisted of site piping, site improvements, ion exchange softening, plant piping and valves, water meters, chemical feed equipment, high service pumps, bulk storage/brine tanks, backwash holding tank and pumps, 1,000,000 gallon clearwell tank, HVAC, domestic water piping, motor control centers, electrical, SCADA control system, emergency standby generator including equipment pad, conduit and conductors.		100%	$5,811,504
Cobb County West Side Loop Section 2 36-inch Water Main Replacement Austell, GA	Cobb County Marietta Water Authority 1170 Atlanta Industrial Drive Marietta, GA, 30066 Chris Dillard, PE, PMP 770-514-5218 Fax 770-514-5225 cdillard@ccmwa.org	Freese & Nichols 360 Interstate North Parkway, Suite 250 Atlanta, GA 30339 J Carleton Sherrer, PE 770-799-6432 Carleton.sherrer@freese.com	10/30/2021	Replacement of an existing 36" Prestressed concrete cylinder water main nearing its end of use. Installation of approximately 19,500 LF of new 36" DIP within an active roadway to replace the existing main.	36" DIP – 19,500 LF	100%	$17,624,995
Muncie WTF Phase 2 Improvements Muncie, IN	American Water Indiana 555 E County Line Road Suite 201 Greenwood, IN 46143 Roy Francis 317-407-0238 roy.francis@amwater.com	Gannett Fleming 207 Senate Avenue Camp Hill, PA 17011 Tim Glessner 717-763-7211 tglessner@GFNET.com	9/30/2021	Construction of a new chemical building, new raw water intake and pump station. Construction of an addition to the existing admin building, and misc. ancillary work.	30" -180 LF 4"-476 LF 4" -100 LF 6" -162 LF 30", 42" - 72 LF 30" - 36 LF 42" - 90 LF 36" -198 LF 16"- 90 LF	100%	$19,700,415
Newbridge Road WTP Iron Filtration North Bellmore, NY	American Water New York 60 Brooklyn Ave Merrick, NY 11566 Matthew Bacchus, EIT O 516-632-2245 M 516-287-5490 matthew.bacchus@amwater.com	D&B Engineers and Architects, P.C. 330 Crossways Park Drive Woodbury, NY 11797 Frank X. Merklin O 516-364-9890 ext. #3999 F 516-364-9045 fmerklin@db-eng.com	9/30/2021	Reynolds provided the following: site piping, Valves and actuators, rebuilding and adjustment of four (4) hydraulic flow control valves, removal, disposal and replacement of iron filter and support media, modifications to interior filter vessel underdrain piping, interior and exterior vessel coating repairs, new post-filtration sodium hydroxide storage and treatment system with new chemical safety control system.		100%	$1,090,734
Marston WTP/ Pump Station Upgrades and Entrance Improvements Denver, CO	Denver Water 1600 W 12th Ave Denver, CO 80204 Rob Bowman 303-817-4775 Rob.Bowman@Denverwater.org	Denver Water 1600 W 12th Ave Denver, CO 80204 Nathan Smith 303-396-4187 Nathan.Smith@Denverwater.org	8/18/2021	Installation of new electrical controls, starters, MCC, transformers and Disconnect switch. Refurbishment of 9 existing pumps and controls valves that were from the 1970's and had not been refurbished to date. Installation of a new hydraulic power system for the control valves.		100%	$12,309,108

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Schedule B:
Reynolds Construction Projects Last 5 Years

Project Name & Location	Owner Address	Engineer Address	Final Completion Date	Description	Pipe Length & Width	Status	Final Contract Amount
Gun Club Rd 36" Pipeline Aurora, CO	City of Aurora 15151 E Alameda Pkwy Aurora, CO 80012 Steve Fiori 720-859-4327 sfiori@auroragov.org	Dewberry 990 S. Broadway, Suite 400 Denver, CO 80209 Melinda Brown, P.E., LEED AP 303-951-0634 F 303-825-2322 M 303-906-2440 mbrown@dewberry.com	8/15/2021	Installation of 19,450 feet of 36-inch diameter welded-steel treated water pipeline. Construction of air release/vacuum and blow-off appurtenances, as well as in-line valves.	36" WSP-19,450 LF	100%	$7,591,810
Kiewit Long Ridge Energy Generation Hannibal, OH	Kiewit 8900 Renner Blvd Lenexa, KS 66219 Brandon Douglas 913-689-4337 Brandon.Douglas@kiewit.com	McKim & Creed 300 Bilmar Dr #150 Pittsburgh, PA 15205 Jonathan Shimko 412-385-4132	8/13/2021	The project consisted of renovating an existing surface water intake facility, including a raw water pump station, installed on the Ohio River in Hannibal OH. The facility now provides 3,000 GPM of water to a new 610 MW combined cycle power plant constructed by Kiewit.	14" WSP - 622 LF	100%	$2,895,124
Cobb 2021 Blow Off Acworth, GA	Cobb County Marietta Water Authority 1170 Atlanta Industrial Drive Marietta, GA 30066 Chris Dillard, P.E., PMP O 770-514-5300 F 770-514-5225 cdillard@ccmwa.org	Engineering Strategies, Inc. 3855 Shallowford Road, Suite 525 Marietta, GA 30062 David Erel 770-429-0001 derel@esi-ga.com	6/22/2021	This project included replacement of outlets in CCMWA transmission line. Under this contract, existing 48” and 36” lines were taken out of service, segments of pipe with outlets removed and then replaced with new DIP, MJ tees, Valves and surrounded by precast concrete manholes. As part of this, CCMWA reconfigured some of their inter-connects to improve their system.	48"DIP-20LF 36"DIP-6LF	100%	$1,086,291
Big Coppitt WWTP Tertiary Filtration Improvements Key West, FL	Florida Keys Aqueduct Authority 1100 Kennedy Drive, Suite 307 Key West, FL 33040 David Hackworth, PE 305-296-2454 dhackworth@fkaa.com	CPH, Inc. 1992 SW 1st Street Miami, FL 33135 Kyle Bechtelheimer, PE 305-274-4805 kbechtelheimer@cphcorp.com	6/11/2021	Two (2) membrane disk filters were installed which involved a coordinated shutdown that included the installation of 10” PVC pipe, flowmeters and chemical injection relocation. All electrical and Instrumentation and controls upgrades were performed under the supervision of Reynolds.	8” PVC and DIP- 120LF 4”, 6”, 8” 10” -140LF	100%	$784,765
Huntingburg WTP Huntingburg, IN	City of Huntingburg 508 E 4th Street Huntingburg, IN 47542 Brad Coomer 812-683-2211	Midwestern Engineers, Inc. 802 W. Broadway Street Loogootee, IN 47553 John Wetzel 812-295-2800	5/19/2021	Div. I – Water Main Replacement Along U.S. 231/Main Street: Approximately 6,000 L.F. of new 8” and 10” water main and appurtenances. Connections to Existing Mains. Div. II – WTP Improvements: New Raw Water Intake Pump Station. New Set of Flucculators, Clarifiers and Gravity Filters. Improvements/ Modifications to the Existing Chemical Feed Systems. New Backwash and Blowdown Tanks. New Sludge Drying Beds. Div. III – WTP Improvements – Solar Field Addition	8” and 10” - 6,000 L.F	100%	$4,903,940
Georgia Pacific Riverbank Stabilization Cedar Springs, GA	Georgia Pacific 12551 GA-273 West Cedar Springs, GA 39832 TR Henderson, GP Manager 229-372-5443	LEA P.O. Box 2830, 3996 Perimeter Road Valdosta, GA 31604 Clayton Milligan 229-253-0900	5/12/2021	Marine Services- Clear and grub approximately 400LF of river bank on the Chattahoochee River. Remove all soil deemed not suitable and replace with suitable soil. River bank slope is to be Graded to a 2-1 slope. Once soil was placed and tested for compaction Filter fabric was put in place, the entire area was covered with Rip Rap beginning at the bottom of the slope to the top of the slope.		100%	$1,611,463
Spurlock Station, East Kentucky Power Cooperative Maysville, KY	East Kentucky Power Cooperative 4775 Lexington Road Patrick Bischoff 859-229-4684 Patrick.bischoff@ekpc.com	GRW Engineers 801 Corporate Dr Lexington, KY Joe Henry 859-223-3999 ext 213 jhenry@grwinc.com	5/2/2021	Construction of the Temporary Containment and Pumping project at EKPC’s Spurlock Generating Station in Maysville, KY consisting of a duplex VFD driven pump station, concrete containment structure, parking/road aggregate pavement, polymer feed building, 12” HDPE force main, site grading, together with all related work.	4" PVC - 140 LF 12" HDPE - 900 LF	100%	$1,926,008
Downtown WWTP Improvements Project Jeffersonville, IN	City of Jeffersonville 1420 Bates Boyer Avenue Jeffersonville, IN 47130 Reynolds was a subcontractor to: Dugan & Meyers 11110 Kenwood Road Cinncinati, OH 45242 Josh Tummers 513-891-4300 jtummers@dugan-meyers.com	Lochmueller Group, Inc. 331 Quartermaster Ct. Jeffersonville, IN 47130 Donald Wilson 812-725-7900	4/23/2021	Reynolds was a subcontractor to Dugan & Meyers. We installed 1,128 LF of 36” DIP and 215 LF of 60” DIP Sewer Pipeline as part their WWTP improvement project.	36” DIP – 1,128 LF 60” DIP – 215 LF	100%	$1,574,543

Schedule B:
Reynolds Construction Projects Last 5 Years

Project Name & Location	Owner Address	Engineer Address	Final Completion Date	Description	Pipe Length & Width	Status	Final Contract Amount
Historic Miramar Infrastructure Phase 3 Miramar, FL	City of Miramar 13900 Pembroke Road Miramar, FL 33027 Jody C. Kirkman, PE, Director of Utilities O 954-883-5065 C 954-268-0431 jkirkman@miramarfl.gov Robin Bain, PE, Assistant Director of Utilities C 623-217-7202	AECOM 800 South Douglas Road, 2nd Floor, North Tower Coral Gables, Florida 33134 Scott Lee, P.E., Senior Design Engineer Jim Penkosky, P.E., Senior Project Manager Everette Lopez, Project Manager Gino Mora, Engineering Inspector P 305-444-4691 F 305-447-3580	3/31/2021	The total project area covers approximately 211 acres and included adding drainage, gravity sewer, watermain, forcemain, septic to gravity sewer conversions, asbestos pipe removal, and a lift station that serves over 700 residents. 125 Sewer Structures. Lift Station: Tremie Method of installation 32' feet deep Asbestos Pipe Removal: 10,300 Linear Feet Pipe Grouting: 8,674 Linear Feet	**Gravity Sewer** 8" PVC SDR 26-31,144 LF 10" PVC SDR 26 -1,411 LF **Forcemain** 4" DIP –32 LF 8", 10" DIP – 1896 LF **Watermain** 4",6", 8" DIP - 35,698 LF 10", 12", 16" DIP - 12,899 LF	100%	$21,265,543
Coal Pile Runoff Pond Supplemental Storage Maysville, KY	East Kentucky Power Cooperative 4775 Lexington Road PO Box 707 Winchester, KY 40392 Patrick Bischoff 859-744-4812 859-744-4864 patrick.bischoff@ekpc.com	GRW Engineers 801 Corporate Drive Lexington, KY 40503 Adalyn Haney 859-223-3999 F 859-519-4507 ahaney@grwinc.com	3/4/2021	Construction of the Coal Pile Runoff Pond Supplemental Storage project consisted of a quadplex principal spillway pump station, including influent channel, valve vault and submersible pumps, approximately 3,100 LF of 24" HDPE force main, approximately 1,200 LF of ditch improvements including grading, liner and concrete bottom installation, and a new emergency spillway consisting of an 8ft x 8ft concrete outlet structure, two (2) 3ft x 6ft box culverts and headwalls.	24" HDPE- 3,100LF	100%	$5,219,030
Emlenton Raw Water Emlenton, PA	Aqua America Pensylvania 762 West Lancaster Ave Bryn Mawr, PA 19010 Michael L. Convery, PE 610-453-0027 MLConvery@aquaamerica.com	Entech Engineering 1524 West College Ave, Suite 206 State College, PA 16801 Michael Daschbach 814-404-3937 MDaschbach@entecheng.com	3/4/2021	Installation of an 8" raw water intake in the Allegany River. It consisted of 2 half screens mounted on concrete anchors in the deepest point of the river. Installation of ductile iron pipe from the screens at station 2+87 to station 0+70. From this point there was a directional drill which included installation of an 8" HDPE. The directional drill was installed inside an existing dry well. Inside the dry well the HDPE was connected to existing pumps that will complete the installation of the new raw water intake system.	8" TR Flex DIP - 220 LF 8" HDPE - 70 LF	100%	$2,447,984
Cobb James E Quarler Dewater Liquid Lime System Improvements Marietta, GA	Cobb County Marietta Water Authority 1170 Atlanta Industrial Dr. Marietta, GA 30066 Lance Buchanan O 770-514-5220 C 678-296-0750 lbuchanan@ccmwa.org	Hazen and Sawyer 5775 Peachtree Dunwdy # D520 Atlanta, GA 30342 Bevis Pigott O 404-459-6363 C 678-244-6719 bpigott@hazenandsawyer.com	1/31/2021	Demolition of an existing slaked lime system. Construction of a new liquid lime system in outside concrete containment, including tanks, pumps, piping, and valves. Construction of a new liquid lime feed pump skid and a new sludge condition tank inside the existing building. The system was constructed while maintaining continuous operation on the old system until the new system was online.	8-12" DIP – 60 LF 2" PVC – 200 LF	100%	$2,150,484
Cobb County Hwy 41 Northwest 20" Parallel Pipeline Marietta, GA	Cobb County Marietta Water Authority 1170 Atlanta Industrial Drive Marietta, GA 30066 Jacob Wilson 770-514-5291 Jacobwilson@ccmwa.org	Engineering Strategies, Inc. 3855 Shallowford Rd, Suite 525, Marietta, GA 30062 Pedro Rossello 770-429-0001 prossello@esi-ga.com	1/17/2021	Installation of a pipeline parallel to an existing 24" prestressed concrete cylinder pipe (PCCP) located on the west side of Cobb Parkway with approximately 12,000 LF of 20" zinc coated ductile iron pipe (DIP) water main to be located on the east side of Cobb Parkway and through US Army Corps of Engineers property for Lake Allatoona, Jacking & Boring of 36" steel casing, open cut crossing of Lake Allatoona during annual lowest water level in winter and other connections to existing stub outs.	20" DIP- 12,000 LF	100%	$3,257,935
Denver Water ALSLR (Accelerated Lead Service Line Replacement) Denver, Colorado	Denver Water 1600 W 12th Ave Denver, CO 80204 Alexis Woodrow 303-628-6000 Alexis.Woodrow@denverwater.org	AECOM 6200 S Quebec St Greenwood Village, CO 80111 James Roberts 303-694-2700 james.roberts1@aecom.com	12/21/2020	Investigation of existing materials used in the service line by inspection of the line entering the property inside, and potholing outside to verify as needed. Those containing any lead or galvanized material were replaced. Reynolds successfully replaced 22,000 LF of copper pipeline, for a total of 340 lines replaced.	¾" & 1" copper- 22,000 LF	100%	$5,151,679

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Schedule B:
Reynolds Construction Projects Last 5 Years

Project Name & Location	Owner Address	Engineer Address	Final Completion Date	Description	Pipe Length & Width	Status	Final Contract Amount
Columbus Dewatering Columbus, IN	Columbus City Utilities 1111 McClure Rd. Columbus, IN 47201 Scott Dompke, P.E., Director 812-372-8861 Randy Duckworth, Manager of Wastewater Operations 812-447-8684	GRW Engineers 9001 N. Wesleyan Road, Suite 200 Indianapolis, Indiana 46268 Darren Wells, P .E., BCEE, Project Manager M 317-347-3650 F 317-347-3656	12/5/2020	Reynolds installed new sludge dewatering equipment for the Columbus WTP. Installation included new non-potable water supply piping, new centrifuge, appurtenances, output conveyor, sludge feed pump, new polymer feed equipment, interior, process valves and piping modifications, together with all related civil/site work, process, architectural, structural, plumbing, electrical, and instrumentation & control work.		100%	$1,372,960
Citizens Energy CSO Indianapolis, IN	Citizens Energy Group 2150 Dr. Martin Luther King Drive Indianapolis, IN 46202 Tracy Black 317-429-3930	American Structurepoint, Inc 9025 River Rd #200 Indianapolis, IN 46240 Kaitlyn Bilodeau 317-547-5580	11/30/2020	The Work of this Contract comprises the construction of CSO 013 Consolidation Sewer — Phase 2 project, a combined sewer overflow project consisting of a 17'x 22' Concrete diversion structure, precast manholes, and 629 LF of 78" Micro tunnel with a 60-inch Hobas Carrier pipe. This project included the demolition of the existing LS 528 and installing new pumps, piping, etc. including 4 vertical turbine flygt submersible pumps: (2) 15 HP pumps,(2) 3 HP pumps 3 large construction shafts	60" Hobas – 408 LF 60" Hobas – 121 LF 18" PVC – 143 LF 12" PVC – 19 LF 12" DI – 23 LF	100%	$7,015,831
Withlacoochee WWTP Secondary EQ Basin Valdosta, GA	City of Valdosta 1016 Myrtle Street Valdosta, Georgia Daryl Muse 229-259-3592	Lovell Engineering Associates 3998 Inner Perimeter Rd Valdosta, GA 31602 Clayton Milligan 229-253-0900 ext. 24 clayton.milligan@lea-pc.com	11/13/2020	Construction of a lined 7.26 MG excavated basin, a new pump station, and associated gravity pipe and forcemain. The liner system included 115,000 SF of a 200 MIL non-woven geotextile, a geosynthetic clay liner, and a 60 MIL HDPE geomembrane.	24" DIP – 230 LF, gravity 16" DIP – 150 LF, gravity 12" DIP – 120 LF, forcemain	100%	$1,793,504
I-69 Utility Relocation Project Bloomington, IN	City of Bloomington Utilities 600 E Miller Dr Bloomington, IN 47401 Vic Kelson, Director 812-349-3930	GRW Engineers 9001 N. Wesleyan Road, Suite 200 Indianapolis, IN 46268 George Miller 317-347-3650 glewis@grwinc.com	11/9/2020	Relocation of utilities in conjunction with INDOT's I-69 improvements. Work involved relocating existing sewers and other utility improvements at multiple locations along the I-69 corridor between mile markers 117 and 124.	20" PVC-48 LF 18" PVC-45 LF 15" PVC-503 LF 10" PVC-345 LF 8" PVC-536 LF 6" PVC-119 LF	100%	$2,337,354
Plum Creek Raw Water Return Pipeline Project Douglas County, CO	Town of Castle Rock/Castle Rock Water 175 Kellog Court Castle Rock, Colorado 80109 Matt Hayes 303-510-1678 mhayes@crgov.com Matt Benak 720-733-6037 MBenak@crgov.com	Providence Infrastructure Consultants 4901 East Dry Creek Road, Suite 210 Centennial, CO 80122 Daniel Rice 303-997-5035 drice@providenceic.com	10/27/2020	Installation of approximately 30,000 of 30" welded steel pipe, associated BFVs, CARVs, and low-point blowoffs. The pipeline was installed in public right-of-way and private property and included tunneled crossings of BNSF Railroad, SH 67 and N. Meadows Blvd (Total of 4 tunnels).	30" Steel - 30,000 LF	100%	$13,976,804
Hamilton SE Booster Fishers, IN	Citizens Energy Group 2150 Dr. Martin Luther King Jr. St. Indianapolis, IN 46202 Mr. Bruce Cooley P.E. 317-498-9964 BCooley@CitizensEnergyGroup.com	Greeley and Hansen 7820 Innovation Blvd. Suite 150 Indianapolis, IN 46278 Amanda E. White 317-744-2872	10/26/2020	Addition of a pre-built, self contained booster station constructed and delivered by Engineered Fluid Inc. Installation of 800 LF of 20" ductile iron pipe for connection to the customer's existing system. Reynolds was responsible for all testing of pipe and connections. The station was placed to support future growth and a new water tower on the Station site.	20"-800 LF	100%	$1,598,428
Design-Build Jefferson City Service Area New Service Center DB Project Water Jefferson City, MO	American Water Missouri 906 W High St Jefferson City, MO 65109 Robert Goeltz C: 314-996-2308 O: 866-430-0820	Stark Mechanical 7566 Sandalwood Dr. Indianapolis, IN 46217 317-995-9333 sales@starkmechanicalllc.com	9/25/2020	New construction of office and garage consisting of: Office building: 7,000 sq foot structural steel frame with metal studs, brick façade and an architectural metal roof. Garage: I2,800 sq ft, is accessed from the office and is a pre-engineered metal structure		100%	$3,073,994

Schedule B:
Reynolds Construction Projects Last 5 Years

Project Name & Location	Owner Address	Engineer Address	Final Completion Date	Description	Pipe Length & Width	Status	Final Contract Amount
Citizens Reservoir Project Fishers, IN	Citizens Energy Group 10997 Olio Road Fishers, IN 46040 Bruce L. Cooley, P.E. 317-927-4793 BCooley@citizensenergygroup.com	Arcadis, Inc. 150 W. Market Street, Suite 728, Indianapolis, IN 46204 Stéphane Jousset 317-236-2877 917-361-6835 stephane.jousset@arcadis.com	7/18/2020	Citizens Energy Group converted the Geist Quarry into a raw water storage reservoir to provide additional water supply and to supplement the existing system. Geist Quarry now provides approximately 3 billion gallons of additional water storage.		100%	$5,920,658
Design-Build Presidents Street Bio-Solids Dryer Facility Savannah, GA	City of Savannah City Hall, 2 Bay Street Savannah, GA Lester Hendrix, PM 912-651-6620 F 912-650-7839 lhendrix@savannahga.gov	Parsons Water & Infrastructure 4701 Hedgemore Drive Charlotte, NC 28209 Patrick Brooks, PE, Sr. VP of Water Construction and Buiness Development 703-218-6292 Patrick.brooks@parsons.com	6/1/2020	Reynolds designed, obtained permits, furnished and installed the necessary structures, equipment, storage, piping, electrical, and control systems comprising a complete and fully functional “Class A” solids dryer facility for the dewatered primary and waste solids generated at the President Street water reclamation facility, as well as the separate but adjacent Sludge Dewatering Facility.		100%	$21,227,719
Allisonville Rd Water Treatment Facility Noblesville, IN	American Water Indiana 555 E County Line Road Suite 201 Greenwood, IN 46143 Roy Francis, PE, PMP Senior Project Engineer 317-407-0238	Gannett Fleming PO Box 67100 Harrisburg, PA 17106-7100 Jeff Raffensperger 717-763-7211 jraffensperger@GFNET.com	5/31/2020	Design-build of a new 4.5 MGD groundwater treatment facility to increase capacity of the system and to provide iron and manganese removal. Construction of the new plant was independent from their existing plant. The new plant capacity is 6.0 MGD expandable to 10 MGD. To satisfy the current and future demands in Noblesville, additional source of supply, treatment and pumping was required.		100%	$17,083,911
TW Moses Basin Indianapolis, IN	Citizens Energy Group 2150 Dr. Martin Luther King Jr. Street Indianapolis, IN 46202 Ben Reed 317-927-4609 breed@citizensenergygroup.com	CMID 941 N Meridian St, Suite C Indianapolis, IN 46204 Dave Steiner 317-917-4260 dsteiner@cmidinc.com	5/31/2020	Replacement of flocculator equipment and baffle walls. Repaired concrete tanks while they were down		100%	$1,957,257
Newburgh WTP Consolidation & Chlorine Conversion Newburg, IN	American Water Indiana 153 North Emerson Avenue Greenwood, IN 46143 Jared Burnett, EI. 317-885-2428 F 317-885-2431 jared.burnett@amwater.com	Black & Veatch 8415 Allison Pointe Blvd. Indianapolis, IN 46250 Amanda Canida 317-288-3843 F 317-570-8356 CanidaA@bv.com	4/30/2020	The Newburgh WTF Consolidation and Chlorine conversion project scope of work includes the design, permitting and construction of all improvements including a proposed 2MGD filter expansion, high services pump replacement, a liquid chemical storage, feed and containment system for sodium hypochlorite (12.5%), a permanent standby generator and installation of a 2 MGD well at the Scuffletown Wellfield.		100%	$3,498,997
Town of Wolcott Water Improvement Project Division “A” – Water Treatment Plant Wolcott, IN	Town of Wolcott 101 West North Street Wolcott, IN 47995 Robert Thomas 219-863-8758 F 219-279-2172 rthomas@wolcottindiana.org Chad Reynolds 219-863-8757 F 219-279-2172 creynolds@wolcottindiana.org	Commonwealth Engineers, Inc. 7256 Company Drive Indianapolis, IN 46237 Rob Bellucci, PE 317-888-1177	3/25/2020	Construction of a new WTP, including a new forced aeration unit, two new high service pumps, new horizontal pressure filter, chemical feed equipment, mechanical and HVAC systems, new SCADA system, and associated water mains, valves, plumbing, sanitary sewers, earthwork, electrical work, connections to existing water mains, and all other work required for the complete and fully operational plant.		100%	$1,904,304
North Pressure Zone Water Main Improvements Cumming, GA	Forsyth County Department of Water & Sewer 110 E Main St, Suite 150 Cumming, GA 30040 Kyle Fikes 678-455-8384 DKFikes@forsythco.com	Brown and Caldwell 990 Hammond Drive, Suite 400, Atlanta, GA 30328 Scott Adams 770-673-3637 F 770-396-9495 shadams@brwncald.com	1/27/2020	Installation of approximately 13,000 LF of 20” & 24” Ductile Iron water main along Mayfield Drive, Jot Em Down Road, & Grindle Road. (2) live 12” tie-ins utilizing a wet tap w/ tapping saddle, (3) 36” jack & bores & (1) open cut creek crossing. This project was located within existing road right of way & easements.	24” DIP- 12,969 LF 20” DIP -1007 LF	100%	$1,363,618

NOTE: This list has been modified, if you need further information about a project please contact us

Schedule B:
Reynolds Construction Projects Last 5 Years

Project Name & Location	Owner Address	Engineer Address	Final Completion Date	Description	Pipe Length & Width	Status	Final Contract Amount
Key Largo Disenfection Basin Key Largo, FL	Key Largo Wastewater District Laura Weinstock 103355 Overseas Highway Key Largo, FL 33037 laura.weinstock@klwtd.com 305- 451-4019	N/A	1/22/2020	Removal of existing coatings, spot repairs in any locations where the concrete was in need of repairs by injecting a corrosion inhibitor along the full length of the cold joint, resurfaced the concrete and applied a high-performance protective coating system. Installed effluent DI piping and valves for emergency removal. This work consisted of coring through the disinfection basin wall in one location, and installing piping, valves and other fittings as necessary to construct the emergency disposal piping.		100%	$343,104
Little River Outfall Evans, GA	Columbia County Water Authority 1130 Maple Ridge Court Evans, GA 30809 Matthew Gibbs, Wastewater Manager O 706-650-5006 M 706-868-4264 mgibbs@columbiacountyga.gov	Turnipseed Engineers 4210 Columbia Rd Building 3 Augusta, GA 30907 Kenneth Green, PE O 706-863-8800 kgreen@gbtengineers.com	12/31/2019	Construction of an additional outfall line to the Savannah River. The project consisted of the installation of approximately 2625 LF of 36" DIP sewer line, 484 LF of river crossing pipe and a new river diffuser. In addition, modifications to the existing diffuser were completed. The project required crossing significant wetlands, the Little river, and terminated with a diffuser in the Savannah river.	36"- 2140 LF 36"- 400 LF	100%	$4,017,414
Conduit 16 Denver, CO	Denver Water 1600 West 12th Avenue Denver, CO 80204 Ryan Haas 303-628-7270 ryan.hass@denverwater.org	HDR 1670 Broadway, Suite 3400 Denver, CO 80202 Mike Gossett O 303-318-6280 M 720-252-3393 michael.gossett@hdrinc.com Dewberry 990 S. Broadway #400 Denver, CO 80209 Randy Parks rparks@dewberry.com	12/20/2019	Installation of five Conduit No 16 tunnels. All included (96-inch min. diameter, 120-inch max. diameter) including furnishing and installing 84-inch diameter steel carrier pipe.	84" steel 5,494 LF	100%	$24,084,023
TN River Crossing Waterline Chattanooga, TN	American Water Tennessee 1500 Riverside Drive Chattanooga, Tennessee 37406 Kurt Stafford 866-736-6520 Kurt.Stafford@amwater.com	CTI Engineers, Inc. 1122 Riverfront Parkway Chattanooga, TN 37402 Jerry Hightower 423-267-7613 F 423-267-0603 jhightower@ctiengr.com	11/27/2019	Installation of a new 30" water line to provide supplemental clean water to AWTN customers North of the Tennessee River. Project involved laying DIP crossing the River	30" DIP-1,800 LF	100%	$3,270,099

Reynolds Construction, LLC List of Pending Claims

Legal Claim/ Litigation	Type	Relationship to Claimant	Date Entered	Description	Status
Reynolds Construction, LLC vs Campbells Excavating, Inc.	Litigation	Defendant	5/9/2024	Defendant claims Reynolds owes rental payment for use of certain shoring equipment in spite of no formal contractual relationship established between the parties. Defendant placed a mechanics lien on municipal property related to claim. Reynolds filed claim to have mechanics lien declared invalid and demand for removal.	Pending
Reynolds Construction of Georgia, LLC vs City of Loganville, GA	Litigation	Defendant	5/13/2024	Breach of contract claim against Owner who refuses to make payment in full by offsetting claimed Liquidated Damages due to late completion. Reynolds asserts Owner did not acknowledge previously agreed to time extensions nor consider their beneficial use of facility in their assessment. After over a year of attempted resolution, Reynolds had no choice but to pursue litigation for full payment.	Pending

REYNOLDS CONSTRUCTION, LLC OSHA CITATIONS IN THE LAST 5 YEARS

YEAR	INSPECTION #	ISSUE DATE	DATE CLOSED	OFFICE	LEVEL	FINE	DESCRIPTION	CORRECTIVE ACTION
2022	1583972.015	9/6/2022	11/9/2022	Denver, CO	Other	6,993.00	Referral Inspection-Trench Safety	Retrain all Colorado Employees in Trenching, Excavation and Fall Protection. Evaluate the use of catwalks by Safety Dept.
2021	1512794.015	2/2/2021	5/4/2022	Denver, CO	Serious Other	$59,505.00	Referral Inspection-Trench Safety	focusing on excavation. Conducted an OSHA 10hr Construction Safety Class. OSHA will also conduct site visit focusing on excavation work. Lastly Reynolds will
2020	1486735.015	8/5/2020	9/28/2020	Denver, CO	Other	$6,964.00	Complaint Inspection-Trench Safety	Conducted Trenching & Excavation safety stand down.
2019	1420608.015	7/24/2019	10/20/2020	Ft. Lauderdale, FL	Other	Initial: $13,260 Final: $9,282	Referral Inspection-Trench Safety	Trained employees to adhere to manufactures specifications. Also added and retrained top lander employees on hand signals and communications.

REYNOLDS' EMR RATINGS AND EXPLANATION

Reynolds construction has a long-standing commitment to Safety. This is a commitment we take very seriously both as an obligation we make to our employees and to our customers. In addition to six (6) full time Risk Management professionals, we also engage the support of our business line insurance carrier, Travelers Insurance Company. These Safety experts collectively implement our Safety program which is based on a Safety focused culture emphasizing continual employee training, use of daily job hazard analysis and planning, regular site safety audits, and a safety performance incentive program. While there is considerable information available as to the intended purpose of the EMR and why it should not be used as an indicator of an employer's Safety program, we do understand the concern regarding our current EMR of 1.07. In that regard and without going into too much detail, our current EMR has been negatively impacted by resetting the EMR to unity in 2017 due to a change in company ownership, polluted loss data due to this transaction, and the performance of a high loss operational unit which has since been discontinued. We believe there a more appropriate measures to evaluate our Safety program. The first is our company's Total Recordable and Lost Time Incident Rates (TRIR and LTIR). Over the past three-year period, our TRIR and LTIR has averaged 0.95 and 0.30, respectively – which is less than half of the Bureau of Labor Statistics (BLS) benchmark values of similar businesses in our industry. Further, our current CY24 TRIR and LTIR is 0.65 and 0.00, respectively. Perhaps, the most compelling statement we can make regarding the effectiveness our Safety program is the recent change we chose to make regarding the structure of our insurance program for Workers Compensation (WC) where we moved from a guaranteed loss to a loss sensitive program. Under the loss sensitive program, Reynolds is responsible for every dollar of WC claims experienced. Over the past two years of being under the loss sensitive program, we have realized significant cost savings – both an indicator of our low claims cost experience as well as the overall effectiveness of our Safety program.

DATE	RATING	
4/28/2024-4/28/2025	**0.84**	****NCCI Rating Limited to Northern Operations
	1.07	***NCCI rating for entire company
4/28/2023-4/28/2024	**0.98**	**Excluding Discontinued Operations
	0.79	*NY Mod
	1.32	***NCCI
4/28/2022-4/28/2023	**.90**	**Excluding Discontinued Operations
	1.21	***NCCI

* For the 2023-2024 term, New York created their own Mod structure. This pulled all NY payrolls and losses out from the NCCI calculations.

** On May 1st, 2017, a group of private investors, including former owner Jeff Reynolds, and members of our senior management, acquired the assets of Layne Heavy Civil (LHC) business and existing employees began working under the name Reynolds Construction, LLC. As part of the acquisition, Reynolds Construction, LLC assumed completion responsibilities for active LHC projected including six (6) performed by the Integrated Services (IS) division in Florida involving pipeline installation. These projects have since been completed and the operations of the Integrated Services division has been officially discontinued. Based on this, the claims and payroll for the Integrated Services discontinued operations has been removed, and a "revised" EMR has been calculated excluding the discontinued operations. This rate is more reflective of the "true" EMR that the Reynolds Construction Safety program provided during this timeframe.

*** Unadjusted EMR as calculated by NCCI. More information can be provided upon request.

**** This rating reflects the Northern Operations NCCI Worker Compensation History. More information can be provided upon request.

JERMEY GIROD | Senior Manager

Training and Certifications:
Carpenter Journeyman
Millwright Accreditations
OSHA 40-Hour
HazMat Training
Scaffold Erection & Inspection
Erosion Control
First Aid, CPR and AED

Total Years Experience:
32

Joined Reynolds Construction:
2015*

References:
Don Hubbule
Inspector, Carollo
(970) 412-2937

Scott Koons
Thienman Construction
(765) 730-4093

Steve Suggs, PE
Weiler Engineering
(941) 323-1787

Language:
English

*Date provided is indicative of the year the employee either joined Reynolds Construction, or one of the former companies in the Reynolds history (Reynolds, Inc. or Layne Heavy Civil, Inc.).

Summary of Qualifications

Mr. Girod joined Reynolds Construction in 2015 and has 32 years of experience in the construction industry. He has served as superintendent for the last 14 years, acting as foreman previously. His extensive experience includes concrete, underground piping and mechanical work, welding, and sheet metal.

Project Experience

- **Richard A Heyman Environmental Protection Facility: RAS & WAS Pump System Replacement: City of Key West, Key West, FL–** Assistant Superintendent. This project will include the removal and replacement of the pumps, valves, plumbing, and meters. As well as, VFD's instrumentation, controls, and supports for the WAS and RAS system. Contract amount $3.6M. Estimated Completion March 2025.

- **Kermit H Lewin RO: Florida Keys Aqueduct Authority, Key West, FL–** Superintendent. This project consists of the construction of an emergency standby electrical power generation facility consisting of two Tier 2 rated, high-speed emergency engine generators. Each generator will be furnished with an exhaust silencer, protected-type day tanks to be located in separate sprinkled rooms with remote pumps to supply fuel to the engine-generators. Contract amount $8.1M. Estimated Completion December 2024.

- **Key Largo Wastewater Treatment District Vacuum Stations Modifications: Key Largo Wastewater District, Key Largo, FL–** Superintendent. The District is performing capital upgrades of its vacuum pump stations to allow emergency operation using a trailer-mounted vacuum pump skid and control panel. Upgrades will take place at all 7 pump station locations. Contract amount $2.6M. Estimated Completion November 2024.

- **Key Largo Filtration: Key Largo Wastewater District, Key Largo, FL–** Superintendent. The Key Largo Wastewater Treatment District intends to install a third disc filtration unit to treat its effluent prior to disinfection and disposal. The facility currently has two disc filter units. The third unit will be added to increase throughput and to provide additional reliability. The work includes installation of the new disc filter, including foundation, platform and filtration unit. All associated work needed to provide a fully functional system, including installation of 18" and 20" ductile iron pipe, replacement of booster pump, elevated concrete platform, and electrical work. Contract amount $1.9M. Estimated Completion November 2024.

- **Sigsbee Master Lift Station: Florida Keys Aqueduct Authority, Dredger's Key, Key West, FL –** Superintendent. This project included replacing the existing wastewater master lift station. The facility consists

of several force mains, an existing pump station, and wet well. Contract amount $2.7M. Completion July 2023.

- **Clayton County Water Authority: WJ Hooper Clayton County, Stockbridge, GA –** Project Superintendent. The project consisted of the following major items: Construction of a new sludge thickener and pump vault, Demolition, modifications and installation of new sludge collection equipment and pumps, Modifications to existing sludge loading facility including new conveyor system and truck scale, Replacement of equipment in two existing sludge thickeners, New underground electrical network with modifications to the SCADA system, Installation of new underground piping and valves and modifications to existing valves. Contract amount $7.6M. Completion March 2023.

- **Walnut Creek Lift Station: Clayton County Water Authority, Hampton, GA –** Superintendent. Project included installation of new lift station, wetwell, screening structure, valve vault, electrical building, generator, piping, and mechanical equipment. Installation of concrete driveway, crush stoned areas, and demolition of existing station once new station was on-line. Contract amount $2.7M. Completion March 2023.

- **NAS Key West Boca Chica Field- West Fire Pumping Station: Florida Keys Aqueduct Authority, Key West, FL –** Superintendent. The project consisted of replacing three fire pumps and motors, associated fuel systems, water piping and non-operable storage tank valves at the West fire pumping stations at NAS Key West Boca Chica Field for the U.S. Navy, which is owned and operated by FKAA. Contract amount $1.1M. Completion February 2023.

- **Cobb James E Quarles Dewater Liquid Lime System Improvements: Cobb County Marietta Water Authority, Marietta, GA** – Superintendent. This project consisted of, Demolition of existing slaked lime system, installation of new liquid lime system in outside concrete containment including tanks, pumps, piping, and valves. New liquid lime feed pump skid inside existing building. New sludge condition tank inside existing building. Integration of all new systems into existing SCADA system. Installation of a temporary Liquid lime storage and feed system maintaining continuous operation until new system is online. All work was performed with continuous plant operations of the lime system with no incidents. Contract amount $2.3M. Completion January 2022.

- **Area 3, 4, & 5 WWTP Upgrades: City of Marathon, Marathon, FL –** Superintendent. This project upgraded the city's wastewater treating capacity. Area 3: Reynolds replaced an existing membrane disc filter, modified existing screenings equipment, installed a new equalization basin, and replaced existing blowers. Area 4: Reynolds installed a new membrane disc filter and rehabilitated the existing sand filters. Area 5: upgraded the MBR system, installed a new screening system with free standing elevated steel platform, along with multiple pump and piping upgrades Contract amount $9M. Completion January 2022.

- **Key Largo WWTP: Key Largo Wastewater District, Key Largo, FL –** Superintendent. Capital upgrades on three of the WWTP systems. Contract amount $1.1M. Completion May 2019.

- **Orchard Knob Pump Station Improvements: City of Chattanooga, Chattanooga, TN –** Superintendent. Project consisted of new wet 31' diameter wet well to replace the existing structure and to install new influent and effluent lines made up of 42" DIP and manholes. Contract amount $3M. Completion April 2019.

- **Metro Par 1085: Metro Wastewater Reclamation District, Denver, CO-** Superintendent. In order to obtain access to the transmission water main, the project was designed with a combination of Horizontal Directional Drill (HDD) and Open Cut pipeline. The HDD consisted of installing 635 LF of 16" Steel Casing in which a 10" Fusible PVC potable Waterline was installed. The remainder of the project included installation of 1,300 LF of Restrained Joint Ductile Iron Pipe that was constructed through a portion of Denver Water Reclamation facility and public roadways. The Project included a Pressure Reducing Valve Vault, Metering Vault, Backflow Prevention Facility, Electrical and SCADA Communication lines. Contract amount $1.9M. Completion May 2016.

JASON BROWNLEE | Project Manager

Education:
Bachelor of Science in Civil Engineering from Mississippi State University

Training and Certifications:
OSHA 10
Purdue Site Supervision Training
First Aid & CPR Certified

Total Years Experience:
5

Joined Reynolds Construction:
2020

References:
Robert Archer
Project Manager
Garney Construction
370 E Crown Point Rd,
Winter Garden, FL 34787
(970-631-2533
Rarcher@Garney.com

Christina Lopez
Recruiting Coordinator
Garney Construction
370 E Crown Point Rd,
Winter Garden, FL 34787
(407) 947-5001
Clopez@Garney.com

Summary of Qualifications

Mr. Brownlee is a dedicated Project Manager motivated to maintain safety and contribute to the project's success. He is experienced in pipework both below grade and mechanical. He is also experienced in site layout and concrete work. Mr. Brownlee is a valuable addition to any project team.

Project Experience

- **Richard A Heyman Environmental Protection Facility: RAS & WAS Pump System Replacement: City of Key West, Key West, FL–** Project Manager. This project will include the removal and replacement of the pumps, valves, plumbing, and meters. As well as, VFD's instrumentation, controls, and supports for the WAS and RAS system. Contract amount $3.6M. Estimated Completion March 2025.

- **Kermit H Lewin RO: Florida Keys Aqueduct Authority, Key West, FL–** Assistant Project Manager. This project consists of the construction of an emergency standby electrical power generation facility consisting of two Tier 2 rated, high-speed emergency engine generators. Each generator will be furnished with an exhaust silencer, protected-type day tanks to be located in separate sprinkled rooms with remote pumps to supply fuel to the engine-generators. Contract amount $8.1M. Estimated Completion December 2024.

- **Key Largo Wastewater Treatment District Vacuum Stations Modifications: Key Largo Wastewater District, Key Largo, FL–** Project Manager. The District is performing capital upgrades of its vacuum pump stations to allow emergency operation using a trailer-mounted vacuum pump skid and control panel. Upgrades will take place at all 7 pump station locations. Contract amount $2.6M. Estimated Completion November 2024.

- **Marathon, Area 7: City of Marathon, Marathon, FL–** Project Manager. The construction of this project consists of upgrades to the filters and static screen at the Area 7 WWTP. The upgrades include the installation of two-disc filters and a metal platform. Modification to the existing headworks platform as well as the purchase and installation of a new static screen will occur. Contract amount $1.2M. Estimated Completion November 2024.

- **Marathon WWTP Chemical System Upgrades: City of Marathon, Marathon, FL –** Project Manager. Project included capital upgrades on chemical feed systems for the 5 wastewater treatment facilities located in the city. Systems include pumps and controls for feed of sodium hydroxide, alum, sodium hypochlorite. Contract amount $2.8M. Completion September 2024.

- **Sigsbee Master Lift Station: Florida Keys Aqueduct Authority, Dredger's Key, Key West, FL –** Project Manager. This project included replacing the existing wastewater master lift station. The facility consists of several force mains, an existing pump station, and wet well. Contract amount $2.7M. Completion July 2023.

- **NAS Key West Boca Chica Field- West Fire Pumping Station: Florida Keys Aqueduct Authority, Key West, FL –** Project Engineer. The project consisted of replacing three fire pumps and motors, associated fuel systems, water piping and non-operable storage tank valves at the West fire pumping stations at NAS Key West Boca Chica Field for the U.S. Navy, which is owned and operated by FKAA. Contract amount $1.1M. Completion February 2023.

- **Area 4 Upgrades: City of Marathon, Marathon, FL –** Project Manager and Engineer. Project included installation of a concrete slab, concrete stairs, and a new monorail system at Marathon Area 4 WWTP. Contract amount $1.6M. Completion January 2023.

- **Multiple Area 4 Upgrades: City of Marathon, Marathon, FL –** Project Manager. Project included installation of a concrete slab, concrete stairs, and a new monorail system at Marathon Area 4 WWTP. Contract amounts ranged from: $105,592-$1.6M. Completion November 2021.

- **Big Coppitt WWTP Tertiary Filtration Improvements: Florida Keys Aqueduct Authority, Key West, FL –** Project Engineer. This project included installation of 2 additional disk filters at the Big Coppitt Wastewater Treatment Plant that were furnished by FKAA. Two (2) membrane disk filters were installed which involved a coordinated shutdown that included the installation of 10" PVC pipe, flowmeters and chemical injection relocation. All electrical and Instrumentation and controls upgraded. Contract amount $784,764. Completion June 2021.

Previous Project Experience

- **MPWW Plant Expansion: MPWW, Mt. Pleasant, SC –** Field Engineer with Garney Construction. Robotic Total Station surveying for wall form layout. As-builds using total station. Worked with crew on forming and pouring walls with reinforcing, box-outs and water stop. Inspecting Gang Forms and rebar prior to concrete placement for quality control. Contract amount $70M. Completion April 2021.

JACOB LONG | Superintendent

Education:
AA, Liberal Arts, Itawamba Community College

Presently Pursuing BS in Construction Management, University of Southern Mississippi

Training and Certifications:
Purdue Site Supervision Training
OSHA 30 Certified
First Aid & CPR Certified
Erosion Control Blue card holder

Total Years Experience:
8

Joined Reynolds Construction:
2019

References:
Sam Aultman, Inspector
Mt. Pleasant Waterworks
1619 Rifle Range Rd, Mt. Pleasant, SC 29464
(843) 884-9626
saultman@mpwonline.com

Christina Lopez, Recruiting Coordinator
Garney Construction
370 E Crown Point Rd,
Winter Garden, FL 34787
(407) 947-5001
Clopez@Garney.com

Summary of Qualifications

Dedicated Field Engineer motivated to maintain safety and contribute to company success. Experience laying Ductile Iron and PVC pipe from 4" to 42", and leading crews rehabbing pump stations. Proven ability to communicate work to workers and exceed job completion deadlines.

Project Experience

- **Richard A Heyman Environmental Protection Facility: RAS & WAS Pump System Replacement: City of Key West, Key West, FL–** Superintendent. This project will include the removal and replacement of the pumps, valves, plumbing, and meters. As well as, VFD's instrumentation, controls, and supports for the WAS and RAS system. Contract amount $3.6M. Estimated Completion March 2025.

- **Key Largo Wastewater Treatment District Vacuum Stations Modifications: Key Largo Wastewater District, Key Largo, FL–** Assistant Superintendent. The District is performing capital upgrades of its vacuum pump stations to allow emergency operation using a trailer-mounted vacuum pump skid and control panel. Upgrades will take place at all 7 pump station locations. Contract amount $2.5 M. Estimated Completion November 2024.

- **Key Largo Filtration: Key Largo Wastewater District, Key Largo, FL–** Superintendent/ QA/QC. The Key Largo Wastewater Treatment District intends to install a third disc filtration unit to treat its effluent prior to disinfection and disposal. The facility currently has two disc filter units. The third unit will be added to increase throughput and to provide additional reliability. The work includes installation of the new disc filter, including foundation, platform and filtration unit. All associated work needed to provide a fully functional system, including installation of 18" and 20" ductile iron pipe, replacement of booster pump, elevated concrete platform, and electrical work. Contract amount $2.1M. Estimated Completion November 2024.

- **Marathon WWTP Chemical System Upgrades: City of Marathon, Marathon, FL –** Superintendent. Project included capital upgrades on chemical feed systems for the 5 wastewater treatment facilities located in the city. Systems include pumps and controls for feed of sodium hydroxide, alum, sodium hypochlorite. Contract amount $2.8M. Completion September 2024.

- **Sigsbee Master Lift Station: Florida Keys Aqueduct Authority, Dredger's Key, Key West, FL –** Assistant Superintendent. This project included replacing the existing wastewater master lift station. The facility consists of several force mains, an existing pump station, and wet well. Contract amount $2.7M. Completion July 2023.

- **NAS Key West Boca Chica Field- West Fire Pumping Station: Florida Keys Aqueduct Authority, Key West, FL –** Assistant Superintendent. The project consisted of replacing three fire pumps and motors, associated fuel systems, water piping and non-operable storage tank valves at the West fire pumping stations at NAS Key West Boca Chica Field for the U.S. Navy, which is owned and operated by FKAA. Contract amount $1.1M. Completion February 2023.

- **Big Coppitt WWTP Tertiary Filtration Improvements: Florida Keys Aqueduct Authority, Key West, FL –** Superintendent. This project included installation of 2 additional disk filters at the Big Coppitt Wastewater Treatment Plant that were furnished by FKAA. Two (2) membrane disk filters were installed which involved a coordinated shutdown that included the installation of 10" PVC pipe, flowmeters and chemical injection relocation. All electrical and Instrumentation and controls upgraded. Contract amount $784,764. Completion June 2021

- **Marathon Air WWTP: City of Marathon, Marathon, FL –** Assistant Superintendent. Assisted in a collaborative design effort with City staff for retrofitting UG air piping to an above grade systems at 3 remote areas. Performed design duties, layout, installation, tie-in and demolition. Contract amount $360,299. Completion April 2020

- **Key Largo Steel Storage Building: KLWWTD, Key Largo, FL –** Field Engineer. Monitored subcontractor for quality of work. Project included installation of a steel storage building at the City's WWTP. Contract amount $219,833. Completion April 2020.

- **Key Colony Beach: City of Key Colony Beach, FL –** Field/Project Engineer. Project consisted of demolition of the existing pre-engineered metal building, furnishing and installing a UV replacement system. Contract amount $348,967. Completion February 2020.

Previous Project Experience

- **MPWW Plant Expansion: MPWW, Mt. Pleasant, SC –** Field Engineer with Garney Construction. Robotic Total Station surveying for building layout and control points. As-builds using total station. Worked with crew on forming and pouring slabs with reinforcing, embeds, box-outs and water stop. Inspecting Rebar placement for quality control. Contract amount $70M. Completion April 2021.

- **MPWW Pump Station Rehabilitation: MPWW, Mt. Pleasant, SC –** Field Engineer with Garney Construction. Lead crew in rehabbing and installing new pump stations. Layout and grade for new asphalt driveways to pump stations. Handled renting equipment needed for task. Contract amount $3.5M. Completion May 2019.

ARMANDO EXPOSITO | Safety Officer

Training and Certifications:
OSHA 10 HR Construction
OSHA 30 HR Construction
OSHA 510 Construction
OSHA 500 Construction
CPR
First Aid
Florida Advance MOT Certification

Total Years Experience:
29

Joined Reynolds Construction:
2019

References:
Alejandro Alvarez
(305) 967-5890

Orly Maldonado
(305) 610-0014

Hector Mejia
(786) 334-3492

Languages:
English, Spanish

Summary of Qualifications

Armando has 29 years of experience in the construction industry, including hands-on underground utility install, production, supervision and operations management experience. Armando has a proven ability to contribute to business success via management skills, safety training, productivity initiatives, safety incentives, cost control, reward plans and operational efficiency improvements. He is able to direct multiple teams, projects and locations simultaneously. Armando is truly a dedicated team player committed to performing all necessary tasks for the overall success of the company.

Project Experience

- **Peachtree City DB WWFT Improvements: Peachtree City Water & Sewage Authority, Peachtree, GA –** Safety. Improvements at Line Creek include new mechanical screening at the headworks and replacement of an existing Trojan UV system with a DeNora system. At Rockaway, a new disc filter will work in tandem with the existing filter and replacement of the UV system will improve operational flexibility. The design, permitting and construction activities will revolve around pre-selected equipment for each project location. This project is not intended to increase wastewater treatment capacity. Reynolds will self-perform, underground piping, concrete work and equipment installation. Contract amount $5.9M. Estimated Completion February 2026.

- **South Cobb Filtration Rehab: Cobb County Water System, Austell, GA –** Safety. This project includes removing and replacing the filter media and porous plates in 7 sand filters. Reynolds will also be repairing the filter bridges and accessories associated with the bridges. Contract amount $3.7M. Estimated Completion October 2025.

- **Richard A Heyman Environmental Protection Facility: RAS & WAS Pump System Replacement: City of Key West, Key West, FL–** Safety. This project will include the removal and replacement of the pumps, valves, plumbing, and meters. As well as, VFD's instrumentation, controls, and supports for the WAS and RAS system. Contract amount $3.6M. Estimated Completion March 2025.

- **Galleria Area Outfall Sewer Replacement: Cobb County Water, Atlanta, GA–** Safety. This project is a sewer replacement for Cobb County. It includes 500lf of 84" tunnel with shafts, 200' of open cut pipe - 30", 1,500' of 18 FPVC to be installed inside of a 7'x7' box culvert, as well as a bypass system to carry all of the sewer during construction. Contract amount $9M. Estimated Completion February 2025.

- **GP Cedar Springs Outfall: Georgia Pacific, Cedar Springs, GA –** Safety. Reynolds will construct two concrete structures, connecting via 72" piping and diffuser piping into the river. We will also install owner

supplied equipment that is provided. Contract amount $8.7M. Estimated Completion December 2024.

- **Key Largo Wastewater Treatment District Vacuum Stations Modifications: Key Largo Wastewater District, Key Largo, FL–**Safety. The District is performing capital upgrades of its vacuum pump stations to allow emergency operation using a trailer-mounted vacuum pump skid and control panel. Upgrades will take place at all 7 pump station locations. Contract amount $2.6M. Estimated Completion November 2024.

- **Key Largo Filtration: Key Largo Wastewater District, Key Largo, FL–** Safety. The Key Largo Wastewater Treatment District intends to install a third disc filtration unit to treat its effluent prior to disinfection and disposal. The facility currently has two disc filter units. The third unit will be added to increase throughput and to provide additional reliability. The work includes installation of the new disc filter, including foundation, platform and filtration unit. All associated work needed to provide a fully functional system, including installation of 18" and 20" ductile iron pipe, replacement of booster pump, elevated concrete platform, and electrical work. Contract amount $2.1M. Estimated Completion November 2024.

- **James E Quarles WTP Valve & Actuator Replacement: Cobb County-Marietta Water, Marietta, GA–** Safety. Reynolds was contracted to repair and replace the existing valves for the sand filters in the treatment plant, as they would not fully seal. This project included the removal of 34 electric actuators and the installation of 112 valve and actuator assemblies, as well as the instillation of 5 actuators on the raw water pumps control valves. Replacement of 10 electric actuators and demolition of concrete to install grating around the bonnets of the influent valves on filters was also necessary to this project. Contract amount $3.8M. Estimated Completion November 2024.

- **Confidential RNG Facility: Confidential, NC–** Safety. The completed project will provide renewable natural gas. Estimated Completion November 2024.

- **Kermit H Lewin RO: Florida Keys Aqueduct Authority, Key West, FL–** Safety. This project consists of the construction of an emergency standby electrical power generation facility consisting of two Tier 2 rated, high-speed emergency engine generators. Each generator will be furnished with an exhaust silencer, protected-type day tanks to be located in separate sprinkled rooms with remote pumps to supply fuel to the engine-generators. Contract amount $8.1M. Estimated Completion October 2024.

- **Marathon WWTP Chemical System Upgrades: City of Marathon, Marathon, FL –** Safety Representative. Project included capital upgrades on chemical feed systems for the 5 wastewater treatment facilities located in the city. Systems include pumps and controls for feed of sodium hydroxide, alum, sodium hypochlorite. Contract amount $2.8M. Completion September 2024.

- **Area 3, 4, & 5 WWTP Upgrades: City of Marathon, Marathon, FL –** Safety Representative. This project upgraded the city's wastewater treating capacity. Marathon Area 3, Reynolds replaced an existing disc filter, modified existing screenings equipment, installed a new equalization basin, and replaced existing blowers. Marathon Area 4, Reynolds installed a new disc filter and rehabilitate the existing sand filters. Contract amount $6.9M. Completion January 2022.

- **Big Coppitt Wastewater Treatment Plant Tertiary Filtration Improvements: Florida Keys Aqueduct Authority – Key West, FL –** Safety. This project included installation of 2 additional disk filters at the Big Coppitt Wastewater Treatment Plant that were furnished by FKAA. Two (2) membrane disk filters were installed which involved a coordinated shutdown that included the installation of 10" PVC pipe, flowmeters and chemical injection relocation. All electrical and Instrumentation and controls upgraded. Contract amount $784,764. Completion June 2021

Reynolds Construction, LLC Equipment List

Equipment Number	Model Year	Item Class Desc	Desc 1	Co Divison	Ownership	Acquisition Date
115001	2015	HALF TON PICKUPS	15 RAM 1500 4x4 QC PU	Safety	Owned	5/1/2017
104012	2004	DUMP TRUCKS	04 MAC CV713 TNDM DMP TK	Southeast	Owned	5/1/2017
115012	2015	THREE QUARTER TON TRUCKS	15 RAM 2500 4x4 CC	Southeast	Owned	5/1/2017
116008	2016	THREE QUARTER TON TRUCKS	16 RAM 2500 4x4 CC	Southeast	Owned	5/1/2017
116010	2016	THREE QUARTER TON TRUCKS	16 RAM 2500 4x4 CC SB	Southeast	Owned	5/1/2017
203001	2003	TRAILERS	03 KAU 25' TAGALONG TR	Southeast	Owned	5/1/2017
203004	2003	TRAILERS	03 UTL FLATBED TR	Southeast	Owned	5/1/2017
208002	2008	TRAILERS	08 HMD CARGO TR	Southeast	Owned	5/1/2017
208003	2008	TRAILERS	08 LOU 24F FLATBED TR	Southeast	Owned	5/1/2017
208006	2008	TRAILERS	08 VIC 7X16 CARGO TR	Southeast	Owned	5/1/2017
209002	2009	TRAILERS	09 GAT 8X20FT UTILITY TR	Southeast	Owned	5/1/2017
289001	1989	TRAILERS	89 BEL TR	Southeast	Owned	5/1/2017
298001	1998	TRAILERS	98 ATO CARGO TR	Southeast	Owned	5/1/2017
298003	1998	TRAILERS	98 BEL TR	Southeast	Owned	5/1/2017
299001	1999	TRAILERS	99 CGM 7X16 TR ENCLOSED	Southeast	Owned	5/1/2017
299008	1999	RT TRAILERS	99 TKG DROP DECK TR	Southeast	Owned	5/1/2017
299011	1999	TRAILERS	99 GAT 20X8 UTLITY TRAILR	Southeast	Owned	5/1/2017
300013	2000	BEDDING BOX	00 7 YARD BEDDING BOX	Southeast	Owned	5/1/2017
300025	2000	MANHOLE / TRENCH BOX	00 KUN 6X6X23 TR BOX	Southeast	Owned	5/1/2017
300034	2000	CLEAN-UP EQUIPMENT	CASE 96" ANGLE BROOM	Southeast	Owned	5/1/2017
300035	2000	GENERATORS	CAT 230KW GENERATOR	Southeast	Owned	5/1/2017
300036	2000	GENERATORS	CAT 455 GEN SET	Southeast	Owned	5/1/2017
300038	2000	SAFETY EQUIPMENT	CIS MANBASKET (SV)	Southeast	Owned	5/1/2017
300039	2000	MISC OFF-HWY EQUIP	COLUMBIA R57 DROP CROSS	Southeast	Owned	5/1/2017
300041	2000	COMPACTORS	COMPACTOR	Southeast	Owned	5/1/2017
300056	2000	MANHOLE / TRENCH BOX	GME 6X6 ALUMINUM TB	Southeast	Owned	5/1/2017
300057	2000	MANHOLE / TRENCH BOX	GME 6X6 ALUMINUM TB	Southeast	Owned	5/1/2017
300058	2000	MANHOLE / TRENCH BOX	GME 6X6 ALUMINUM TB	Southeast	Owned	5/1/2017
300059	2000	MANHOLE / TRENCH BOX	GME 6X6 TRENCH SHIELD	Southeast	Owned	5/1/2017
300061	2000	MANHOLE / TRENCH BOX	GME 8' X 24' TRENCH BOX	Southeast	Owned	5/1/2017
300063	2000	MANHOLE / TRENCH BOX	GME 8X6 TRENCH SHIELD	Southeast	Owned	5/1/2017
300064	2000	MANHOLE / TRENCH BOX	GME 8x6 TRENCH SHIELD	Southeast	Owned	5/1/2017
300070	2000	MANHOLE / TRENCH BOX	GME TRENCH SHIELD	Southeast	Owned	5/1/2017
300072	2000	MISC OFF-HWY EQUIP	GRN 10TON BAT LOCO	Southeast	Owned	5/1/2017
300073	2000	MISC OFF-HWY EQUIP	GRNSBRG 10TON BATT LOCMO	Southeast	Owned	5/1/2017
300076	2000	PUMPS	HYDRAULIC PUMP	Southeast	Owned	5/1/2017
300079	2000	ROCK DRILLS	ING/RAND ECM350 DRILL	Southeast	Owned	5/1/2017
300082	2000	ROCK DRILLS	ING RAND ECM350 DRILL	Southeast	Owned	5/1/2017
300085	2000	AIR COMPRESSOR	ING RAND P185 COMPRESSR	Southeast	Owned	5/1/2017
300089	2000	PUMPS	JET PUMP	Southeast	Owned	5/1/2017
300091	2000	AIR TEST EQUIPMENT	KING HYDROSTAT TEST PUMP	Southeast	Owned	5/1/2017
300098	2000	WELDING RIGS	LEGEND 200 WELDER	Southeast	Owned	5/1/2017
300100	2000	PUMPS	LH875-60 TSURNAMI PUMP	Southeast	Owned	5/1/2017
300101	2000	Cable/Hose Spooler	LIDGERWOOD Dbl DRM WNCH	Southeast	Owned	5/1/2017
300102	2000	Cable/Hose Spooler	MCELROY DBLE DRUM WNCH	Southeast	Owned	5/1/2017
300112	2000	TEST ENGINES / POWER UNITS	MINING CONT SWITCH GEAR	Southeast	Owned	5/1/2017
300113	2000	TEST ENGINES / POWER UNITS	MINING CONT POWER CENTER	Southeast	Owned	5/1/2017
300114	2000	MISC OFF-HWY EQUIP	MISC CONCRETE FORMS	Southeast	Owned	5/1/2017
300116	2000	BEDDING BOX	NES HI HOPPER BEDDING BX	Southeast	Owned	5/1/2017
300122	2000	MANHOLE / TRENCH BOX	NN EFF 12X30 TR BOX	Southeast	Owned	5/1/2017
300123	2000	MANHOLE / TRENCH BOX	NN EFF 12X30 TR BOX	Southeast	Owned	5/1/2017
300129	2000	MANHOLE / TRENCH BOX	NN EFF 8X12 STACKING TB	Southeast	Owned	5/1/2017
300130	2000	MANHOLE / TRENCH BOX	NN EFF 8X12 STACKING TB	Southeast	Owned	5/1/2017
300131	2000	MANHOLE / TRENCH BOX	NN EFF 8X12 TR BOX	Southeast	Owned	5/1/2017
300132	2000	MANHOLE / TRENCH BOX	NN EFF 8X12 TR BOX	Southeast	Owned	5/1/2017
300139	2000	MANHOLE / TRENCH BOX	NN EFF 8X30 TR BOX	Southeast	Owned	5/1/2017
300140	2000	MANHOLE / TRENCH BOX	NN EFF 8X30 TR BOX	Southeast	Owned	5/1/2017
300146	2000	MANHOLE / TRENCH BOX	NN GME 6X20 TR BOX	Southeast	Owned	5/1/2017
300147	2000	MANHOLE / TRENCH BOX	NN GME 6X20 TR BOX	Southeast	Owned	5/1/2017
300148	2000	MANHOLE / TRENCH BOX	NN GME 6X24 TR BOX	Southeast	Owned	5/1/2017
300150	2000	MANHOLE / TRENCH BOX	NN GME 8X20 TR BOX	Southeast	Owned	5/1/2017
300151	2000	MANHOLE / TRENCH BOX	NN GME 8X24 TR BOX	Southeast	Owned	5/1/2017
300154	2000	MANHOLE / TRENCH BOX	NN KUN 8X10 TR BOX	Southeast	Owned	5/1/2017
300155	2000	MANHOLE / TRENCH BOX	NN KUN 8X10FT TR BOX	Southeast	Owned	5/1/2017
300156	2000	MANHOLE / TRENCH BOX	NN KUN 8X10FT TR BOX	Southeast	Owned	5/1/2017
300165	2000	MISC OFF-HWY EQUIP	PLYMOUTH HMD LOCOMOTIVE	Southeast	Owned	5/1/2017
300166	2000	MISC OFF-HWY EQUIP	PLYMOUTH HMD LOCOMOTIVE	Southeast	Owned	5/1/2017
300167	2000	MANHOLE / TRENCH BOX	PRO-TECH TB 8X10	Southeast	Owned	5/1/2017
300177	2000	TEST ENGINES / POWER UNITS	SUBSTATION 480 V, 3 PHASE	Southeast	Owned	5/1/2017
300179	2000	MISC OFF-HWY EQUIP	TAMROCK (SV)	Southeast	Owned	5/1/2017
300180	2000	MISC HWY EQUIPMENT	TAPMATE PIPE DRILLING	Southeast	Owned	5/1/2017
300182	2000	MISC OFF-HWY EQUIP	TAPPING MACHINE	Southeast	Owned	5/1/2017
300185	2000	MANHOLE / TRENCH BOX	TITAN 10X20 TRENCH SHIELD	Southeast	Owned	5/1/2017
300186	2000	MANHOLE / TRENCH BOX	TITAN 10X20 TRENCH SHIELD	Southeast	Owned	5/1/2017
300187	2000	MANHOLE / TRENCH BOX	TITAN 10X24 TRENCH SHIELD	Southeast	Owned	5/1/2017
300188	2000	MANHOLE / TRENCH BOX	TITAN 10X28 TRENCH SHIELD	Southeast	Owned	5/1/2017
300189	2000	MANHOLE / TRENCH BOX	TITAN 8 X 28 TRENCHBOX	Southeast	Owned	5/1/2017
300191	2000	MANHOLE / TRENCH BOX	TITAN 8X20 TRENCH SHIELD	Southeast	Owned	5/1/2017
300192	2000	MANHOLE / TRENCH BOX	TITAN 8X28 TRENCH SHIELD	Southeast	Owned	5/1/2017
300193	2000	MANHOLE / TRENCH BOX	TITAN 8X28 TRENCH SHIELD	Southeast	Owned	5/1/2017
300194	2000	MANHOLE / TRENCH BOX	TITAN 8X28 TRENCH SHIELD	Southeast	Owned	5/1/2017
300195	2000	MANHOLE / TRENCH BOX	TITAN 9 X 28 TRENCHBOX	Southeast	Owned	5/1/2017
300210	2000	PUMPS	TSURUMI 8" PUMP	Southeast	Owned	5/1/2017
300211	2000	MISC HWY EQUIPMENT	TUGGER 15 TON	Southeast	Owned	5/1/2017
300219	2000	COMPACTORS	WACKER VIB PLATE REVERSE	Southeast	Owned	5/1/2017
300220	2000	WELDING RIGS	WELDER	Southeast	Owned	5/1/2017
300223	2000	GENERATORS	XX MUL SCA125USJ 125K/GEN	Southeast	Owned	5/1/2017
300224	2000	SHOP EQUIPMENT	ZED ALIGNMENT SYSTEM	Southeast	Owned	5/1/2017
300226	2000	TEST ENGINES / POWER UNITS	00 1250 KVA SUBSTATION	Southeast	Owned	5/1/2017
301005	2001	MANHOLE / TRENCH BOX	01 PTC 10X30 TR BOX	Southeast	Owned	5/1/2017

Reynolds Construction, LLC Equipment List

Equipment Number	Model Year	Item Class Desc	Desc 1	Co Divison	Ownership	Acquisition Date
301006	2001	MANHOLE / TRENCH BOX	01 PTC 10X30 TR BOX	Southeast	Owned	5/1/2017
301007	2001	MANHOLE / TRENCH BOX	01 UNK 10X10 TR BOX	Southeast	Owned	5/1/2017
302001	2002	MANHOLE / TRENCH BOX	02 TTN 8X24X6 TR BOX	Southeast	Owned	5/1/2017
302002	2002	MANHOLE / TRENCH BOX	02 TTN 8X24X8 TR BOX	Southeast	Owned	5/1/2017
302004	2002	SAFETY EQUIPMENT	02 UNK S36 750LB MANCAGE	Southeast	Owned	5/1/2017
303001	2003	MANHOLE / TRENCH BOX	03 KUN 10X24 TR BOX	Southeast	Owned	5/1/2017
303003	2003	MANHOLE / TRENCH BOX	03 KUN 4X24 TR BOX	Southeast	Owned	5/1/2017
303005	2003	MANHOLE / TRENCH BOX	03 UNK 8X24 TR BOX	Southeast	Owned	5/1/2017
304001	2004	MANHOLE / TRENCH BOX	04 EFF 6X8 TR BOX	Southeast	Owned	5/1/2017
304004	2004	MANHOLE / TRENCH BOX	04 GME 6X8 ALUMINUM BOX	Southeast	Owned	5/1/2017
304005	2004	MANHOLE / TRENCH BOX	04 GME 6X8 TR BOX	Southeast	Owned	5/1/2017
304006	2004	MANHOLE / TRENCH BOX	04 GME 8X16 TR BOX	Southeast	Owned	5/1/2017
304008	2004	MANHOLE / TRENCH BOX	04 GME 8X8 TR BOX	Southeast	Owned	5/1/2017
304013	2004	MANHOLE / TRENCH BOX	04 KUN 6X10 TR BOX	Southeast	Owned	5/1/2017
304014	2004	MANHOLE / TRENCH BOX	04 KUN 6X10 TR BOX	Southeast	Owned	5/1/2017
304015	2004	MANHOLE / TRENCH BOX	04 KUN 6X20 TR BOX	Southeast	Owned	5/1/2017
304018	2004	MANHOLE / TRENCH BOX	04 KUN 7.5X8 TB BOX	Southeast	Owned	5/1/2017
304019	2004	MANHOLE / TRENCH BOX	04 KUN 7.5X8 TB BOX	Southeast	Owned	5/1/2017
304020	2004	MANHOLE / TRENCH BOX	04 KUN 8X10 MH BOX	Southeast	Owned	5/1/2017
304021	2004	MANHOLE / TRENCH BOX	04 KUN 8X10 MH BOX	Southeast	Owned	5/1/2017
304023	2004	MANHOLE / TRENCH BOX	04 KUN 8X20 TR BOX	Southeast	Owned	5/1/2017
304025	2004	MANHOLE / TRENCH BOX	04 KUN 8X24 TR BOX	Southeast	Owned	5/1/2017
304029	2004	MANHOLE / TRENCH BOX	04 SPS 6X24 TR BOX	Southeast	Owned	5/1/2017
304030	2004	MANHOLE / TRENCH BOX	04 SPS 6X24 TR BOX	Southeast	Owned	5/1/2017
305008	2005	MANHOLE / TRENCH BOX	05 KUN 6X6 TR BOX	Southeast	Owned	5/1/2017
305010	2005	MANHOLE / TRENCH BOX	05 KUN 8X10 MH BOX	Southeast	Owned	5/1/2017
305013	2005	MANHOLE / TRENCH BOX	05 KUN 8X24 TR BOX	Southeast	Owned	5/1/2017
305014	2005	MANHOLE / TRENCH BOX	05 SCK 4X8 STACK MH TB	Southeast	Owned	5/1/2017
305015	2005	MANHOLE / TRENCH BOX	05 SCK 4X8 STACK MH TB	Southeast	Owned	5/1/2017
305016	2005	MANHOLE / TRENCH BOX	05 SHR 8X10 MH BOX	Southeast	Owned	5/1/2017
305017	2005	MANHOLE / TRENCH BOX	05 SPS 4X8 MH BOX	Southeast	Owned	5/1/2017
305018	2005	MANHOLE / TRENCH BOX	05 SPS 8X8 MH BOX	Southeast	Owned	5/1/2017
305019	2005	MANHOLE / TRENCH BOX	05 SPS 8X8 MH BOX	Southeast	Owned	5/1/2017
305020	2005	MANHOLE / TRENCH BOX	05 STS 4X16 TR BOX	Southeast	Owned	5/1/2017
305023	2005	MANHOLE / TRENCH BOX	05 UNK 2X7 STCK ALM TR BX	Southeast	Owned	5/1/2017
305024	2005	MANHOLE / TRENCH BOX	05 UNK 4X7 STCK ALM TR BX	Southeast	Owned	5/1/2017
306003	2006	MISC HWY EQUIPMENT	06 DYN LT6000 TAMPER	Southeast	Owned	5/1/2017
306004	2006	MANHOLE / TRENCH BOX	06 EFF 10X16X4 TR BOX	Southeast	Owned	5/1/2017
306005	2006	MANHOLE / TRENCH BOX	06 EFF 10X16X6 TR BOX	Southeast	Owned	5/1/2017
306006	2006	MANHOLE / TRENCH BOX	06 EFF 8X24 TR BOX	Southeast	Owned	5/1/2017
306016	2006	AIR COMPRESSOR	06 SUL 750 CFM AIR COMP	Southeast	Owned	5/1/2017
306017	2006	MANHOLE / TRENCH BOX	06 TTN 8X6 TR BOX	Southeast	Owned	5/1/2017
306018	2006	MANHOLE / TRENCH BOX	06 TTN 8X6 TR BOX	Southeast	Owned	5/1/2017
307001	2007	PUMPS	07 12" GORMAN RUPP PUMP	Southeast	Owned	5/1/2017
307004	2007	MANHOLE / TRENCH BOX	07 GME 8X24 TR BOX	Southeast	Owned	5/1/2017
307005	2007	BEDDING BOX	07 GME 9YD BOX	Southeast	Owned	5/1/2017
307010	2007	GROUT PUMPS	07 MAYCO C30HDZ GRT PMP	Southeast	Owned	5/1/2017
307011	2007	MISC HWY EQUIPMENT	07 SOL DIAGNOSTIC TOOL	Southeast	Owned	5/1/2017
308007	2008	MANHOLE / TRENCH BOX	08 EFF 4X20 TR BOX	Southeast	Owned	5/1/2017
308009	2008	MANHOLE / TRENCH BOX	08 EFF 8X20 TR BOX	Southeast	Owned	5/1/2017
308017	2008	MANHOLE / TRENCH BOX	08 GME 20X8X4 TR BOX	Southeast	Owned	5/1/2017
308059	2008	BEDDING BOX	08 KUN 12CY BD BOX	Southeast	Owned	5/1/2017
308060	2008	BEDDING BOX	08 KUN 12CY STONE BOX	Southeast	Owned	5/1/2017
308061	2008	MANHOLE / TRENCH BOX	08 KUN 6X24 TR BOX	Southeast	Owned	5/1/2017
308062	2008	MANHOLE / TRENCH BOX	08 KUN 6X24 TR BOX	Southeast	Owned	5/1/2017
308068	2008	MANHOLE / TRENCH BOX	08 PTC 8X8 TR BOX	Southeast	Owned	5/1/2017
308071	2008	MANHOLE / TRENCH BOX	08 SEC 8X10 TR BOX	Southeast	Owned	5/1/2017
308074	2008	GENERATORS	08 WAC SP5600A GENSET	Southeast	Owned	5/1/2017
310002	2010	SAFETY EQUIPMENT	10 PERSON MAN BASKET	Southeast	Owned	5/1/2017
312002	2012	GENERATORS	12 MUL DCA25 29KVA GENSET	Southeast	Owned	5/1/2017
312003	2012	AIR COMPRESSOR	12 SUL D185 PRTBL COMP	Southeast	Owned	5/1/2017
312005	2012	AIR COMPRESSOR	12 SUL D185 PRTBL COMP	Southeast	Owned	5/1/2017
316001	2016	MANHOLE / TRENCH BOX	16 EFF HDHT8-1026-28	Southeast	Owned	5/1/2017
316002	2016	MANHOLE / TRENCH BOX	16 EFF HDHT8-1026-28	Southeast	Owned	5/1/2017
316006	2016	MANHOLE / TRENCH BOX	16 EFF HT6-626	Southeast	Owned	5/1/2017
392002	1992	MANHOLE / TRENCH BOX	92 UNK 8X8 MH BOX	Southeast	Owned	5/1/2017
394003	1994	MANHOLE / TRENCH BOX	94 SHI 10X30X14 TR BOX	Southeast	Owned	5/1/2017
394005	1994	BEDDING BOX	94 UNK 6X16 BD BOX	Southeast	Owned	5/1/2017
396001	1996	MISC OFF-HWY EQUIP	96 RON 1220 DRILL	Southeast	Owned	5/1/2017
397009	1997	MANHOLE / TRENCH BOX	97 PRO 10X24 TR BOX	Southeast	Owned	5/1/2017
397011	1997	MANHOLE / TRENCH BOX	97 SHR 4X7 ALUMINM TR BX	Southeast	Owned	5/1/2017
398004	1998	MANHOLE / TRENCH BOX	98 GME 8X18 TR BOX	Southeast	Owned	5/1/2017
398005	1998	MANHOLE / TRENCH BOX	98 GME 8X20 TR BOX	Southeast	Owned	5/1/2017
398009	1998	MANHOLE / TRENCH BOX	98 PTC 6X20 TR BOX	Southeast	Owned	5/1/2017
398010	1998	MANHOLE / TRENCH BOX	98 PTC 8X16 NONSTCK TR BX	Southeast	Owned	5/1/2017
398012	1998	BEDDING BOX	98 UNK 12YD ROCK BOX	Southeast	Owned	5/1/2017
398013	1998	BEDDING BOX	98 UNK 15CY BEDDING BOX	Southeast	Owned	5/1/2017
399002	1999	MISC HWY EQUIPMENT	99 CHR AIRLOCK TEST KIT	Southeast	Owned	5/1/2017
410001	2010	EXCAVATORS	10 CAT 303.5 MINIHEX	Southeast	Owned	5/1/2017
502002	2002	FORKLIFT / TELEHANDLER	02 CATERPILLLAR FORKLIFT	Southeast	Owned	5/1/2017
505005	2005	FORKLIFT / TELEHANDLER	05 JLG TELESCOPIC LIFT	Southeast	Owned	5/1/2017
508003	2008	BACKHOES	08 CAS 580SM BACKHOE	Southeast	Owned	5/1/2017
509001	2008	LOADERS	09 VOL L90F LDR	Southeast	Owned	5/1/2017
707001	2007	CRANES	07 KOB CK850 85T CRWL CRN	Southeast	Owned	5/1/2017
799002	1999	CRANES	99 AMERICAN HC-80 CRANE	Southeast	Owned	5/1/2017
800001	2000	MARINE	00 20' XPRESS JON BOAT	Southeast	Owned	5/1/2017
800004	2000	MARINE	0018' XPRESS JON BOAT	Southeast	Owned	5/1/2017
805002	2005	MARINE	05 TRUCKABLE PUSH BOAT	Southeast	Owned	5/1/2017
805003	2005	MARINE	05 TRUCKABLE PUSH BOAT	Southeast	Owned	5/1/2017
805004	2005	BORING EQUIPMENT	05 PJU 80" TNL BORNG MACH	Southeast	Owned	5/1/2017

Reynolds Construction, LLC Equipment List

Equipment Number	Model Year	Item Class Desc	Desc 1	Co Divison	Ownership	Acquisition Date
806001	2006	MARINE	06 SHUGART 10X41 PONTOON	Southeast	Owned	5/1/2017
806002	2006	MARINE	06 SHUGART 10X41 PONTOON	Southeast	Owned	5/1/2017
806003	2006	MARINE	06 SHUGART 10X41 PONTOON	Southeast	Owned	5/1/2017
807001	2007	MARINE	07 SHUGART 10X41 PONTOON	Southeast	Owned	5/1/2017
807002	2007	MARINE	07 SHUGART 10X41 PONTOON	Southeast	Owned	5/1/2017
807003	2007	MARINE	07 SHUGART 10X41 PONTOON	Southeast	Owned	5/1/2017
807004	2007	MARINE	07 SHUGART 10X41 PONTOON	Southeast	Owned	5/1/2017
807005	2007	MARINE	07 SHUGART 10X41 PONTOON	Southeast	Owned	5/1/2017
807006	2007	MARINE	07 SHUGART 10X41 PONTOON	Southeast	Owned	5/1/2017
807007	2007	MARINE	07 SHUGART 10X41 PONTOON	Southeast	Owned	5/1/2017
807008	2007	MARINE	07 SHUGART 10X41 PONTOON	Southeast	Owned	5/1/2017
808003	2008	MARINE	08 SHUGART 10X20 PONTOON	Southeast	Owned	5/1/2017
808004	2008	MARINE	08 SHUGART 10X20 PONTOON	Southeast	Owned	5/1/2017
808005	2008	MARINE	08 SHUGART 10X20 PONTOON	Southeast	Owned	5/1/2017
808006	2008	MARINE	08 SHUGART 10X20 PONTOON	Southeast	Owned	5/1/2017
808007	2008	MARINE	08 SHUGART 10X20 PONTOON	Southeast	Owned	5/1/2017
808008	2008	MARINE	08 SHUGART 10X20 PONTOON	Southeast	Owned	5/1/2017
808009	2008	MARINE	08 SHUGART 10X41 PONTOON	Southeast	Owned	5/1/2017
808010	2008	MARINE	08 SHUGART 10X41 PONTOON	Southeast	Owned	5/1/2017
808011	2008	MARINE	08 SHUGART 10X41 PONTOON	Southeast	Owned	5/1/2017
808012	2008	MARINE	08 SHUGART PONTOON	Southeast	Owned	5/1/2017
808013	2008	MARINE	08 SHUGART PONTOON	Southeast	Owned	5/1/2017
808014	2008	MARINE	08 SHUGART PONTOON	Southeast	Owned	5/1/2017
808015	2008	MARINE	08 SHUGART PONTOON	Southeast	Owned	5/1/2017
808016	2008	MARINE	08 SHUGART PONTOON	Southeast	Owned	5/1/2017
808017	2008	MARINE	08 SHUGART PONTOON	Southeast	Owned	5/1/2017
808018	2008	MARINE	08 SHUGART PONTOON	Southeast	Owned	5/1/2017
808019	2008	MARINE	08 SHUGART PONTOON	Southeast	Owned	5/1/2017
808020	2008	MARINE	08 SHUGART PONTOON	Southeast	Owned	5/1/2017
808021	2008	MARINE	08 SHUGART PONTOON	Southeast	Owned	5/1/2017
808022	2008	MARINE	08 SHUGART PONTOON	Southeast	Owned	5/1/2017
808023	2008	MARINE	08 SHUGART PONTOON	Southeast	Owned	5/1/2017
808024	2008	MARINE	08 SHUGART PONTOON	Southeast	Owned	5/1/2017
808025	2008	MARINE	08 SHUGART PONTOON	Southeast	Owned	5/1/2017
808026	2008	MARINE	08 SHUGART PONTOON	Southeast	Owned	5/1/2017
810001	2010	MARINE	10 20' CUB SEAARK BOAT	Southeast	Owned	5/1/2017
892001	1992	BORING EQUIPMENT	92 BOR 48IN BORING MACH	Southeast	Owned	5/1/2017
894002	1994	MARINE	94 SHUGART 10X20 PONTOON	Southeast	Owned	5/1/2017
894003	1994	MARINE	94 SHUGART 10X20 PONTOON	Southeast	Owned	5/1/2017
895001	1995	BORING EQUIPMENT	95 JARVA 18-806 TNL BORER	Southeast	Owned	5/1/2017
898001	1998	MARINE	98 SHUGART PONTOON	Southeast	Owned	5/1/2017
900001	2000	BUCKETS	00 ATLAS 3CY DIGING BCKT	Southeast	Owned	5/1/2017
900006	2000	HYD. HAMMERS	00 VIBRATORY HAMMER	Southeast	Owned	5/1/2017
906001	2006	BUCKETS	06 FEL 30IN CMP BCKT	Southeast	Owned	5/1/2017
906003	2006	BUCKETS	06 JRB 2.25CY SD DMP BCKT	Southeast	Owned	5/1/2017
995001	1995	BUCKETS	95 2YD CLMSHL DIGING BCKT	Southeast	Owned	5/1/2017
995002	1995	BUCKETS	95 Clamshell Bucket	Southeast	Owned	5/1/2017
997001	1997	BUCKETS	97 FEL 24X60IN COMP BUCKT	Southeast	Owned	5/1/2017
997002	1997	BUCKETS	97 FELCO "D" FAMILY	Southeast	Owned	5/1/2017
998003	1998	HEX GET/MISC	98 HEN H24BL COMPCTR	Southeast	Owned	5/1/2017
999001	1999	HEX GET/MISC	99 NPK C8C COMPCTR	Southeast	Owned	5/1/2017
117002	2017	THREE QUARTER TON TRUCKS	17 RAM 2500 4x4 CC UTIL	Southeast	Owned	5/1/2017
399009	1999	MISC OFF-HWY EQUIP	99 MCE PITBULL 8IN FUSION	Southeast	Owned	5/1/2017
107013	2007	ROAD TRACTORS	07 PET 379 ROAD TRACTOR	Southeast	Owned	5/1/2017
116017	2016	HALF TON PICKUPS	16 RAM 1500 4x4 QC PU	Southeast	Owned	5/1/2017
296003	1996	RT TRAILERS	96 WIT CHLGR TR	Southeast	Owned	5/1/2017
301017	2001	BEDDING BOX	NN UNK CY ROCK BOX	Southeast	Owned	5/1/2017
118001	2018	HALF TON PICKUPS	18 RAM 1500 4x4 CC PU	Southeast	Owned	5/9/2018
394012	1994	PUMPS	AIR TEST PUMP	Southeast	Owned	5/1/2017
399010	1999	MISC OFF-HWY EQUIP	99 MCE PITBULL 8IN	Southeast	Owned	5/1/2017
219002	2019	TRAILERS	19 CORNPRO UT12 LS 3.5K	Southeast	Owned	5/2/2019
894004	1994	MARINE	94 JON BOAT 18' 7"	Southeast	Owned	5/1/2017
115020	2015	HALF TON PICKUPS	15 FOR TRANSIT LR PAS	Southeast	Owned	8/21/2017
511005	2011	LOADERS	11 JDR 544K LDR	Southeast	Owned	1/18/2018
118002	2018	HALF TON PICKUPS	18 RAM 1500 4x4 CC PU	Southeast	Owned	5/17/2018
118007	2018	THREE QUARTER TON TRUCKS	18 RAM 2500 4x4 CC UTIL L	Southeast	Leased	5/9/2018
974001	1970	BUCKETS	74 Erie GP212 2.5y	Southeast	Owned	6/21/2018
894006	1994	MARINE	94 GREEN JOHN BOAT	Southeast	Owned	7/20/2018
806004	2006	MARINE	06 SEAARK WORK BOAT	Southeast	Owned	7/20/2018
818001	2018	MARINE	18 SEAARK CUB 2072 70HPYA	Southeast	Owned	8/15/2018
118015	2018	HALF TON PICKUPS	18 RAM 1500 4x4 CC PU	Southeast	Leased	8/24/2018
975001	1975	BUCKETS	75 Erie GP212 2.5y	Southeast	Owned	11/14/2018
317007	2017	ROCK DRILLS	17 EPIROC FLEXIROC T20R	Southeast	Owned	11/16/2018
118022	2018	THREE QUARTER TON TRUCKS	18 RAM 2500 4x4 CC PU L	Southeast	Owned	12/21/2018
118025	2018	THREE QUARTER TON TRUCKS	18 RAM 2500 4x4 CC PU L	Southeast	Owned	1/4/2019
118026	2018	THREE QUARTER TON TRUCKS	18 RAM 2500 4x4 CC PU L	Southeast	Owned	1/4/2019
118027	2018	THREE QUARTER TON TRUCKS	18 RAM 2500 4x4 CC PU L	Southeast	Owned	1/4/2019
318006	2018	BEDDING BOX	18 GME BH-12EPA 12Y	Southeast	Owned	1/1/2019
219004	2019	TRAILERS	19 CORNPRO UT18 H 12K	Southeast	Owned	5/2/2019
119009	2019	MECHANIC / FUEL TRUCKS	19 RAM 5500 CC MECH	Southeast	Leased	7/10/2019
219010	2019	TRAILERS	19 CORNPRO UT12 LS 3.5K	Southeast	Owned	7/16/2019
119014	2019	HALF TON PICKUPS	19 RAM 1500 4x4 CC PU	Southeast	Leased	8/12/2019
119015	2019	HALF TON PICKUPS	19 RAM 1500 4x4 CC PU	Southeast	Leased	8/12/2019
119012	2019	THREE QUARTER TON TRUCKS	19 RAM 2500 4x4 CC PU L	Southeast	Leased	11/6/2019
119017	2019	HALF TON PICKUPS	19 RAM 1500 4x4 CC PU	Southeast	Leased	8/1/2019
316010	2016	MISC HWY EQUIPMENT	16 KAWASAKI MULE 4010 4x4	Southeast	Owned	11/18/2019
320001	2020	WELDING RIGS	20 MIL BIG BLUE 400 PRO	Southeast	Owned	1/31/2020
920003	2020	COUPLERS	20 CAT 303.5 QUICKCOUPLER	Southeast	Owned	1/22/2020
320002	2020	WELDING RIGS	20 MIL BIG BLUE 400 PRO	Southeast	Owned	1/22/2020
320004	2020	WELDING RIGS	20 MIL BIG BLUE 400 PRO	Southeast	Owned	1/22/2020

Reynolds Construction, LLC Equipment List

Equipment Number	Model Year	Item Class Desc	Desc 1	Co Divison	Ownership	Acquisition Date
320005	2020	WELDING RIGS	20 MIL BIG BLUE 400 PRO	Southeast	Owned	1/22/2020
300229	0	MANHOLE / TRENCH BOX	00 8x12 TRENCH BOX	Southeast	Owned	5/1/2017
222004	2022	TRAILERS	22 TEX 14TL20 GRAV TILT	Southeast	Owned	4/28/2022
122002	2022	THREE QUARTER TON TRUCKS	22 RAM 2500 4x4 CC PU L	Southeast	Leased	9/30/2022
122003	2022	THREE QUARTER TON TRUCKS	22 RAM 2500 4x4 CC PU L	Southeast	Leased	9/30/2022

[redacted]

Reynolds Construction, LLC
Balance Sheets

[redacted]

Reynolds Construction, LLC
Balance Sheets
December 31, 2023 and 2022

	2023	2022
Assets		
Current Assets		
Cash		
Accounts and other receivables, net of allowance of $492,668		
Contract assets		
Inventories		
Prepaid expenses and other		
Total current assets		
Property and Equipment, net		
Property and equipment		
Property and equipment held for sale, net		
Total property and equipment, net		
Other Assets		
Right-of-use assets - operating leases		
Right-of-use assets - finance leases		
Total other assets		
Total assets		
Liabilities and Member's Equity		
Current Liabilities		
Accounts payable		
Contract liabilities		
Current maturities of long-term debt		
Current maturities of operating lease liabilities		
Current maturities of finance lease liabilities		
Accrued expenses		
Total current liabilities		
Other Liabilities		
Line of credit		
Notes payable		
Operating lease liabilities		
Finance lease liabilities		
Total other liabilities		
Member's Equity		
Total liabilities and member's equity		

[redacted]

Reynolds Construction, LLC

Balance Sheets
December 31, 2022 and 2021

	2022	2021
Assets		
Current Assets		
Cash		
Accounts and other receivables, net of allowance of $492,668 and $1,658,523		
Contract assets		
Inventories		
Prepaid expenses and other		
Current assets of discontinued operations		
Total current assets		
Property and Equipment, net		
Property and equipment		
Property and equipment held for sale, net		
Total property and equipment, net		
Other Assets		
Right-of-use assets - operating leases		
Right-of-use assets - finance leases		
Total other assets		
Total assets		
Liabilities and Member's Equity		
Current Liabilities		
Accounts payable		
Contract liabilities		
Current maturities of long-term debt and capital lease obligation		
Current maturities of operating lease liabilities		
Current maturities of finance lease liabilities		
Accrued expenses		
Current liabilities of discontinued operations		
Total current liabilities		
Other Liabilities		
Line of credit		
Notes payable		
Capital lease obligations		
Operating lease liabilities		
Finance lease liabilities		
Total other liabilities		
Member's Equity		
Total liabilities and member's equity		

CERTIFICATE

The undersigned, Elizabeth L. Smith, hereby certifies that she is the duly elected, qualified, and acting Executive Vice President and Secretary of Reynolds Construction, LLC, a Delaware corporation (the "Company"), and as such is familiar with the books and records of said Company, and does hereby certify the following:

1. that the resolutions set forth below were adopted by the Board of Managers of the Company by unanimous written consent, dated as of April 22, 2024; that the following is a true and correct copy of such resolutions as they appear in the minute books of the Company; and that such resolutions are in full force and effect:

AUTHORITY TO ENTER INTO CONTRACTS

WHEREAS, the managers deem it in the best interests of the corporation to state the bid, contract and purchase order limits of the various officers and employees of the corporation.

NOW, THEREFORE, BE IT RESOLVED, that effective as of April 22, 2024, the authority of the following officers and employees of the corporation to (i) accept customer purchase orders and affix the corporate seal thereon and (ii) issue bids and/or enter into contracts with customers in the name of and on behalf of the corporation, shall be for an amount up to and including the amount set forth beside each of their titles in the following schedule:

Title	Amount
President	$20,000,000
Executive Vice President	$10,000,000
Vice President	$5,000,000

FURTHER RESOLVED, that the authority of the following officers and employees of the corporation to enter into contracts with vendors in connection with the purchase of supplies and equipment (other than purchases of capital equipment), or the contracting for professional services in the name of and on behalf of the corporation, shall be for an amount up to and including the amount set forth beside each of their titles in the following schedule:

Title	Amount
President	$10,000,000
Executive Vice President	$5,000,000
Vice President	$1,000,000
Group Manager	$500,000
Project Manager	$250,000

FURTHER RESOLVED, that for the purchase of capital equipment, only the Director or President is authorized to execute such transactions in an amount not to exceed $1,000,000. Any capital expenditures in excess of this, amount must be approved by two members of the Board of Managers, with one approving member being the Director.

FURTHER RESOLVED, that the President, Executive Vice President, or Vice President of the corporation may delegate the authority to enter into contractual commitments which they are authorized to execute pursuant to these resolutions to any other officer, district manager, group lead or other employee of the corporation and may, as requested by any third party, indicate such delegation by addressing a letter or other written document to such third party.

FURTHER RESOLVED, that prior to execution thereof, pursuant to the preceding resolution, any contract, in excess of the authorized limits granted herein must be approved by both the President and the Director; provided, however, that the execution of any contract in accordance with the preceding resolution may be considered by all third parties

to be conclusive evidence that all appropriate authority pursuant to these resolutions has been granted.

FURTHER RESOLVED, that the secretary, any assistant secretary, or any other officer of the corporation be, and they hereby are, authorized to certify a copy of these resolutions, and any customer of the corporation is hereby authorized to rely upon said certificate as so presented.

2. that the resolutions set forth below were adopted by the Board of Managers of the Company by unanimous written consent, dated as of April 22, 2024; that the following is a true and correct copy of such resolutions as they appear in the minute books of the Company; and that such resolutions are in full force and effect:

APPOINTMENT OF OFFICERS

RESOLVED, that all of the acts, actions and things done for, in the name of, and on behalf of this corporation by its officers during the preceding year be, and the same hereby are, ratified, confirmed and approved.

RESOLVED, that the following persons be, and they hereby are, elected to the offices set opposite their respective names, to serve in such capacities at the pleasure of the Board of Managers until the next annual meeting of the Board of Managers and until their successors are duly elected and qualified:

Jeffrey J. Reynolds	— Director	Scott E. Huber	— Vice President
Leslie F. Archer	— President	Joshua R. Vondersaar	— Vice President
Kevin D. Shemwell	— Executive Vice President	Eduardo Medina	— Vice President
Michael P. Burton	— Executive Vice President	Greg Slone	— Vice President
Elizabeth L Smith	— Executive Vice President and Secretary	Eric Griffin	— Vice President
		Jeanie M. Lucas	— Assistant Secretary
John R. Chase	— Vice President	Wendy C. Scudder	— Assistant Secretary
William R. Ryon	— Vice President	Jon D. Kinney	— Assistant Secretary
Randolph E. Tummers	— Vice President	Freddye Churbock	— Assistant Secretary
Adam K. Ralph	— Vice President	Stephanie A. Keffer	— Assistant Secretary
Jeffrey P. Berning	— Vice President	Patricia J. Tellez	— Assistant Secretary

RESOLVED, that all of the acts, actions and things done for, in the name of and on behalf of this corporation and its officers, shall also be deemed to apply to all of the company's state specific operating names including:

Reynolds Construction of Alabama, LLC
Reynolds Construction of Arizona, LLC
Reynolds Construction of Arkansas, LLC
Reynolds Construction of Delaware, LLC
Reynolds Construction of Florida, LLC
Reynolds Construction of Georgia, LLC
Reynolds Construction of Indiana, LLC
Reynolds Construction LLC of Louisiana
Reynolds Construction, LLC of Michigan
Reynolds Construction of Mississippi, LLC
Reynolds Construction of Missouri, LLC
Reynolds Construction of Montana, LLC
Reynolds Construction of Nebraska, LLC
Reynolds Construction of New Jersey, LLC
Reynolds Construction of New York, LLC
Reynolds Construction of Pennsylvania, LLC
Reynolds Construction of Utah, LLC
Reynolds Construction of Washington, LLC
Reynolds Construction of West Virginia, LLC
Reynolds Lone Star Construction, LLC
Reynolds Southwest, LLC

IN WITNESS WHEREOF, Elizabeth L. Smith has hereunto set her hand this 22nd day of April, 2024.

Elizabeth L. Smith – Executive Vice President and Secretary
Reynolds Construction, LLC
6225 N County Road 75 E Orleans, IN 47452

PEDRO FALCON CONTRACTORS INC.

31160 Avenue C, Big Pine Key, FL 33043-4516
(305) 872-2200 Fax: (305) 872-2219
EC 13003416 / CGC 1507617
www.PedroFalcon.com

Response to

Weiler Engineering Corporation

For

KWRU Blower & Electrical Upgrades

BID

November 4, 2024

PEDRO FALCON CONTRACTORS INC.

Weiler Engineering Corporation
6805 Overseas Hwy
Marathon, FL 33050

Re: KWRU Blower & Electrical Upgrades Bid
Pedro Falcon Contractors, Inc. (PFC) has been a stable organization in the Florida Keys for more than thirty-five years. We are licensed as both General and Electrical Contractors. We understand the unique requirements of the Florida Keys market including environment, weather, material acquisition, and staffing. We are proud of the reputation we have for quality, commitment, and integrity.

Our team at Pedro Falcon Contractors, Inc. is diverse and committed. Our team members mutually recognize a pride in final product, a disposition to provide our clients with exceptional service, and a dedication to the entire process for every project we are involved in. We are also proud of our long history of providing quality work within budget constraints and ofproviding on-time delivery of our projects.

We have thoroughly examined and reviewed the request for proposal documents for the KWRU Blower & Electrical Upgrades Project and are pleased to provide a proposal. Thank you for your time and attention in considering the qualifications we put forth in the following pages.

Sincerely,

Christian Brisson, as President
Pedro Falcon Contrators, Inc

BID FORM

KWRU Blower & Electrical Upgrades Project

TABLE OF CONTENTS

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

KW Resort Utilities Corp.

6630 Front Street

Key West, Florida 33040

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for **60 days** after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

Addendum No.	Addendum, Date
1	October 8, 2024
2	October 15, 2024
3	October 18, 2024
4	October 24, 2024
5	October 31, 2024

B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions (if any) at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.

F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.

J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 *Bidder certifies that:*

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the e execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
1.00	**General**				
1.01	Mobilization (no more than 5% of bid price)	LS	1	$87,215.00	$87,215.00
1.02	Bonds & Insurance (no more than 2.5% of bid price)	LS	1	$43,607.00	$43,607.00
1.03	Prepare & Submit Submittals for All Products	LS	1	$11.265.00	$11,265.00
1.04	Erosion Control (BMPS)	LS	1	$6,026.00	$6,026.00
2.00	**Blower**				
2.01	Demo & Removal of Existing Blowers, Piping, and Concrete	LS	1	$27,808.00	$27,808.00
2.02	Install Rotary Screw Blowers	EA	3	$2,925.00	$8,775.00
2.03	Furnish & Install 6" SS 316 SCH.10 Air Piping	LS	1	$222,611.00	$222,611.00
2.04	Furnish & Install Butterfly Valves & Fittings	LS	1	$45,843.00	$45,843.00
2.05	Install Concrete Platform Extension	LS	1	$55,354.00	$55,354.00
2.06	Reroute Existing PVC Pipe	LS	1	$41,684.00	$41,684.00
3.00	**Electrical**				
3.01	Demo Existing Electrical Equipment	LS	1	$32,787.00	$32,787.00
3.02	Furnish & Install New Electrical Equipment	LS	1	$149,917.00	$149,917.00
3.03	Furnish & Install New Electrical Conduits	LS	1	$226,518.00	$226,518.00

Item No.	Description	Unit	Estimated Quantity	Bid Unit Price	Bid Price
3.04	Furnish & Install New Electrical Wires & Cables	LS	1	$104,219.00	$104,219.00
3.05	Removal of Existing Conduits, Wires & Cables	LS	1	$12,471.00	$12,471.00
3.06	Furnish & Install Pre-Engineered/Fabricated Aluminum Platform	LS	1	$106,728.00	$106,728.00
3.07	Demo Existing Concrete Foundation	LS	1	$32,352.00	$32,35200
3.08	Install New Concrete Foundation	LS	1	$37,251.00	$37,251.00
4.00	**SCADA Integration**				
4.01	Provide and install SCADA System	LS	1	$450,438.00	$450,438.00
4.02	Provide and install fiber optic SCADA network	LS	1	$23,642.00	$23,642.00
4.03	Provide and Install cellular backup system for SCADA	LS	1	$11,199.00	$11,199.00
5.00	**Closeout**				
5.01	Record Documents	LS	1	$6,593.00	$6,593.00
	Total of Bid Items				$ 1,744,303.00

Bidder acknowledges that (1) each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and (2) estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

Total of Unit Price Bids = Total Bid Price $ 1,744,303.00

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete within **330** calendar days after the date when the Contract Times commence to run as provided in Paragraph 4.01 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions within **360** calendar days after the date when the Contract Times commence to run.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 *The following documents are submitted with and made a condition of this Bid:*

A. List of Proposed Subcontractors;

B. List of Project References;

C. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such license within the time for acceptance of Bids;

D. Contractor's License No.: CGC1507617;

E. Required Bidder Qualification Statement with supporting data

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

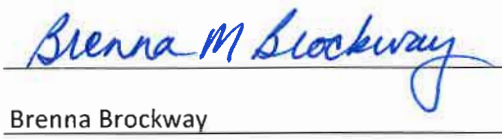
BIDDER: *[Indicate correct name of bidding entity]*

Pedro Falcon Contractors, Inc

By:
[Signature] 

[Printed name] Christian Brisson

(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:
[Signature] 

[Printed name] Brenna Brockway

Title: Assistant Project Manager

Submittal Date: October 28, 2024

Address for giving notices:

31160 Avenue C Big Pine Key, FL 33043

Telephone Number: 305-872-2200

Fax Number: 305-872-2219

Contact Name and e-mail address: Christian Brisson - cb@pedrofalcon.com

Bidder's License No.: CGC1507617
(where applicable)

Bidder Qualification Statement

QUALIFICATIONS STATEMENT

THE INFORMATION SUPPLIED IN THIS DOCUMENT IS CONFIDENTIAL TO THE EXTENT PERMITTED BY LAWS AND REGULATIONS

1. SUBMITTED BY:

Official Name of Firm: Pedro Falcon Contractor's, Inc.

Address: 31160 Avenue C

Big Pine Key, FL 33043

2. SUBMITTED TO: Weiler Engineering Corporation

3. SUBMITTED FOR: Key West Utilities Corp

Owner: Key West Utilities Corp

Project Name: KWRU Blower & Electrical Upgrades

TYPE OF WORK: Demo, electrical upgrade, piping upgrade. equipment upgrade, and control upgrade.

4. CONTRACTOR'S CONTACT INFORMATION

Contact Person: Christian Brisson

Title: President

Phone: 305-872-2200 ext 26

Email: cb@pedrofalcon.com

5. AFFILIATED COMPANIES:

Name: _____

Address: _____

_____

_____

6. TYPE OF ORGANIZATION:

☐ SOLE PROPRIETORSHIP

Name of Owner: _____

Doing Business As: _____

Date of Organization: _____

☐ PARTNERSHIP

Date of Organization: _____

Type of Partnership: _____

Name of General Partner(s): _____

_____

_____

☑ CORPORATION

State of Organization: Florida

Date of Organization: June 1985

Executive Officers:

- President: Christian Brisson
- Vice President(s): _____

_____

_____

- Treasurer: _____
- Secretary: Christian Brisson

☐ LIMITED LIABILITY COMPANY

State of Organization: _____

Date of Organization: _____

Members: _____

_____

_____

_____

☐ JOINT VENTURE

Sate of Organization: _____

Date of Organization: _____

Form of Organization: _____

Joint Venture Managing Partner

- Name: _____

- Address: _____

_____

_____

Joint Venture Managing Partner

- Name: _____

- Address: _____

_____

Joint Venture Managing Partner

- Name: _____

- Address: _____

_____

7. LICENSING

Jurisdiction: Florida

Type of License: Certified General Contractor

License Number: CGC1507617

Jurisdiction: Florida

Type of License: Certified Electrical Contractor

License Number: EC13003416

8. CERTIFICATIONS

CERTIFIED BY:

Disadvantage Business Enterprise: _____

Minority Business Enterprise: _____

Woman Owned Enterprise: _____

Small Business Enterprise: _____

Other (_____): _____

9. BONDING INFORMATION

Bonding Company: Travelers Casualty and Surety Company of America

Address: One Tower Square

Hartford, CT 06183

Bonding Agent: Acrisure Southeast

Address: 15050 NW 79th Court, Ste 200

Miami Lakes, FL 33016

Contact Name: Joseph P Nielson

Phone: 305-722-2671

Aggregate Bonding Capacity: $60,000,000.00

Available Bonding Capacity as of date of this submittal: $54,000,000.00

10. FINANCIAL INFORMATION

Financial Institution: Centennial Bank

Address: 200 Wilder Rd

Big Pine Key, FL 33043

Account Manager: Tina Geide

Phone: 305-676-3072

INCLUDE AS AN ATTACHMENT AN AUDITED BALANCE SHEET FOR EACH OF THE LAST 3 YEARS

11. CONSTRUCTION EXPERIENCE:

Current Experience:

List on **Schedule A** all uncompleted projects currently under contract (If Joint Venture list each participant's projects separately).

Previous Experience:

List on **Schedule B** all projects completed within the last 5 Years (If Joint Venture list each participant's projects separately).

Has firm listed in Section 1 ever failed to complete a construction contract awarded to it?

☐ YES ☑ NO

If YES, attach as an Attachment details including Project Owner's contact information.

Has any Corporate Officer, Partner, Joint Venture participant or Proprietor ever failed to complete a construction contract awarded to them in their name or when acting as a principal of another entity?

☐ YES ☑ NO

If YES, attach as an Attachment details including Project Owner's contact information.

Are there any judgments, claims, disputes or litigation pending or outstanding involving the firm listed in Section 1 or any of its officers (or any of its partners if a partnership or any of the individual entities if a joint venture)?

☐ YES ☑ NO

If YES, attach as an Attachment details including Project Owner's contact information.

12. SAFETY PROGRAM:

Name of Contractor's Safety Officer: Ken Bygler

Include the following as attachments:

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) OSHA No. 500- Log & Summary of Occupational Injuries & Illnesses for the past 5 years.

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) list of all OSHA Citations & Notifications of Penalty (monetary or other) received within the last 5 years (indicate disposition as applicable) - IF NONE SO STATE.

Provide as an Attachment Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) list of all safety citations or violations under any state all received within the last 5 years (indicate disposition as applicable) - IF NONE SO STATE.

Provide the following for the firm listed in Section V (and for each proposed Subcontractor furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) the following (attach additional sheets as necessary):

Workers' compensation Experience Modification Rate (EMR) for the last 5 years:

YEAR	2023	EMR	.93
YEAR	2022	EMR	1.62
YEAR	2021	EMR	1.54
YEAR	2020	EMR	1.57
YEAR	2019	EMR	.81

Total Recordable Frequency Rate (TRFR) for the last 5 years:

YEAR	2023	TRFR	2.88
YEAR	2022	TRFR	0
YEAR	2021	TRFR	3.2
YEAR	2020	TRFR	0
YEAR	2019	TRFR	0

Total number of man-hours worked for the last 5 Years:

YEAR	2023	TOTAL NUMBER OF MAN-HOURS	69,517.25
YEAR	2022	TOTAL NUMBER OF MAN-HOURS	70,569.77
YEAR	2021	TOTAL NUMBER OF MAN-HOURS	62,553.00
YEAR	2020	TOTAL NUMBER OF MAN-HOURS	60,918.00
YEAR	2019	TOTAL NUMBER OF MAN-HOURS	60,810.75

Provide Contractor's (and Contractor's proposed Subcontractors and Suppliers furnishing or performing Work having a value in excess of 10 percent of the total amount of the Bid) Days Away From Work, Days of Restricted Work Activity or Job Transfer (DART) incidence rate for the particular industry or type of Work to be performed by Contractor and each of Contractor's proposed Subcontractors and Suppliers) for the last 5 years:

YEAR	2023	DART	2.88
YEAR	2022	DART	0
YEAR	2021	DART	3.2
YEAR	2020	DART	0
YEAR	2019	DART	0

13. EQUIPMENT:

MAJOR EQUIPMENT:

List on **Schedule C** all pieces of major equipment available for use on Owner's Project.

I HEREBY CERTIFY THAT THE INFORMATION SUBMITTED HEREWITH, INCLUDING ANY ATTACHMENTS, IS TRUE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

NAME OF ORGANIZATION: Pedro Falcon Contractors, Inc

BY: Christian Brisson

TITLE: President

DATED: November 4, 2024

NOTARY ATTEST: Brenna M Brockway

SUBSCRIBED AND SWORN TO BEFORE ME

THIS 4th DAY OF NOVEMBER, 2024

NOTARY PUBLIC - STATE OF FLORIDA

MY COMMISSION EXPIRES: 4.28.25

REQUIRED ATTACHMENTS

1. Schedule A (Current Experience).
2. Schedule B (Previous Experience).
3. Schedule C (Major Equipment).
4. Audited balance sheet for each of the last 3 years for firm named in Section 1.
5. Evidence of authority for individuals listed in Section 7 to bind organization to an agreement.
6. Resumes of officers and key individuals (including Safety Officer) of firm named in Section 1.
7. Required safety program submittals listed in Section 13.
8. Additional items as pertinent.

SCHEDULE A

CURRENT EXPERIENCE

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
Power Conditioning & Surge Protection	Name: Daniel Saus Address: 9805 Overseas Hwy Marathon Telephone: 305-289-5009	Name: Stephen J Suggs Company: Weiler Engineering Corp Telephone: 941-505-1700	1/09/2024	Upgrade Sewer Plant	50%	$4,328,361.00
Quay Restroom	Name: Carlos Solis Address: 9805 Overseas Hwy Marathon Telephone: 305-743-0033	Name: Philip D. Badalamenti Company: Little Red Rooster Telephone: 305-509-7932	8/29/2024	Build Concrete bath house	5%	$394,967.00
Smathers Beach Pavilions	Name: Eric Augst Address: 500 Whitehead St KW Telephone: 305-809-3964	Name: Serge Mashtakov Company: Artibus Design Telephone: 305-304-3512	3/01/2024	Demo and furnish 7 new pavilions	80%	$178,650.00
Bahia Honda Concession Area	Name: Jim Post Address: 3800 Commonwealth Blvd Tallahassee Telephone: 305-853-3571	Name: Jeffrey Parzych Company: JGP Structural Group Telephone: 850-574-2888	7/05/2023	Build ADA accessible conditions at concession stand & deck	10%	$430,562.00
Conditt Boathouse	Name: Mary Conditt Address: Telephone:	Name: Matthew Stratton Company: M. Stratton Architecture Telephone: 305-923-9670	4/28/2023	Construct a concrete boathouse	65%	$740,000.00
NAS KW Bldg A 950 Subcontractor for Hitt Contracting	Name: Webco Address: 8136 Old Keene Mill Rd Springfield VA 22152 Telephone:	Name: Company: LBE, Inc Telephone:	2/02/2024	Install new electrical system	70%	$1,000,000.00
NAS KW Fuel Farm	Name: Harvey Watson Address: 316 S. Midwest Blvd Midwest City, OK 73100 Telephone:	Name: Johnathan Tavaraz Company: Nautilus Drafting & Design Services Telephone: 305-906-1530	9/01/2023	Install new stairs, new door and pain building	97%	$116,000.00

SCHEDULE B

PREVIOUS EXPERIENCE (Include ALL Projects Completed within last 5 years)

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
Marathon Airport ASOS	Name: Address: 500 Whitehead St Key West, FL 33040 Telephone:	Name: Company: Jacobs Engineering Group Telephone:	September 2023	Demo, upgrade electrical, install new generator, install new concrete structure, Furnish and install elevated platform	100%	$1,270,697.00
MCSO Marathon Substation Reno	Name: Matthew Howard Address: 500 Whitehead St KW Telephone:	Name: Company: William P Horn Architect Telephone:	April 2023	Install recessed lighting, exit signs and new commercial sign	100%	$302,536.00
MCHA - Scattered Sites Big Pine & Conch Key	Name: Ken Burger Address: 1400 Kennedy Dr KW Telephone: 305-296-5621 x244	Name: Devon Ayers Company: K2M Design Telephone:	June 2023	Furnish 20 affordable houses in Big Pine Key & Conch Key	100%	$5,557,000.00
Emergency Operation Center Subcontractor for Ajax	Name: Marshall Quarles Address: Telephone: 813-510-1206	Name: Thornton Tomasetti Company: Architects Design Group, Inc Telephone: 954-903-9300	October 2022	Install lighting system and counterpoise system	100%	$6,002,335.00
Marathon Moose Lodge	Name: Gerard Dubois Address: 11601 1st Ave Gulf Marathon, FL 33050 Telephone:	Name: Steven Grasley Company: K2M Design Telephone:	October 2022	Demo old roof and install new gavalume roof	100%	$247,597.00
Historical Jail Buildout	Name: Rob Tudor - MC Public Works Address: 500 Whitehead St KW, FL 33040 Telephone: 305-292-9416	Name: David Salay Company: Bender & Associates Architect PA Telephone: 305-296-1347	June 2022	Renovate Historic jail per plans	100%	$714,631.00
Coral Shores Cosmetology	Name: Theresa Axford Address: MC Schools Telephone:	Name: Company: Anston-Greenlees Inc Telephone: 813-963-1919	May 2022	Furnish and install all electrical for new cosmetology training room	100%	$145,452.00

SCHEDULE B

PREVIOUS EXPERIENCE (Include ALL Projects Completed within last 5 years)

Project Name	Owner's Contact Person	Design Engineer	Contract Date	Type of Work	Status	Cost of Work
Sugarloaf School	Name: MC School District Address: 241 Trumbo Rd KW Telephone:	Name: Company: Harvard Jolly Architecture Telephone: 727-896-4611	April 2021	Electrical for new bldg addition	100%	$804,102.00
Bahia Honda Bathhouse Renovation	Name: James Post Address: 3900 Commonwealth Blvd MS#520 Tallahassee, FL 32399 Telephone:	Name: Stephen J Suggs Company: Weiler Engineering Corp Telephone: 941-323-1787	November 2021	Renovate existing bathrooms	100%	$664,470.00
Centennial Bank	Name: Kelly Straessle Address: 2171 West Main ST AR Telephone: 501-454-7839	Name: Steve Grasley Company: K2M Design Telephone:	November 2021	Construct a new branch	100%	$5,690,257.00
Rowell's Waterfront Park	Name: Address: Subcontractor for Toppino on this project Telephone:	Name: Jason Bullard Company: S&ME Inc Telephone: 407-975-1273	June 2021	Electrical for parking lights	100%	$141,500.00
MCSO Cudjoe Substation Renovation	Name: Address: 5525 College Rd Key West FL, 33040 Telephone:	Name: Manuel Synalovski Company: Synalovski, Romanik, Saye Telephone: 954-961-6806	August 2021	Install new pre engineered bldg at transfer station	100%	$244,000.00
Marina Building remodel	Name: Carlos Solis - City of Marathon Address: 9805 Overseas Hwy Marathon FL 33050 Telephone:	Name: Stephen J Suggs Company: Weiler Engineering Corp Telephone: 941-323-1787	June 2021	Add second floor and office space	100%	$274,867.00
Freund House	Name: Nancy Fruend Address: 3520 Sunrise Drive Key west, FL 33040 Telephone:	Name: Anthony Architecture/ K2M Design/Campbell Engineering Company: Telephone:	June 2020	New residential construction of home	100%	$2,648,037.00

SCHEDULE C - LIST OF MAJOR EQUIPMENT AVAILABLE

ITEM	PURCHASE DATE	CONDITION	ACQUIRED VALUE
Skid Loader (multiple attachments)			
Forklift			
Mini Excavator			
Vermeer Trencher			
Man Lift			
Telehandler (56 foot)			
Drill			
Excavation Machinery			
Generators (5 kw)			
Generators (30 kw)			
Scaffolding (of all types)			
Multiple Pick-up trucks and vans			
Enclosed Trailers			
Equipment Trailers			
Dump Truck			
Dump Trailers			
Numerous power tools of all types			
Numerous hand tools of all types			

Addendum

"Excellence in Engineering"

6805 Overseas Highway
Marathon, Florida 33050
(305) 289-4161 ph
(305) 289-4162 fax

ADDENDUM NO. 1

Issue Date: ***October 8, 2024***

Project Name: ***KWRU Blower & Electrical Upgrades***

Notice to All Bidders:

The following information contained within this addendum is part of the contact documents and is binding. Any clarifications, additional information, and changes in scope presented in this addendum shall amend, where noted, previous parts or requirements of the bid documents which are dated prior to the issuance of this addendum.

Prospective Bidders shall acknowledge this addendum by including a signed copy of this page with their bid packages in order to be considered responsive and responsible.

Issued By: **Yanay Ferral, E.I. Weiler Engineering, Project Administrator**
Name

PROOF OF RECEIPT

Recipient Signature:
Print Name: Christian Brisson
Company: Pedro Falcon Contractors, Inc
Date: October 28, 2024

"Excellence in Engineering"

6805 Overseas Highway
Marathon, Florida 33050
(305) 289-4161 ph
(305) 289-4162 fax

ADDENDUM NO. 2

Issue Date: ***October 15, 2024***

Project Name: ***KWRU Blower & Electrical Upgrades***

Notice to All Bidders:

The following information contained within this addendum is part of the contact documents and is binding. Any clarifications, additional information, and changes in scope presented in this addendum shall amend, where noted, previous parts or requirements of the bid documents which are dated prior to the issuance of this addendum.

Prospective Bidders shall acknowledge this addendum by including a signed copy of this page with their bid packages in order to be considered responsive and responsible.

Issued By: **Yanay Ferral, E.I. Weiler Engineering, Project Administrator**
Name

PROOF OF RECEIPT

Recipient Signature:
Print Name: Christian Brisson
Company: Pedro Falcon Contractors, Inc
Date: October 28, 2024

"Excellence in Engineering"

6805 Overseas Highway
Marathon, Florida 33050
(305) 289-4161 ph
(305) 289-4162 fax

ADDENDUM NO. 3

Issue Date: ***October 18, 2024***

Project Name: ***KWRU Blower & Electrical Upgrades***

Notice to All Bidders:

The following information contained within this addendum is part of the contact documents and is binding. Any clarifications, additional information, and changes in scope presented in this addendum shall amend, where noted, previous parts or requirements of the bid documents which are dated prior to the issuance of this addendum.

Prospective Bidders shall acknowledge this addendum by including a signed copy of this page with their bid packages in order to be considered responsive and responsible.

Issued By: **Yanay Ferral, E.I. Weiler Engineering, Project Administrator**
Name

PROOF OF RECEIPT

Recipient Signature: _____
Print Name: Christian Brisson
Company: Pedro Falcon Contractors, Inc
Date: October 28, 2024

"Excellence in Engineering"

6805 Overseas Highway
Marathon, Florida 33050
(305) 289-4161 ph
(305) 289-4162 fax

ADDENDUM NO. 4

Issue Date: ***October 24, 2024***

Project Name: ***KWRU Blower & Electrical Upgrades***

Notice to All Bidders:

The following information contained within this addendum is part of the contact documents and is binding. Any clarifications, additional information, and changes in scope presented in this addendum shall amend, where noted, previous parts or requirements of the bid documents which are dated prior to the issuance of this addendum.

Prospective Bidders shall acknowledge this addendum by including a signed copy of this page with their bid packages in order to be considered responsive and responsible.

Issued By: **Yanay Ferral, E.I. Weiler Engineering, Project Administrator**
Name

PROOF OF RECEIPT

Recipient Signature: _____
Print Name: Christian Brisson
Company: Pedro Falcon Contractors, Inc
Date: October 24, 2024

WEC xcellence in engineering

"Excellence in Engineering"

6805 Overseas Highway
Marathon, Florida 33050
(305) 289-4161 ph
(305) 289-4162 fax

ADDENDUM NO. 5

Issue Date: ***October 31, 2024***

Project Name: ***KWRU Blower & Electrical Upgrades***

Notice to All Bidders:

The following information contained within this addendum is part of the contact documents and is binding. Any clarifications, additional information, and changes in scope presented in this addendum shall amend, where noted, previous parts or requirements of the bid documents which are dated prior to the issuance of this addendum.

Prospective Bidders shall acknowledge this addendum by including a signed copy of this page with their bid packages in order to be considered responsive and responsible.

Issued By: **Yanay Ferral, E.I. Weiler Engineering, Project Administrator**
Name

PROOF OF RECEIPT

Recipient Signature:
Print Name: Christian Brisson
Company: Pedro Falcon Contractors, Inc
Date: 10/31/24

Resumes

CHRISTIAN BRISSON

President/Project Manager

Mr. Brisson has over 40 years of experience with commercial, institutional, residential and Construction Project Management. In his position as President he is responsible for contract negotiations with Owners & Owner's Representatives, looking for and finding future work for the company, employee salary assessments, coordination and evaluation of manpower loading for concurrent projects, major equipment purchases, and the review and appraisal of the company's operating costs.

In his position as Project Manager he is responsible for organizing & managing Design/Build projects (including estimating and purchasing). Christian maintains the interface between Architectural/Engineering firm, Owner, subcontractors and direct construction personnel. He is responsible for the development, review, and editing of project drawings and specifications, and the coordination of the scope of work activities with subcontractors. In the case of performance specifications, he maintains the same responsibilities.

EDUCATION

- B.S./1993/Civil Engineering, Old Dominion University, Norfolk, VA

PROFESSIONAL REGISTRATIONS & CERTIFICATIONS

- Certified General Contractor, Unlimited, FL (CGC 1507617)
- Engineer In Training (E.I.T.)
- OSHA Scaffolding & Hazardous Communication, Quality Control Management, Confined Space Entry Competent Person, and Respiratory Protection & Fit Testing

PREVIOUS EXPERIENCE

- DeMello Concrete Floors Co., RI – Estimator for large scale concrete floor, footing and wall projects.
- Trataros Construction, Inc., Old San Juan, Puerto Rico – Project Engineer/General Superintendent - $25M renovation/restoration of Historic Post Office & Courthouse.

Updated June 20, 2024

Design/Build Building A-4191 Boca Chica NAS, Key West

Design/Build Correct Commercial CNS Power Feed

A SELECTION OF MR. BRISSON'S PROJECTS

- Design/Build Sunrise Dr. Residence, KW (2.7M)
- Design/Build Renovation: Bldg. A-4191 Jet Fuel Lab, Boca Chica NAS, Key West, FL (994K)
- Historic Glynn Archer Gymnasium Renovation ($2M)
- Aircraft Crash Fire & Rescue HQ, NAS KW ($1.3M)
- Sexton House at Historic Key West Cemetery ($445K)
- Design/Build Correct Commercial CNS Power Feed, MacDill AFB ($1.5M)
- D/B Repair Runway Keel, MacDill AFB ($1.4M)
- D/B Repair JICCENT Data Center HVAC, MacDill AFB
- D/B Repair Airfield Drainage, Avon Park, FL ($1.9M)
- KWIA Customs Terminal Security Enhancements ($306K)
- Design/Build Digital Airport Surveillance Radar Installation, NAS KW ($679K)
- Design/Build JIATF–S Building 291 Elevator (400K)

Robert David Allsbrook

Senior Consultant

Mr. Allsbrook has over 35 years of experience in electrical and related construction trades including HVAC controls, fire alarm systems, telecommunication systems, and computing infrastructure. In his current PFEC position as Senior Consultant he provides support in all aspects of electrical systems work on an as needed basis.

EDUCATION

- Masters Course, 1993, Midlands Tech, Columbia, SC
- Journeyman's Course, 1983, Midlands Tech, Columbia, SC
- IBEW JATC, 1974-1978, Midlands Tech, Columbia, SC

PROFESSIONAL REGISTRATIONS & CERTIFICATIONS

- Unlimited Master's Electrical License, State of Florida
- OSHA Quality Control Management
- OSHA Confined Space Entry Competent Person
- OSHA Respiratory Protection and Fit Testing Competent Person

PREVIOUS EXPERIENCE

- Pedro Falcon Electrical Contractors, Inc. - Electrical Project Manager
- Pedro Falcon Electrical Contractors, Inc. - Electrical Superintendent
- Etheridge Electrical Contractors, Columbia, SC – Electrical Superintendent
- ESAR Inc., Columbia, SC – HVAC Controls Installer, Fire Alarm Installation & Repair

A SELECTION OF MR. ALLSBROOK'S PROJECTS

- P678 Aircraft Crash and Fire Rescue Headquarters, Boca Chica, NAS Key West
- Mote Marine Tropical Research Lab, Summerland Key
- Correct CNS Commercial Power Feed, MacDill AFB
- Truman Water Tower Replacement, NAS KW
- Anti-Terrorism Force Protection, (ATFP), NAS KW
- Big Pine Key Park Poles & Fixtures Replacement

Jet Fuel Pump Station, Boca Chica NAS Key West

JIATF Generators, Truman Annex NAS

MR. ALLSBROOK'S PROJECTS (*continued*)

- 13.8 kW Overhead Transmission Line Relocation, Fleming Key
- Replacement of Underground Fuel Supply Line, NAS KW
- Obstruction Light for Fencing, Boca Chica NAS
- Various High Schools, Florida Keys
- Repair Magazines, Boca Chica & Fleming Key
- The Galley – Upgrade Electrical Facilities – High Voltage Lines to Subpanels, NAS KW
- Communication Tower, NAS KW
- JIATF Command Theater Upgrades
- JIATF Building 290 Hurricane Wilma Repairs
- Transfer Switches, NAS (3) Locations
- Secondary Containment Construct/Repair Generator Installation

KEN BYGLER

Senior Project Manager

Mr. Bygler is Senior Project Manager and Corporate Safety Officer. He has over 35 years of experience in Commercial Construction and Construction Project Management.

Ken has experience in many different aspects of the construction industry including as the Owner/Operator for a structural steel erection company in the Washington D.C./Northern Virginia area. He has also worked extensively as a Superintendent and Project Manager.

EDUCATION

- Ryken High School
- Charles County Community College
- St. Mary's College of Maryland
- Ashworth University

PROFESSIONAL REGISTRATIONS & CERTIFICATIONS

- ACOE Construction Quality Management for Contractors
- OSHA Outreach Trainer
- ECAATS Prime Contractor
- Primavera Suretrak
- FL Qualified Stormwater Management Inspector #12697

PREVIOUS EXPERIENCE

- CSBI Consulting Services & Building Inspections, Leonardtown, MD – Project Manager/Owner Rep.
- Southbuild, Inc., Springfield, VA – Project Manager
- Ceiling & Partition Systems, Mechanicsville, MD – Owner/Project Manager
- Furman Builders, Inc., Rockville, MD - Superintendent.

OTHER REPRESENTATIVE PROJECTS

- Project Manager/Owner's Rep – James A. Forrest Career & Technology Center – 130,000 SF Expansion & Renovation, Leonardtown, MD ($18M)
- Project Manager/Owner's Rep – Banneker Elementary School – 60,000 SF Renovation ($12M)

Updated June 20, 2024

Dockmaster/Transient Restrooms, Garrison Bight, Key West

Marathon City Hall, Marathon, FL

A SELECTION OF MR. BYGLER'S PROJECTS

- Monroe County Public Library & Adult Education Center, Marathon, FL ($7M)
- Dockmaster/Transient Restrooms Building at Garrison Bight, Key West ($1.9M)
- Henderson Building, Big Pine Key ($2.7M)
- Demolition of Old/Installation of New Transfer Station Offices (3 sites), Monroe County ($1.1M)
- City of Marathon Utility & Public Works Maintenance Facility Building ($1.9M)
- Marathon Airport Customs Facility, Guardian Ad Litem ($1M)
- Monroe County ADA Compliance Segments #3 & #4 – 23 Buildings, Key Largo to BPK ($559K)
- Monroe County Fire Station #13, BPK ($3.2M)
- USAF 7th Floor Renovations, Tampa, FL ($3.3M)
- Monroe County Fire Station #17, Conch Key ($1.7M)
- Big Pine Key Park Redevelopment, BPK ($4.5M)

ROMAN SVIRIDENKO

Project Manager, Electrical Division

Mr. Sviridenko joined Pedro Falcon Contractors, Inc. in 2015. He has a Master's Degree in engineering which he earned while working full time. He also has more than ten years of experience as a Project Manager, Engineer and Electrician.

Roman has a proven ability to successfully manage multiple projects and produce results on time and within budget. His skills include a broad range of administrative and management disciplines including customer satisfaction, quality control, cost estimating, purchasing and scheduling.

EDUCATION

Almaty Institute of Power Engineering & Telecommunications – Almaty, Kazakhstan – Master of Engineering Degree

PREVIOUS EXPERIENCE

- US 1 Mobil Marine, Marathon, FL - Owner
- FL Keys Community College – Instructor, Lab Asst.
- Ampre Electric, Bedford, OH – Electrician
- Code Electric, Raleigh, NC – Electrician
- Enterstroy, Almaty, Kazakhstan – Project Manager, Engineer
- Automatica, Almaty, Kazakhstan - Technician

OTHER INTERESTS

- 2004 Olympic Swimmer
- 10 time Kazakhstan Swimming Champion (1 Gold)
- 3 time Asian Swimming Champion (3 Bronze)

OTHER REPRESENTATIVE PROJECTS

- Duke University/Chapel Hill – Foreman, electrical work at various campus buildings.
- IBM Offices, Durham, NC - Electrician
- Karachaganak Field (Gas Condensate Field), Kazakhstan – Design of fire alarm systems.
- Karachaganak Field (Gas Condensate Field), Kazakhstan – Connecting & maintaining fire alarm systems.
- Karachaganak Field (Gas Condensate Field), Kazakhstan – Plan set development, graphics preparation & report writing.

Mote Marine Tropical Research Lab

P678 Aircraft Crash Rescue & Fire HQ

A SELECTION OF MR. SVIRIDENKO'S PROJECTS

- Key West High School Backyard Electrical (1.7M)
- Marathon High School Athletic Complex (1.8M)
- Dockmaster/Transient Restrooms, Key West
- Sheltering & Temporary Essential Power Program (STEP), Monroe County, FL
- Historic Glynn Archer Gymnasium Renovation, KW
- Demolition of Old & Installation of New Transfer Station Offices, 3 Sites, Monroe County, FL
- Athletic Complex Improvements, Coral Shores HS
- Special Forces Training Facility Boat Maintenance Building, NAS Key West
- Marathon Utility & Public Works Maintenance Facility Building, Marathon, FL
- TCTS Building A4082 Electrical Upgrades, NAS KW
- P678 Aircraft Crash Rescue & Fire HQ, Boca Chica NAS
- Mote Marine Tropical Research Lab, Summerland
- Marathon City Hall

Updated April 20, 2022

JORGE NODAL

Site Superintendent – Electrical Division

Mr. Nodal joined Pedro Falcon Contractors, Inc. in 2019. He has nearly 18 years of experience with Electrical Systems construction, maintenance and repair. In addition, he has experience in a variety of construction disciplines including framing, masonry, concrete repair and finishing, truss work, tile setting, painting, and stucco.

Jorge's expertise includes customer satisfaction, quality control, scheduling, inspecting and field supervision. He has successfully managed multiple projects, producing results on time and within budget.

EDUCATION

- Florida Keys Community College, Key West

PROFESSIONAL REGISTRATIONS & CERTIFICATIONS

- OSHA Excavation & Trenching For the Competent Person Certificate

PREVIOUS EXPERIENCE

- Calulaco Construction, Inc., Miami, FL – Project Coordinator
- Nearshore Electric, Key West, FL – Project Manager/Lead Electrician
- Calulaco Construction Inc., Miami, FL - Builder
- South Coast Electric - Electrician

OTHER REPRESENTATIVE PROJECTS

- Northrop Grumman Facility, Melbourne, FL – Installation of all electrical & fire alarm systems.
- Kennedy Space Center, FL – Industrial electrical support. Low voltage; electrical maintenance and modifications.
- CVS, Stock Island, FL – New Construction
- Johnny Rockets on Duval, Key West, FL – New Construction
- Three NYA Hostels, Key West, FL – New Construction
- Rockledge, FL – Manufacture of automated control panels.
- Upgrade C5 Substation & Pad B PTCR Area – 115Kv GO switches, control wiring, high voltage substation.

Henderson Building, Big Pine Key

Monroe County Library & Adult Education Center, Marathon, FL

A SELECTION OF MR. NODAL'S PROJECTS

- Henderson Building, Big Pine Key, FL – New Construction
- Monroe County Public Library & Adult Education Center, Marathon, FL – New Construction
- Florida Keys Community College, Key West, FL – Generators
- Rowell's Waterfront Park – Upgrade / New Electric

Updated April 20, 2022

ANTONIO ALBERNAS

Site Superintendent – Electrical Division

Mr. Albernas joined Pedro Falcon Contractors, Inc. in 2019. He has nearly 5 years of experience with Electrical Systems construction, maintenance and repair. In addition, he has experience with intelligent electrical systems (including lighting and monitoring) as well as electrical distribution systems.

Antonio excels at customer satisfaction, quality control, scheduling, inspecting and field supervision. He has assisted in the successful completion of two major projects with Pedro Falcon, producing results on time and within budget.

EDUCATION

- Participating in Electrical Apprenticeship courses

PROFESSIONAL REGISTRATIONS & CERTIFICATIONS

- OSHA 10 Hour Construction – Safety & Health
- Heartsaver First Aid CPR AED Online

A SELECTION OF MR. ALBERNAS'S PROJECTS

- East Martello Park – Phase II, Key West, FL
- Sugarloaf Renovation Phase I, Sugarloaf Key, FL

OTHER REPRESENTATIVE PROJECTS

- Henderson Building, Big Pine Key, FL
- Monroe County Public Library & Adult Education Center, Marathon, FL
- Key West High School - Backyard Renovation, Key West, FL
- Florida Keys Community College (KFCC) Generators, Key West, FL

Henderson Building, Big Pine Key

Monroe County Library & Adult Education Center, Marathon, FL

Key West High School Backyard, Key West, FL

Updated April 20, 2022

Licenses

W-9

Pedro Falcon Contractors, Inc.

State of Florida
Department of State

I certify from the records of this office that PEDRO FALCON ELECTRICAL CONTRACTORS INC. is a corporation organized under the laws of the State of Florida, filed on May 21, 1985.

The document number of this corporation is H58348.

I further certify that said corporation has paid all fees due this office through December 31, 2024, that its most recent annual report/uniform business report was filed on January 22, 2024, and that its status is active.

I further certify that said corporation has not filed Articles of Dissolution.

Given under my hand and the Great Seal of the State of Florida at Tallahassee, the Capital, this the Twenty-sixth day of June, 2024

Secretary of State

Tracking Number: 0701193879CU

To authenticate this certificate,visit the following site,enter this number, and then follow the instructions displayed.

https://services.sunbiz.org/Filings/CertificateOfStatus/CertificateAuthentication

Ron DeSantis, Governor

Melanie S. Griffin, Secretary

Florida dbpr

STATE OF FLORIDA
DEPARTMENT OF BUSINESS AND PROFESSIONAL REGULATION

CONSTRUCTION INDUSTRY LICENSING BOARD

THE GENERAL CONTRACTOR HEREIN IS CERTIFIED UNDER THE
PROVISIONS OF CHAPTER 489, FLORIDA STATUTES

BRISSON, CHRISTIAN NORMAND

PEDRO FALCON ELECTRICAL CONTRACTORS INC
31160 AVENUE C
BIG PINE KEY FL 33043

LICENSE NUMBER: CGC1507617

EXPIRATION DATE: AUGUST 31, 2026

Always verify licenses online at MyFloridaLicense.com

ISSUED: 08/13/2024

Do not alter this document in any form.

This is your license. It is unlawful for anyone other than the licensee to use this document.

Ron DeSantis, Governor

Melanie S. Griffin, Secretary

STATE OF FLORIDA
DEPARTMENT OF BUSINESS AND PROFESSIONAL REGULATION

ELECTRICAL CONTRACTORS' LICENSING BOARD

THE ELECTRICAL CONTRACTOR HEREIN IS CERTIFIED UNDER THE
PROVISIONS OF CHAPTER 489, FLORIDA STATUTES

ALLSBROOK, ROBERT DAVID

PEDRO FALCON ELECTRICAL CONTRACTORS INC
31160 AVENUE C
BIG PINE KEY FL 33043

LICENSE NUMBER: EC13003416

EXPIRATION DATE: AUGUST 31, 2026

Always verify licenses online at MyFloridaLicense.com

ISSUED: 07/12/2024

Do not alter this document in any form.

This is your license. It is unlawful for anyone other than the licensee to use this document.

2023 / 2024
MONROE COUNTY BUSINESS TAX RECEIPT
EXPIRES SEPTEMBER 30, 2024

RECEIPT# 30140-9801

Business Name: PEDRO FALCON ELECTRICAL CONTRACTORS INC

Owner Name: PEDRO FALCON, CHRISTIAN N BRISSON
Mailing Address: QUALIFIER, ROBERT D ALLSBROOK
31160 AVE C
BIG PINE KEY, FL 33043

Business Location: 31160 AVE C
BIG PINE KEY, FL 33043

Business Phone: 305-872-2200
Business Type: CONTRACTOR (GENERAL/ELECTRICAL 3RD QUALIFIER STATE LIC EC13003416)

Employees 10

STATE LICENSE: EC0001491/CGC1507617/

Tax Amount	Transfer Fee	Sub-Total	Penalty	Prior Years	Collection Cost	Total Paid
25.00	0.00	25.00	0.00	0.00	0.00	25.00

Paid 000010 07/17/2023 25.00

THIS BECOMES A TAX RECEIPT WHEN VALIDATED

Sam C. Steele, CFC, Tax Collector
PO Box 1129, Key West, FL 33041

THIS IS ONLY A TAX. YOU MUST MEET ALL COUNTY AND/OR MUNICIPALITY PLANNING, ZONING AND LICENSING REQUIREMENTS.

MONROE COUNTY BUSINESS TAX RECEIPT
P.O. Box 1129, Key West, FL 33041-1129
EXPIRES SEPTEMBER 30, 2024

RECEIPT# 30140-9801

Business Name: PEDRO FALCON ELECTRICAL CONTRACTORS INC

Owner Name: PEDRO FALCON, CHRISTIAN N BRISSON
Mailing Address: QUALIFIER, ROBERT D ALLSBROOK
31160 AVE C
BIG PINE KEY, FL 33043

Business Location: 31160 AVE C
BIG PINE KEY, FL 33043

Business Phone: 305-872-2200
Business Type: CONTRACTOR (GENERAL/ELECTRICAL 3RD QUALIFIER STATE LIC EC13003416)

Employees 10

STATE LICENSE: EC0001491/CGC1507617/

Tax Amount	Transfer Fee	Sub-Total	Penalty	Prior Years	Collection Cost	Total Paid
25.00	0.00	25.00	0.00	0.00	0.00	25.00

Paid 000010 07/17/2023 25.00

Form **W-9**
(Rev. October 2018)
Department of the Treasury
Internal Revenue Service

Request for Taxpayer Identification Number and Certification

▶ **Go to *www.irs.gov/FormW9* for instructions and the latest information.**

Give Form to the requester. Do not send to the IRS.

Print or type. See Specific Instructions on page 3.

1 Name (as shown on your income tax return). Name is required on this line; do not leave this line blank.

Pedro Falcon Contractors, Inc

2 Business name/disregarded entity name, if different from above

3 Check appropriate box for federal tax classification of the person whose name is entered on line 1. Check only **one** of the following seven boxes.

☐ Individual/sole proprietor or single-member LLC ☐ C Corporation ☑ S Corporation ☐ Partnership ☐ Trust/estate

☐ Limited liability company. Enter the tax classification (C=C corporation, S=S corporation, P=Partnership) ▶ _____

Note: Check the appropriate box in the line above for the tax classification of the single-member owner. Do not check *LLC if the LLC is classified as a single-member LLC that is disregarded from the owner unless the owner of the LLC is* another LLC that is **not** disregarded from the owner for U.S. federal tax purposes. Otherwise, a single-member LLC that is disregarded from the owner should check the appropriate box for the tax classification of its owner.

☐ Other (see instructions) ▶

4 Exemptions (codes apply only to certain entities, not individuals; see instructions on page 3):

Exempt payee code (if any) _____

Exemption from FATCA reporting code (if any) _____

(Applies to accounts maintained outside the U.S.)

5 Address (number, street, and apt. or suite no.) See instructions.

31160 Ave C

Requester's name and address (optional)

6 City, state, and ZIP code

Big Pine Key, FL 33043

7 *List account number(s) here (optional)*

Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on line 1 to avoid backup withholding. For individuals, this is generally your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the instructions for Part I, later. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN*, later.

Note: If the account is in more than one name, see the instructions for line 1. Also see *What Name and Number To Give the Requester* for guidelines on whose number to enter.

Social security number

			–			–				

or

Employer identification number

5	9	–	2	5	5	0	2	3	1

Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me); and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding; and
3. I am a U.S. citizen or other U.S. person (defined below); and
4. The FATCA code(s) entered on this form (if any) indicating that I am exempt from FATCA reporting is correct.

Certification instructions. You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the certification, but you must provide your correct TIN. See the instructions for Part II, later.

Sign Here | **Signature of U.S. person ▶** [signature] **Date ▶** August 13, 2024

General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

Future developments. For the latest information about developments related to Form W-9 and its instructions, such as legislation enacted after they were published, go to *www.irs.gov/FormW9*.

Purpose of Form

An individual or entity (Form W-9 requester) who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) which may be your social security number (SSN), individual taxpayer identification number (ITIN), adoption taxpayer identification number (ATIN), or employer identification number (EIN), to report on an information return the amount paid to you, or other amount reportable on an information return. Examples of information returns include, but are not limited to, the following.

- Form 1099-INT (interest earned or paid)
- Form 1099-DIV (dividends, including those from stocks or mutual funds)
- Form 1099-MISC (various types of income, prizes, awards, or gross proceeds)
- Form 1099-B (stock or mutual fund sales and certain other transactions by brokers)
- Form 1099-S (proceeds from real estate transactions)
- Form 1099-K (merchant card and third party network transactions)
- Form 1098 (home mortgage interest), 1098-E (student loan interest), 1098-T (tuition)
- Form 1099-C (canceled debt)
- Form 1099-A (acquisition or abandonment of secured property)

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN.

If you do not return Form W-9 to the requester with a TIN, you might be subject to backup withholding. See What is backup withholding, *later.*

Detail by Entity Name

Florida Profit Corporation
PEDRO FALCON ELECTRICAL CONTRACTORS INC.

Filing Information

Document Number	H58348
FEI/EIN Number	59-2550231
Date Filed	05/21/1985
State	FL
Status	ACTIVE

Principal Address

31160 AVE C
BIG PINE KEY, FL 33043

Changed: 01/16/2004

Mailing Address

31160 AVE C
BIG PINE KEY, FL 33043

Changed: 03/18/1997

Registered Agent Name & Address

BRISSON, CHRISTIAN N
31160 AVENUE C
BIG PINE KEY, FL 33043

Name Changed: 01/16/2018

Address Changed: 02/19/1999

Officer/Director Detail

Name & Address

Title PDS

BRISSON, CHRISTIAN N
31160 AVE C
BIG PINE KEY, FL 33043

Annual Reports

Report Year	Filed Date
2022	02/16/2022
2023	01/05/2023
2024	01/22/2024

Document Images

01/22/2024 -- ANNUAL REPORT	View image in PDF format
01/05/2023 -- ANNUAL REPORT	View image in PDF format
02/16/2022 -- ANNUAL REPORT	View image in PDF format
01/20/2021 -- ANNUAL REPORT	View image in PDF format
01/22/2020 -- ANNUAL REPORT	View image in PDF format
01/10/2019 -- ANNUAL REPORT	View image in PDF format
01/16/2018 -- ANNUAL REPORT	View image in PDF format
01/24/2017 -- ANNUAL REPORT	View image in PDF format
01/29/2016 -- ANNUAL REPORT	View image in PDF format
01/20/2015 -- ANNUAL REPORT	View image in PDF format
01/27/2014 -- ANNUAL REPORT	View image in PDF format
01/10/2013 -- ANNUAL REPORT	View image in PDF format
01/10/2012 -- ANNUAL REPORT	View image in PDF format
01/17/2011 -- ANNUAL REPORT	View image in PDF format
07/07/2010 -- ANNUAL REPORT	View image in PDF format
02/01/2010 -- ANNUAL REPORT	View image in PDF format
01/26/2009 -- ANNUAL REPORT	View image in PDF format
01/04/2008 -- ANNUAL REPORT	View image in PDF format
01/11/2007 -- ANNUAL REPORT	View image in PDF format
01/30/2006 -- ANNUAL REPORT	View image in PDF format
03/28/2005 -- ANNUAL REPORT	View image in PDF format
01/16/2004 -- ANNUAL REPORT	View image in PDF format
02/27/2003 -- ANNUAL REPORT	View image in PDF format
03/06/2002 -- ANNUAL REPORT	View image in PDF format
01/26/2001 -- ANNUAL REPORT	View image in PDF format
02/20/2000 -- ANNUAL REPORT	View image in PDF format
02/19/1999 -- ANNUAL REPORT	View image in PDF format
03/03/1998 -- ANNUAL REPORT	View image in PDF format
03/18/1997 -- ANNUAL REPORT	View image in PDF format
04/30/1996 -- ANNUAL REPORT	View image in PDF format
03/20/1995 -- ANNUAL REPORT	View image in PDF format

Insurance

Pedro Falcon Contractors, Inc.

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 10/31/2024

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
Bowen, Miclette & Britt of Florida, LLC
850 Concourse Parkway S
Suite #105
Maitland FL 32751

CONTACT NAME: Michelle Rushing
PHONE (A/C, No, Ext): (407) 647-1616 **FAX (A/C, No):** (407) 628-1635
E-MAIL ADDRESS: mrushing@bmbinc.com

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : Amerisure Mutual Insurance Company	23396
INSURER B : James River Insurance Co.	12604
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

INSURED PEDROFALCO
Pedro Falcon Electrical Contractors, Inc.
31160 Avenue C
Big Pine Key FL 33043-4516

COVERAGES **CERTIFICATE NUMBER:** 1337516243 **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 INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
B	X COMMERCIAL GENERAL LIABILITY	Y	Y	00123482-3	11/2/2024	11/2/2025	EACH OCCURRENCE	$ 1,000,000
	[ ] CLAIMS-MADE [X] OCCUR						DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 100,000
							MED EXP (Any one person)	$ 5,000
							PERSONAL & ADV INJURY	$ 1,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						GENERAL AGGREGATE	$ 2,000,000
	[ ] POLICY [X] PRO-JECT [ ] LOC						PRODUCTS - COMP/OP AGG	$ 2,000,000
	[ ] OTHER:							$
A	**AUTOMOBILE LIABILITY**	Y	Y	CA20929391002	11/2/2024	11/2/2025	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
	X ANY AUTO						BODILY INJURY (Per person)	$
	[ ] ALL OWNED AUTOS [ ] SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	[ ] HIRED AUTOS [ ] NON-OWNED AUTOS						PROPERTY DAMAGE (Per accident)	$
								$
B	[ ] **UMBRELLA LIAB** [X] OCCUR	Y	Y	00138713-2	11/2/2024	11/2/2025	EACH OCCURRENCE	$ 5,000,000
	X **EXCESS LIAB** [ ] CLAIMS-MADE						AGGREGATE	$ 5,000,000
	[ ] DED [ ] RETENTION $							$
A	**WORKERS COMPENSATION AND EMPLOYERS' LIABILITY** Y / N		Y	WC20945261002	11/2/2024	11/2/2025	X PER STATUTE [ ] OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? [N] **(Mandatory in NH)**	N / A					E.L. EACH ACCIDENT	$ 1,000,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
							E.L. DISEASE - POLICY LIMIT	$ 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

The following policy provisions and/or endorsements form part of the policies of insurance represented by this certificate of insurance. The terms contained in the policies and/or endorsements supersede the representations made herein. Electronic copies of the policy provisions and/or endorsements listed below are available by emailing: Contact Name shown above.

When required by written contract, those parties listed in said contract, including the Certificate Holder, are added as additional insureds with respect to the General Liability including ongoing and completed operations, Auto Liability, and Excess Liability as afforded by the policy and/or endorsements.

When required by written contract, waiver of Subrogation is granted with respect to the General Liability, Auto Liability, Workers Compensation, and Excess
See Attached...

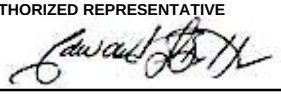
CERTIFICATE HOLDER

Specimen

CANCELLATION

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



AGENCY CUSTOMER ID: PEDROFALCO

LOC #:

ADDITIONAL REMARKS SCHEDULE

AGENCY	NAMED INSURED
Bowen, Miclette & Britt of Florida, LLC	Pedro Falcon Electrical Contractors, Inc. 31160 Avenue C Big Pine Key FL 33043-4516
POLICY NUMBER	
CARRIER / NAIC CODE	EFFECTIVE DATE:

ADDITIONAL REMARKS

THIS ADDITIONAL REMARKS FORM IS A SCHEDULE TO ACORD FORM,

FORM NUMBER: 25 **FORM TITLE:** CERTIFICATE OF LIABILITY INSURANCE

Liability to those parties listed in said contract, including the Certificate Holder.

The General Liability certified herein are primary and non-contributory to other insurance available, but only to the extent required by written contract.

For Informational/Bid Purposes Only.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – SCHEDULED PERSON OR ORGANIZATION

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name Of Additional Insured Person(s) Or Organization(s):	Location(s) Of Covered Operations
Where required by written contract or written agreement.	All operations of the Named Insured.
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.	

A. **Section II – Who Is An Insured** is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by:

1. Your acts or omissions; or
2. The acts or omissions of those acting on your behalf;

in the performance of your ongoing operations for the additional insured(s) at the location(s) designated above.

B. With respect to the insurance afforded to these additional insureds, the following additional exclusions apply:

This insurance does not apply to "bodily injury" or "property damage" occurring after:

1. All work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insured(s) at the location of the covered operations has been completed; or
2. That portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project.

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – COMPLETED OPERATIONS

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name Of Additional Insured Person(s) Or Organization(s):	Location And Description Of Completed Operations
Where required by written contract or written agreement.	All operations of the Named Insured.
Information required to complete this Schedule, if not shown above, will be shown in the Declarations.	

Section II – Who Is An Insured is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury" or "property damage" caused, in whole or in part, by "your work" at the location designated and described in the schedule of this endorsement performed for that additional insured and included in the "products-completed operations hazard".

References

PEDRO FALCON CONTRACTORS INC.

Customer References

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Credit References

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Craig Cowan
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Atlass Hardware Corporation
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Davie, FL 33314
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